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HOW TO USE THE BOOK

This book has been divided into many chapters. Chapter gives the motivation for this book and the use of templates. The text is presented in the simplest language. Each paragraph has been arranged under a suitable heading for easy retention of concept. Keywords are the words that academics use to reveal the internal structure of an author's reasoning. Review questions at the end of each chapter ask students to review or explain the concepts. References provides the reader an additional source through which he/she can obtain more information regarding the topic.

LEARNING OBJECTIVES

See what you are going to cover and what you should already know at the start of each chapter

ABOUT THIS CHAPTER

An introduction is a beginning of section which states the purpose and goals of the topics which are discussed in the chapter. It also starts the topics in brief.



CHAPTER 1

Introduction to Health and Illness

"Health is not valued till sickness comes."
–Thomas Fuller

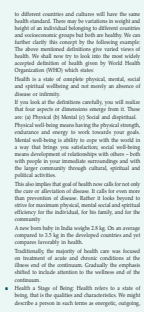
LEARNING OBJECTIVES

After studying this chapter, you will be able to:

1. Describe the various concepts of health
2. Explain the models of health and illness.
3. Describe the various dimensions of health
4. Enumerate the various factors influencing health
5. Understand causes and risk factors for developing illness
   a. Focus on body defenses – immunity and immunization
   b. Understand the illness and illness behavior
6. State the health care services

INTRODUCTION

Health is "a state of complete physical, mental and social well-being and not merely the absence of disease and infirmity". A variety of definitions have been used for different purposes over time. Health can be promoted by encouraging healthful activities, such as regular physical exercise and adequate sleep, and by reducing or avoiding unhealthful activities or situations, such as smoking or excessive stress. Some factors affecting health



to different countries and cultures will have the same health standard. There may be variations in weight and height of an individual belonging to different countries and socioeconomic groups but both are healthy. We can further clarify this concept by the following example: The above mentioned definitions give varied views of health. We shall now try to look into the most widely accepted definition of health given by World Health Organization (WHO) which states:

Health is a state of complete physical, mental, social and spiritual wellbeing and not merely an absence of disease or infirmity.

If you look at the definitions carefully, you will realize that four aspects or dimensions emerge from it. These are: (a) Physical (b) Mental (c) Social and dispiritual.

Physical well-being means having the physical strength, endurance and energy to work towards your goals. Mental well-being is ability to cope with the world in a way that brings you satisfaction; social well-being means development of relationships with others - both with people in your immediate surroundings and with the larger community through cultural, spiritual and political activities.

This also implies that goal of health now calls for not only the cure or alleviation of disease. It calls for even more than prevention of disease. Rather it looks beyond to strive for maximum physical, mental social and spiritual efficiency for the individual, for his family, and for the community

A new born baby in India weighs 2.8 kg. On an average compared to 3.5 kg in the developed countries and yet compares favorably in health.

Traditionally, the majority of health care was focused on treatment of acute and chronic conditions at the illness end of the continuum. Gradually the emphasis shifted to include attention to the wellness end of the continuum.

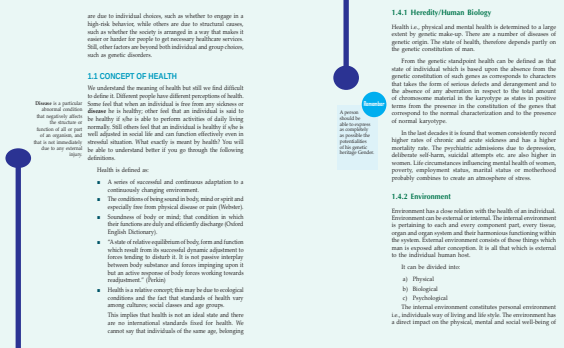
- Health a Stage of Being: Health refers to a state of being, that is the qualities and characteristics. We might describe a person in such terms as energetic, outgoing,

REMEMBER

This revitalizes a must read information of the topic.

KEYWORDS

This section contains some important definitions that are discussed in the chapter. A keyword is an index entry that identifies a specific record or document. It also gives the extra information to the reader and an easy way to remember the word definition.



Disease is a particular abnormal condition that negatively affects the structure or function of all or part of an organism, and that is not immediately due to any external injury.

are due to individual choices, such as whether to engage in a high-risk behavior, while others are due to structural causes, such as whether the society is arranged in a way that makes it easier or harder for people to get necessary healthcare services. Still, other factors are beyond both individual and group choices, such as genetic disorders.

1.1 CONCEPT OF HEALTH

We understand the meaning of health but still we find difficult to define it. Different people have different perceptions of health. Some feel that when an individual is free from any sickness or disease he is healthy; other feel that an individual is said to be healthy if s/he is able to perform activities of daily living normally. Still others feel that an individual is healthy if s/he is well adjusted in social life and can function effectively even in stressful situation. What exactly is meant by health? You will be able to understand better if you go through the following definitions.

Health is defined as:

- A series of successful and continuous adaptation to a continuously changing environment.
- The conditions of being sound in body, mind or spirit and especially free from physical disease or pain (Webster).
- Soundness of body or mind; that condition in which their functions are duly and efficiently discharge (Oxford English Dictionary).
- "A state of relative equilibrium of body, form and function which result from its successful dynamic adjustment to forces tending to disturb it. It is not passive interplay between body substance and forces impinging upon it but an active response of body forces working towards readjustment." (Perkin)
- Health is a relative concept; this may be due to ecological conditions and the fact that standards of health vary among cultures; social classes and age groups.

This implies that health is not an ideal state and there are no international standards fixed for health. We cannot say that individuals of the same age, belonging

1.4.1 Heredity/Human Biology

Health i.e., physical and mental health is determined to a large extent by genetic make-up. There are a number of diseases of genetic origin. The state of health, therefore depends partly on the genetic constitution of man.

From the genetic standpoint health can be defined as that state of individual which is based upon the absence from the genetic constitution of such genes as corresponds to characters that takes the form of serious defects and derangement and to the absence of any aberration in respect to the total amount of chromosome material in the karyotype as states in positive terms from the presence in the constitution of the genes that correspond to the normal characterization and to the presence of normal karyotype.

In the last decades it is found that women consistently record higher rates of chronic and acute sickness and has a higher mortality rate. The psychiatric admissions due to depression, deliberate self-harm, suicidal attempts etc. are also higher in women. Life circumstances influencing mental health of women, poverty, employment status, marital status or motherhood probably combines to create an atmosphere of stress.

Remember

A person should be able to express as completely as possible the potentialities inherited in his/her heritage Gardner.

1.4.2 Environment

Environment has a close relation with the health of an individual. Environment can be external or internal. The internal environment is pertaining to each and every component part, every tissue, organ and organ system and their harmonious functioning within the system. External environment consists of those things which man is exposed after conception. It is all that which is external to the individual human host.

It can be divided into:

a) Physical
b) Biological
c) Psychological

The internal environment constitutes personal environment i.e., individuals way of living and life style. The environment has a direct impact on the physical, mental and social well-being of

DID YOU KNOW?

This section equip readers the interesting facts and figures of the topic.

EXAMPLE

The book cabinets' examples to illustrate specific ideas in each chapter.



Some patients require ongoing wound care and activity and exercise management until they have recovered enough following surgery to independently resume normal activities of daily living.

The intensity of care has increased in restorative care settings because patients leave hospitals earlier. Patients in a home or rehabilitation setting often still receive IV fluids, aggressive pain control, or enteral nutrition. The restorative health care team is inter-professional and includes the patient and family or significant others. In restorative settings nurses recognize that success depends on effective and early collaboration with patients and their families. Patients and families require a clear understanding of goals for physical recovery, the rationale for any physical limitations, and the purpose and potential risks associated with therapies. Patients and families are more likely to follow treatment plans and achieve optimal functioning when they are engaged in their care.

Home Care

Home care is the provision of medically related professional and paraprofessional services and equipment to patients and families in their homes for health maintenance, education, illness prevention, diagnosis and treatment of disease, palliation, and rehabilitation. This care consists of part-time, medically necessary skilled care (nursing, physical therapy, occupational therapy, and speech-language therapy) that is prescribed by a health care provider. A home care service also coordinates the access to and delivery of home health equipment, or durable medical equipment, which is a medical product adapted for home use.

Home care nurses have their own patient caseloads and deliver highly individualized nursing care. They help patients adapt too many permanent or temporary physical limitations so that the patients can assume a daily home routine that is as normal as possible. Home care requires a strong knowledge base in many areas, such as family dynamics, cultural competency, spiritual values, and communication principles. Home health nurses must also have expertise in assessment. Nurses who work in Medicare-certified home care agencies conduct patient-specific comprehensive assessments at a patient's start of care, at 60-day follow-ups, at discharge, and before and after an inpatient

those living in it. In the environment favorable to the individual, he can make full use of his physical and mental capabilities.

1.4.3 Life Style

Life style denotes the way people live, reflecting a whole range of social values, attitudes and activities. Lifestyles are learnt through social interaction with parents, peer, groups, friends and siblings and through school and mass media. Life style is composed of cultural and behavioral patterns and lifelong personal habits that have developed through processes of socialization.

Many of the health problems are associated with life style changes. Risk for illness and death are related with life styles such as lack of sanitation, poor nutrition, personal hygiene, elementary human habits, customs and cultural patterns. Certain life styles like adequate nutrition, enough sleep, sufficient physical activity to promote health. Achievement of optimum health demands adoption of healthy styles.

1.4.4 Resources

The resources which help in maintaining and determining health of an individual are explained below.

Socio Economic Conditions

Socio economic conditions influence human health. Health status is primarily determined by the level of socio-economic development like per capita income, political system, economy etc.

The important socio-economic factors that are of major importance are:

- **Economic Status:** The per capita income is accepted measure of socio-economic performance. The socio-economic development has a major role in reducing morbidity, increasing life expectancy and improving quality of life. Socio-economic status determines the purchasing power, quality of life, standard of life, family size and pattern of disease and deviant behavior in the community.

Did You Know?

Starting in the early 2000s, the World Health Organization facilitated multidisciplinary and political work on social determinants in a way that provided a deep understanding of health disparities in a global perspective.

ROLE MODEL

A biography of someone who has/had acquired remarkable success in their respective field as Role Models are important because they give us the ability to imagine our future selves.

CASE STUDY

This reveals what students need to create and provide an opportunity for the development of key skills such as communication, group working and problem solving.

ROLE MODEL



HALBERT L. DUNN

Halbert L. Dunn, M.D. (1896–1975) was the leading figure in establishing a national vital statistics system in the United States and is known as the "father of the wellness movement".

Early Life

Born in New Paris, Ohio, he attended the University of Minnesota where he earned his M.D. in 1922 and his Ph.D. in 1923. He served as an assistant in medicine at Presbyterian Hospital of New York City 1923–1924 and as fellow in medicine at the Mayo Clinic in Rochester, Minnesota (1924–1925).

Work in Statistics

In 1929, he was the first biostatistician hired by the Mayo Clinic and established its computer coding system for deriving medical statistics. He was Chief of the National Office of Vital Statistics from 1935 through 1960, first as part of the Bureau of the Census and later under the Department of Health, Education and Welfare, where it eventually became the National Center for Health Statistics in 1960. In his final year with the U.S. Public Health Service he was Assistant Surgeon General for aging.

He was one of the founders of the National Association for Public Health Statistics and Information Systems (NAPHSIS) and of the Inter-American Statistics Institute (IASI). He was Secretary General of the IASI from 1941 to 1952. The Halbert L. Dunn Award, named in his honor, has been presented since 1981 by NAPHSIS in recognition of outstanding and lasting contributions to the field of vital and health statistics.

Wellness

Dunn is known as the "father" of the wellness movement. He distinguished between good health—not being ill—and what he termed high-level wellness, which he defined as "a condition of change in which the individual moves forward, climbing toward a higher potential of functioning". He introduced the concept in

CASE STUDY

DISCHARGE FUMBLES

Case #1 A 59 year-old man with severe but well-controlled congestive heart failure, on spironolactone and other appropriate medications, was discharged following a brief hospitalization for leg cellulitis. His pre-admission medication regimen was included on his discharge orders. Within days of discharge, the patient began to feel lethargic and nauseated. He presented to the emergency department (ED) with these complaints and was found to be in acute renal failure, with a serum potassium level of 7.1 and a sodium level of 122. Upon review of his discharge orders, it was discovered that the spironolactone was mistakenly prescribed at a dose 8 times higher than his admission dose.

Case #2 A patient was admitted for atypical chest pain. During the course of her stay, she was evaluated by neurology for memory deficit. She was placed on Reminyl (galantamine hydrobromide, a medication for Alzheimer's disease), 4 mg twice daily to be increased to 8 mg twice daily in one month. Upon discharge, an order was written to "discharge on current medications." The patient presented to the ED the following day with mental status changes. She was found to be profoundly hypoglycemic. Review of her discharge medications revealed an inadvertent addition of Amaryl (glimepiride, a medication for diabetes). It was determined that the pharmacy mistook the original order for Reminyl as Amaryl.

Patient safety problems, similar to the two illustrative cases, are exceedingly common in the early discharge period. Recent studies performed in three hospitals and two countries demonstrate that approximately 1 in 5 medical patients experience an adverse event during the first several weeks after hospital discharge. Many of these events result in symptoms only; however, approximately one third of them are associated with disability and half of them are associated with use of additional health services. The following discussion describes types of post-discharge adverse events, their epidemiology, important health system factors contributing to them, and potential solutions.

Types of adverse events affecting patients after discharge Several types of adverse events may occur following discharge. The most prevalent are medication related, also known as adverse drug events (ADEs). As illustrated in these cases, ADEs, which include outcomes where an error in drug ordering or prescription filling harms the patient, account for about two thirds of all adverse events. However, ADEs more commonly include reactions typically associated with a medication's known pharmacologic activity; for example, constipation secondary to narcotic analgesics. Although ADEs make up the majority of adverse events, there are other important types as well. With shortened length of stays, nosocomial infections often become clinically apparent only after

MULTIPLE CHOICE QUESTIONS

This is given to the students for progress check at the end of each chapter.

REVIEW QUESTIONS

This section is to analyze the knowledge and ability of the reader.

REFERENCES

References refer those books which discuss the topics given in the chapters in almost same manner.

MULTIPLE CHOICE QUESTIONS

1. **When can we say that we are not healthy?**
   a. When we feel good physically
   b. When we are able to cope well with the social pressure
   c. When we have a positive outlook towards life
   d. When we constantly suffer from headaches due to a stressful life
2. **Which of the following is not dimension of health?**
   a. Nutritional
   b. Physical
   c. Social
   d. Mental
3. **A sudden onset of a disease with rapid changed is commonly known as**
   a. Acute
   b. Chronic
   c. Contagious
   d. Non contagious
4. **The term 'health' is defined in many ways. The most accurate definition of the health would be,**
   a. Health is a state of complete physical, mental and social well-being
   b. Health is the state of body and mind in a balanced condition
   c. Health is the reflection of a smiling face
   d. Health is the symbol of economic prosperity
5. **Health is not defined by which of the following?**
   a. physical well being
   b. genetic disorders
   c. physical well being
   d. social well being

REVIEW QUESTIONS

1. What are the 3 definitions of health?
2. List the four concepts of health.
3. List any three health illness models.
4. What are the basic concepts of Rosenstock's Health Belief Model?

REFERENCES

1. Bene, J; Blakey, C; Oppenheimer, C.C; Schurer, H; Robinson, WT (2013). "The healthy people initiative: Understanding the user's perspective". Journal of Public Health Management and Practice. 19 (2): 103-09. doi:10.1097/PHH.0b013e318254cc31. PMID 23358267.
2. Dalal, A. K. & Misra, G. (2011). New Directions in Health Psychology (1st ed.). New Delhi: Sage Publication.
3. Dalal, A. K., & Misra, G. (2006). Psychology of Health and Wellbeing: Some Emerging Perspectives. Psychological Studies.
4. Davis, T. (2019). What Is Well-Being? Definition, Types, and Well-Being Skills. Retrieved from https://www.psychologytoday.com/us/blog/click-here-happiness/201901/what-is-well-being-definition-types-and-well-being-skills on 17/08/2019 at 11:20 am.
5. Dodge, R., Daly, A., Huyton, J., & Sanders, L. (2012). The Challenge of Defining Wellbeing. International Journal of Wellbeing, 2(3), 222-235. doi:10.5502/ijw.v2i3.4
6. Harris AH, Thomsen CE (2005). "Voluntwering is Associated with Delayed Mortality in Older People: Analysis of the Longitudinal Study of Aging" (PDF). Journal of Health Psychology. 10 (6): 739–52. doi:10.1177/1359105305057310. PMID 16176953. S2CID 23314208. Archived from the original (PDF) on 2011-07-22.
7. Jadad, Alejandro R. (2016-11-01). "Creating a pandemic of health: What is the role of digital technologies?". Journal of Public Health Policy. 37 (2): 260–68. doi:10.1057/s41271-016-0016-1. ISSN 0197-5897. PMID 27098800.
8. Jonathan, E. Fielding; Shiriki, Kumanyika; Ronald, W. Manderscheid (2013). *"A Prospective on the Development of the Healthy People 2020 Framework for*

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PREFACE

Throughout the prenatal period, nurses and nurse-midwives provide care for pregnant women in clinics and health centers, and they also offer classes to help families prepare for childbirth. During labor and birth, they care for childbearing families in hospitals, birth centers, and sometimes at home. Obstetrics and midwifery are two related but different fields that focus on the care of pregnant and laboring women. Obstetrics deals with the problems and difficulties of pregnancy and labor, while midwifery emphasizes the normalcy of pregnancy and recognizes the vulnerability associated with the reproductive process. Midwifery emerged from the traditional social and physical support that women have given to one another during childbirth, while obstetrics gradually developed from the medical practices of ancient Greece and Rome, combined with modern anatomical research and surgery in premodern Europe. Obstetrics had its biggest impact in the late 18th century when the fundamentals of parturition were recognized, and large numbers of male medical practitioners began delivering babies. Anesthesia and antisepsis advanced obstetrics in the 19th century, and the introduction of sulfa drugs in the 20th century helped to reduce infections related to medical intervention during childbirth, which had been a leading cause of maternal death.

Today, obstetrics is becoming increasingly technological and focuses on the pathology of pregnancy, while midwifery continues to prioritize the normalcy of pregnancy and the importance of providing pregnant and laboring women with practical and emotional support. The rise of obstetrics had a mixed effect on midwifery, with some midwives clinging to traditional ways and others embracing new science and seeking retraining. National policies also influenced midwifery practice, with American and British midwives being excluded from hospitals and schools that used new techniques and obstetrical knowledge, while European midwives were regulated and re-educated under local and national authorities.

This book provides a comprehensive guide to midwifery and obstetrical nursing, covering all aspects of care during pregnancy, labor, delivery, and postnatal care. It contains seven chapters that cover different topics related to midwifery and obstetrical nursing.

Chapter 1 provides an introduction to midwifery and obstetrical nursing, giving the reader an overview of the field.

Chapter 2 delves into the anatomy and physiology of the female reproductive system, providing an in-depth understanding of this essential system.

Chapter 3 focuses on the assessment and management of pregnancy, covering the different stages of pregnancy and the care required during this period.

Chapter 4 deals with the assessment and management of the intranatal period, which includes labor and delivery, and the necessary care for the mother and baby during this time.

Chapter 5 discusses the assessment and management of women during the postnatal period, which includes the care of both the mother and newborn after delivery.

Chapter 6 addresses the assessment and management of normal neonates, providing information on the necessary care and support for healthy newborns.

Finally, **Chapter 7** covers high-risk pregnancy assessment and management, which involves the care of women who have higher than normal risks during pregnancy.

This book is designed for students to appreciate the concepts and principles of Midwifery and obstetrical nursing. It helps them to acquire knowledge and skills in rendering nursing care to normal and high risk pregnant woman during antenatal, natal and post natal periods in hospitals and community settings. It also helps to develop skills in managing normal and high-risk neonates and participate in family welfare program.



CHAPTER 1

Introduction to Midwifery and Obstetrical Nursing

"It's not just the making of babies, but the making of mothers that midwives see as the miracle of birth."

—*Barbara Katz Rothman*

LEARNING OBJECTIVES

After studying this chapter, you will be able to:

1. Explain the history of management in nursing
2. Understand the concept of nursing management
3. Describe nursing leadership and management, role definitions and differences
4. Discuss about organizations, power, and empowerment
5. Explain the role of nurse as a manager

INTRODUCTION

Midwifery and obstetrical nursing are two closely related fields in healthcare that focus on the care of women during pregnancy, childbirth, and the postpartum period.

Midwifery is a profession that has been around for thousands of years and involves providing care and support to women during pregnancy, childbirth, and the postpartum period. Midwives are trained healthcare professionals who provide personalized, holistic care that is focused on the needs of the woman and her family. They provide prenatal care, assist with labor and delivery, and provide postpartum care for both the mother

and baby. Midwives may work in hospitals, birth centers, or provide care in the home.

Obstetrical nursing, on the other hand, is a specialization within nursing that focuses on providing care for women during pregnancy, childbirth, and the postpartum period. Obstetrical nurses work closely with obstetricians, midwives, and other healthcare professionals to provide a range of services, including prenatal care, labor and delivery support, postpartum care, and newborn care.



Both midwifery and obstetrical nursing play an important role in ensuring the health and safety of women and newborns during childbirth. They work together to provide comprehensive, personalized care that supports the physical, emotional, and social needs of the mother and baby.

1.1 CONCEPTS OF MIDWIFERY AND OBSTETRICAL NURSING

Obstetrics and midwifery are two distinct but overlapping fields of medical knowledge and practice which focus on the care of the pregnant and parturient (laboring) woman. Obstetrics focuses on the problems and difficulties of pregnancy and labor; midwifery emphasizes the normalcy of pregnancy while acknowledging the

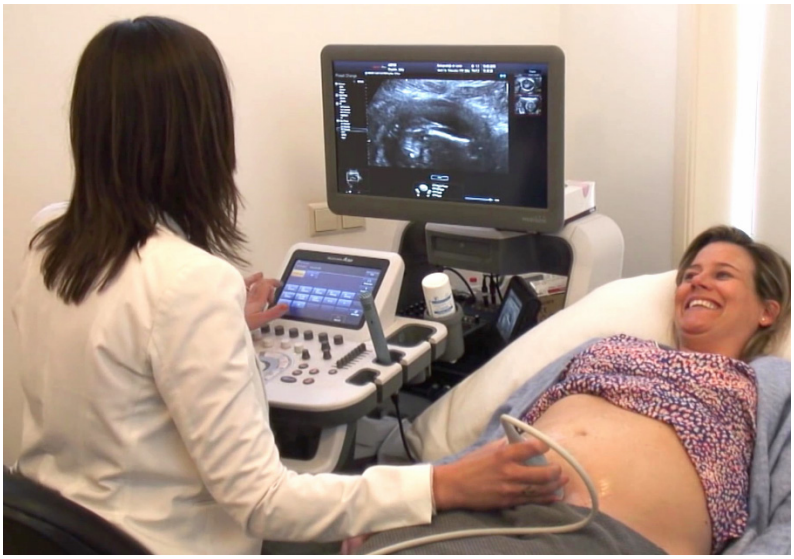
vulnerability associated with the reproductive process. Midwifery arose from the social and physical support women traditionally have given to one another, while obstetrics developed gradually as a combination of the medical traditions practiced in ancient Greece and Rome and the rise of modern anatomical research and surgery developed in premodern Europe. Obstetrics had its greatest impact at the end of the eighteenth century as the fundamentals of parturition, including its anatomy, physiology, and pathology, were recognized and as large numbers of male medical practitioners began to deliver babies. Anesthesia and antisepsis advanced nineteenth-century obstetrics, but it was not until the third decade of the twentieth century with the advent of sulfa drugs that infections related to medical intervention during childbirth ceased to be the leading cause of maternal death. In the twenty-first century, obstetrics is increasingly technological in its orientation and is focused on the pathology of pregnancy while midwifery continues to maintain its emphasis on the normalcy of pregnancy and the importance of providing pregnant and parturient women with practical and emotional support.

What is a Midwife?

Midwives are healthcare providers who deal with pregnancy, childbirth, newborn care and postpartum health. Some midwives provide routine reproductive care like pelvic exams, Pap tests, or counseling on birth control. Midwives tend to be more holistic and supportive of natural approaches to pregnancy and birth. People often choose a midwife when they know they want a nonmedicated birth or want to give birth at home.

Midwives are usually not physicians. They often work alongside obstetricians and **gynecologists** (Ob/Gyns) in a hospital to ensure you have access to any care you need. A midwife is recommended when your pregnancy is low-risk or if you have only mild complications.

Gynaecologist is a specialist doctor who manages conditions that affect the female reproductive system — which includes the vulva, vagina, uterus (womb) and ovaries.



Pregnancy and labor are very personal experiences. You have a choice about the kind of care you'd prefer. That's why it may help to know the differences between midwives and Ob/Gyns.



What Is Obstetrical Nursing?

Obstetrical nursing is a specialty in which nurses provide medical care for pregnant women through all stages of their pregnancy. Obstetrical nursing is one of the most meaningful and exciting occupational fields. An obstetrics nurse works with pregnant women throughout pregnancy, labor, delivery, and recovery to provide medical guidance, care, support, monitoring, and information.

Why choose an obstetrical nursing career?

Working as a nurse in the obstetrics department of a hospital or as an obstetrician in a medical practice means the nurse will work directly with maternity patients, the women who are pregnant and preparing to give birth. While having a baby is a fairly normal event, many types of complications can occur at any stage.



What does obstetrical nurse do?

OB nurses care for women during pregnancy. They are responsible for understanding all the potential problems women can face while pregnant. At the beginning of the pregnancy, a woman infected with HIV may require special care or monitoring. Women with serious medical conditions, such as a weak heart, diabetes, cancer, or other problems, often get checked more frequently than someone without medical issues. Those on special medications or with physical or mental disabilities may have other needs for the evaluation, monitoring, or treatment to keep both mother and child safe and healthy.

During the pregnancy, various complications may arise. For example, gestational diabetes, a problem with the fetus, or extreme pregnancy side effects like frequent nausea and vomiting or severe fatigue may interfere with the mother's well-being.

Late pregnancy during the last trimester often presents other difficulties. For example, Pre-eclampsia, toxemia, Placenta Previa, or preterm delivery are problems that can sometimes be life-threatening for both mother and baby.

An obstetrics nurse needs the education and experience to work with patients who are diagnosed with conditions like these. The nurse must be able to remain calm and have the ability to reassure the patient who is under stress from her pregnancy complications. In addition, the role requires clear, prompt communication between the nurse and the doctor, and other medical staff overseeing the patient's care.

1.1.2 History of Midwifery

Ancient History

In ancient Egypt, midwifery was a recognized female occupation, as attested by the Ebers Papyrus which dates from 1900 to 1550 BCE. Five columns of this papyrus deal with obstetrics and gynecology, especially concerning the acceleration of parturition (the action or process of giving birth to offspring) and the birth prognosis of the newborn. The Westcar papyrus, dated to 1700 BCE, includes instructions for calculating the expected date of confinement and describes different styles of birth chairs. Bas reliefs in the royal birth rooms at Luxor and other temples also attest to the heavy presence of midwifery in this culture.

Midwifery in Greco-Roman antiquity covered a wide range of women, including old women who continued folk medical traditions in the villages of the Roman Empire, trained midwives who garnered their knowledge from a variety of sources, and highly trained women who were considered physicians. However, there were certain characteristics desired in a "good" midwife, as described by the physician Soranus of Ephesus in the 2nd century. He states in his work, *Gynecology*, that "a suitable person will be literate, with her wits about her, possessed of a good memory, loving work, respectable and generally not unduly handicapped as regards her senses [i.e., sight, smell, hearing], sound of limb, robust, and, according to some people, endowed with long slim fingers and short nails at her fingertips." Soranus also recommends that the midwife be of sympathetic disposition

(although she need not have borne a child herself) and that she keep her hands soft for the comfort of both mother and child. Pliny, another physician from this time, valued nobility and a quiet and inconspicuous disposition in a midwife. There appears to have been three "grades" of midwives present: The first was technically proficient; the second may have read some of the texts on obstetrics and gynecology; but the third was highly trained and reasonably considered a medical specialist with a concentration in midwifery.

Agnodice or Agnodike (Gr. Ἀγνοδίκη) was the earliest historical, and likely apocryphal, midwife mentioned among the ancient Greeks.

Midwives were known by many different titles in antiquity, ranging from *iatrinē* (Gr. nurse), *maia* (Gr., midwife), *obstetrix* (Lat., obstetrician), and *medica* (Lat., doctor). It appears as though midwifery was treated differently in the Eastern end of the Mediterranean basin as opposed to the West. In the East, some women advanced beyond the profession of midwife (*maia*) to that of gynaecologist (*iatros gynaikeios*, translated as *women's doctor*), for which formal training was required. Also, there were some gynecological tracts circulating in the medical and educated circles of the East that were written by women with Greek names, although these women were few in number. Based on these facts, it would appear that midwifery in the East was a respectable profession in which respectable women could earn their livelihoods and enough esteem to publish works read and cited by male physicians. In fact, a number of Roman legal provisions strongly suggest that midwives enjoyed status and remuneration comparable to that of male doctors. One example of such a midwife is Salpe of Lemnos, who wrote on women's diseases and was mentioned several times in the works of Pliny.

However, in the Roman West, information about practicing midwives comes mainly from funerary epitaphs. Two hypotheses are suggested by looking at a small sample of these epitaphs. The first is the midwifery was not a profession to which freeborn women of families that had enjoyed free status of several generations were attracted; therefore it seems that most midwives were of servile origin. Second, since most of these funeral epitaphs describe the women as freed, it can be proposed that midwives were generally valued enough, and earned enough

income, to be able to gain their freedom. It is not known from these epitaphs how certain slave women were selected for training as midwives. Slave girls may have been apprenticed, and it is most likely that mothers taught their daughters.

The actual duties of the midwife in antiquity consisted mainly of assisting in the birthing process, although they may also have helped with other medical problems relating to women when needed. Often, the midwife would call for the assistance of a physician when a more difficult birth was anticipated. In many cases the midwife brought along two or three assistants. In antiquity, it was believed by both midwives and physicians that a normal delivery was made easier when a woman sat upright. Therefore, during parturition, midwives brought a stool to the home where the delivery was to take place. In the seat of the birthstool was a crescent-shaped hole through which the baby would be delivered. The birthstool or chair often had armrests for the mother to grasp during the delivery. Most birthstools or chairs had backs which the patient could press against, but Soranus suggests that in some cases the chairs were backless and an assistant would stand behind the mother to support her. The midwife sat facing the mother, encouraging and supporting her through the birth, perhaps offering instruction on breathing and pushing, sometimes massaging her vaginal opening, and supporting her perineum during the delivery of the baby. The assistants may have helped by pushing downwards on the top of the mother's abdomen.

Finally, the midwife received the infant, placed it in pieces of cloth, cut the umbilical cord, and cleansed the baby. The child was sprinkled with "fine and powdery salt, or natron or aphronitre" to soak up the birth residue, rinsed, and then powdered and rinsed again. Next, the midwives cleared away any and all mucus present from the nose, mouth, ears, or anus. Midwives were encouraged by Soranus to put olive oil in the baby's eyes to cleanse away any birth residue, and to place a piece of wool soaked in olive oil over the umbilical cord. After the delivery, the midwife made the initial call on whether or not an infant was healthy and fit to rear. She inspected the newborn for congenital deformities and testing its cry to hear whether or not it was robust and hearty. Ultimately, midwives made a determination about the chances for an infant's survival and likely recommended that a newborn with any severe deformities

be exposed.

A 2nd-century terracotta relief from the Ostian tomb of Scribonia Attice, wife of physician-surgeon M. Ulpius Amerimnus, details a childbirth scene. Scribonia was a midwife and the relief shows her in the midst of a delivery. A patient sits in the birth chair, gripping the handles and the midwife's assistant stands behind her providing support. Scribonia sits on a low stool in front of the woman, modestly looking away while also assisting the delivery by dilating and massaging the vagina, as encouraged by Soranus.

The services of a midwife were not inexpensive; this fact that suggests poorer women who could not afford the services of a professional midwife often had to make do with female relatives. Many wealthier families had their own midwives. However, the vast majority of women in the Greco-Roman world very likely received their maternity care from hired midwives. They may have been highly trained or possessed only a rudimentary knowledge of obstetrics. Also, many families had a choice of whether or not they wanted to employ a midwife who practiced the traditional folk medicine or the newer methods of professional parturition. Like a lot of other factors in antiquity, quality gynecological care often depended heavily on the socioeconomic status of the patient.

Modern History

From the 18th century, a conflict between surgeons and midwives arose, as medical men began to assert that their modern scientific techniques were better for mothers and infants than the folk medicine practiced by midwives. As doctors and medical associations pushed for a legal monopoly on obstetrical care, midwifery became outlawed or heavily regulated throughout the United States and Canada. In Northern Europe and Russia, the situation for midwives was a little easier - in the Duchy of Estonia in Imperial Russia, Professor Christian Friedrich Deutsch established a midwifery school for women at the University of Dorpat in 1811, which existed until World War I. It was the predecessor for the Tartu Health Care College. Training lasted for 7 months and in the end a certificate for practice was issued to the female students. Despite accusations that midwives were "incompetent and ignorant", some argued that poorly trained

surgeons were far more of a danger to pregnant women. In 1846, the physician Ignaz Semmelweiss observed that more women died in maternity wards staffed by male surgeons than by female midwives, and traced these outbreaks of puerperal fever back to (then all-male) medical students not washing their hands properly after dissecting cadavers, but his sanitary recommendations were ignored until acceptance of germ theory became widespread.

The argument that surgeons were more dangerous than midwives lasted until the study of bacteriology became popular in the early 1900s and hospital hygiene was improved. Women began to feel safer in the setting of the hospitals with the amount of aid and the ease of birth that they experienced with doctors. "Physicians trained in the new century found a great contrast between their hospital and obstetrics practice in women's homes where they could not maintain sterile conditions or have trained help." German social scientists Gunnar Heinsohn and Otto Steiger theorize that midwifery became a target of persecution and repression by public authorities because midwives possessed highly specialized knowledge and skills regarding not only assisting birth, but also contraception and abortion.

Contemporary

At late 20th century, midwives were already recognized as highly trained and specialized professionals in obstetrics. However, at the beginning of the 21st century, the medical perception of pregnancy and childbirth as potentially pathological and dangerous still dominates Western culture. Midwives who work in hospital settings also have been influenced by this view, although by and large they are trained to view birth as a normal and healthy process. While midwives play a much larger role in the care of pregnant mothers in Europe than in America, the medicalized model of birth still has influence in those countries, even though the World Health Organization recommends a natural, normal and humanized birth.

The midwifery model of pregnancy and childbirth as a normal and healthy process plays a much larger role in Sweden and the Netherlands than the rest of Europe, however. Swedish midwives stand out, since they administer 80 percent of prenatal care and more than 80 percent of family planning services in

Sweden. Midwives in Sweden attend all normal births in public hospitals and Swedish women tend to have fewer interventions in hospitals than American women. The Dutch infant mortality rate is one of the lowest rate in the world, at 4.0 deaths per thousand births, while the United States ranked twenty-second. Midwives in the Netherlands and Sweden owe a great deal of their success to supportive government policies.

Did You Know?

Midwives are experts in the birthing process and, working hand-in-hand with an obstetrician, can help you have a healthy birth. Today, 7.8 percent of all hospital-born American babies are delivered by a midwife, who are gaining in popularity because women want a healthy, natural birth experience

1.1.3 Types of Midwives

There are a few different types of midwives who have different levels of training and certification. In the United States, midwives fall under two main categories:

- Nurse midwives who are trained in nursing and midwifery
- Direct entry midwives who are trained in midwifery only

Certified Nurse Midwives (CNMs)

A certified nurse midwife (CNM) is a registered nurse who receives additional training in pregnancy and childbirth and has a master's degree in nurse midwifery. CNMs are considered part of the mainstream medical establishment and are certified by the American Midwifery Certification Board.



CNMs receive training in anatomy, physiology, and obstetrics. They are also able to make medical decisions that follow the medical community's standards of care. Most CNMs are involved

with deliveries in hospitals and are involved with obstetricians' offices.

In most cases, CNMs will spend more time with you during labor than a doctor. CNMs will encourage and coach you along the way. This personal touch is one of the reasons many women rely on CNMs.

However, CNMs can't perform cesarean deliveries and in most cases can't perform vacuum or forceps deliveries. They generally care for low-risk women who are unlikely to need these types of interventions.

In some situations CNMs may help OB-GYNs or perinatologists with the care of high-risk women.

Remember

If you're thinking about receiving care from a CNM, you should ask about the doctors the midwife works with. Even low-risk women may suddenly develop complications that require the expertise and special training of a doctor.

Certified Midwives (CMs)

A certified midwife (CM) is similar to a certified nurse midwife. The only difference is that a CMs initial degree was not in nursing.

What Does A Certified Midwife Do?

A certified midwife has a variety of duties, including:

- Monitoring the health of the pregnant woman and her unborn child
- Offering education and counseling to women on an individual basis
- Treating a woman's male partner for sexually transmitting diseases
- Helping throughout labor and delivery
- Providing care for the newborn for the first 28 days
- Providing follow-up care for the newborn and mother and offering guidance on infant care, like help with breastfeeding



Certified Professional Midwives (CPMs)

A certified professional midwife (CPM) works independently with women delivering at home or in birth centers. CPMs attend births and usually provide prenatal care.

CPMs must pass a competency test by the North American Registry of Midwives (NARM).

Direct Entry Midwives (DEMs)

A direct entry midwife (DEM) practices independently and has learned midwifery through a midwifery school, apprenticeship, or college program in midwifery. DEMs provide complete prenatal care and attend home births or deliveries in birth centers.

Lay Midwives

A lay midwife is not a medical professional. The training, certification, and ability of lay midwives may vary since most states have no single, established curriculum, training, or uniform certification process.

Lay midwives are generally not viewed as part of the mainstream medical community and often work with people who practice alternative medicine.

With few exceptions, lay midwives don't deliver babies in hospitals. They usually help with deliveries at home or in birth centers.



Although most women can safely deliver at home under the care of a lay midwife, some women develop serious complications after labor begins. Because the training of lay midwives is not regulated, the ability to recognize complications varies.

Many obstetric complications occur so quickly that even prompt treatment by a doctor may be ineffective without the use of modern medical technology. Because of this, few doctors in mainstream American medicine recommend home birth or delivery by lay midwives.

Doulas

A doula generally assists the mother right before the birth and during labor and delivery. They provide emotional and physical support to the mother and can also help educate them. However, they don't provide medical care.

Doulas are available to the mother before the birth to help come up with a birth plan and answer any questions the mother may have.

During childbirth, the doula will provide comfort to the mother by helping with breathing and relaxation. They will also provide massage and help with labor positions. After childbirth,

the doula will help the mother with breastfeeding and may help during the **postpartum period**.

Postpartum (or postnatal) period begins after childbirth and is typically considered to end within 6 weeks as the mother's body, including hormone levels and uterus size, returns to a non-pregnant state.

The doula will be there for the mother and help her have a safe and positive childbirth, even if it involves medication or surgery.

1.1.4 Benefits of Midwifery

Midwifery benefits pregnant women in several ways. Midwives encourage women to actively participate in health care decisions. They teach women how to best care for themselves through proper nutrition and exercise, giving women greater control over their pregnancies and birth experiences. Many women find this level of participation satisfying.

Although most midwife-attended births take place in hospitals, midwives may also work in less clinical settings such as a home or a homelike, out-of-hospital birth center. This nonthreatening, comfortable atmosphere often helps a woman in labor feel more at ease and more in control of the birth process. In general midwives do not use invasive technology like obstetrical forceps in providing care during labor and birth. Minimizing the use of costly and sometimes painful medical tests and treatments appeals to many women.

During labor and birth, all of the midwife's effort focuses on helping the woman deliver her child with confidence. The midwife carefully monitors the mother's blood pressure, pulse rate, and dehydration levels, and the unborn child's heart rate. Nurse-midwives are trained to recognize and prevent problems before they occur. In cases involving unexpected complications or emergencies, most midwives have arrangements with physicians to ensure that medical help is immediately available. Midwives generally accept patients at low risk for complications during pregnancy and labor. They screen potential clients for conditions such as high blood pressure, diabetes, and a history of multiple births. Studies show that nurse-midwife care compares favorably to care provided by a physician for low-risk pregnancies. According to the ACNM, women who are under the care of a CNM are less likely to have a cesarean section (surgical delivery of the newborn through the abdomen) or an episiotomy (surgical enlargement of the birth canal) during a vaginal delivery.

Moreover, babies born with the help of a CNM usually weigh more at birth and have an increased chance of surviving past their first year.

1.1.5 Current Trends in Midwifery and Obstetrical Nursing

The maternal and child population is constantly changing along with change in social structure variations in family style, increased health care cost, improvement in medical technology and changing patterns of illness. Some of the social changes that have occurred in the last 20-30 years have altered health providers.

- Families are smaller in size than in previous decades. Children are more likely to be born and raised in nontraditional groupings such as:
  - Single parent families can be result of unwed parenthood or divorce & mostly headed by the mother.
  - Blended families formed by the marriage of two adult who have children from previous union.
- An increasing number of mothers work outside the home.
- Abuse is more common than ever before.
- Families are more health conscious than previously.

1. Economic Issues and Trends

The cost of having and raising children continues to increase faster than family income. As cost has increased and as moiré women work outside the home, the number of children in a typical family has decreased. More women of child bearing age are employed outside the home than ever before. Most commonly they work because of economic necessity. Single parents are even more likely to experience difficulty in coping with demands.

2. Trends Related to Technology

Advance in technology had led to change in every aspect of our lives. It affects us as individuals families, society or culture and even the approach of child bearing. Technology allows

diagnosing and treating serious deformities and diseases. Specific areas where advance in technology affect child bearing include fertility concerns, genetic counseling and antepartum or intra partum diagnostic testing.

Fertility concerns:

In the past, conception was a somewhat random event; today conception can be much better controlled. Pregnancies can be planned, infertile women or men can be become parents and unwanted pregnancies can be prevented or terminated. Technology can help women who are unable to conceive have a child. Procedures such as in vitro fertilization, artificial insemination and surrogate mother are current options and new techniques under study.

Genetic Counseling:

Genetic counseling enables to look at the genetic structure of individuals and predict the like hood of occurrence of gene related disorders. Before genetic testing was available, a couple essentially took a risk each time pregnancy occurred.

Diagnostic Testing:

The number and types of diagnostic tests used in medicine and especially in maternity care have grown dramatically such as ultra sound examination. The technology helps in early diagnosis and treatment of problems.

3. Demographic Issues and Trends:

Shift in population distribution occurs as large cities provide the greatest opportunities and convenience. Therefore they attract more people and most of maternity services are concentrated in urban areas.

Availability of maternal care:

In cities number of hospitals are staffed and equipped to provide care to high risk maternity clients. Modern hospital offers more care for the child bearing women than available in the past. More

facilities today provides some form of family centered care, with birthing rooms that encourages more supportive family friendly approach to the child birth.

Increased cultural diversity:

New population introduces new concerns in relation to indigenous infection agents, uncommon diseases & unfamiliar disorders. New cultures introduce unique beliefs and practices and child birth.

Vital statistics

Some statistics have the highest level of significance for identifying trends that will have impact on maternity nursing. The statistics include birth rates and morbidity rates.

- Maternal mortality: there is reduction in maternal mortality rates due to improvement in medical management, early detection of disorders and prevention of complications and better hospital facilities.
- Birth rates: in India the birth rate is increasing. Birth rates also vary according to age and racial groups.
- Number of low birth weight infants: the number of LBW babies has not decreased.
- Infant mortality rates: the number of deaths of infants under one year of age per 1000 live births. To effect change in mortality rate, the focus must shift from high technology medical interventions to improving access to preventive care.

4. Trends in health care settings

- Managed care: is a system of health care delivery that focus on reducing the cost of health care through close monitoring. Before managed care, health care insurance paid separately for each procedures or piece of equipment the client received. Under managed care the agency receive a certain sum of money for the client care.
- Alternative setting: The alternative system provides families with increase control in birth experience and options for birth surrounding unavailable in hospital.

It also increase nursing responsibility for assessment and professional judgment and provides expanded role for nurse practitioner. This promotes a holistic, family centered approach to maternal and child health care.

- Community based care: A shift in setting care institution to the home has been occurring. Even child bearing women at risk are cared for in the home.
- Shortening hospital stay: Routine hospitalization for mothers and new born after an uncomplicated delivery is now 2 days or less. Short term hospitalization requires intensive health teaching from maternity nurses.

5. Trends of Patient Involvement, Self-Care and Focus on Health Care

In the present scenario clients no longer passively accept and comply with the advice of health care providers, rather they demand information and take advice roles. Maternity patients are usually well and thus their care focuses on enhancing health and wellness. Visit to health care providers presents opportunities to address topics such as nutrition, education, stress management, smoking cessation, alcohol and drug treatment etc.

6. Other Trends

Increase in high risk pregnancies:

- The number of high risk pregnancies has increased which means that a greater number of women are risk for pregnancy outcomes.
- Escalating drugs used has contributed incidence of prematurity, LBW, congenital defects, learning disabilities and withdrawal symptoms in infants.
- Alcohol use in pregnancy has been associated with miscarriage, mental retardation, LBW babies etc.
- The two most frequently reported maternal medical risk factors are hypertension associated with pregnancy and diabetics.

High Cost of Health Care:

Health care is one of the fastest growing sectors. A shift in demographic and increased emphasis of high cost technology etc., contribute to high cost of care.

Limited Access to Care:

The most significant barrier to assess is the inability to pay. Lack of transportation and dependent care are other barriers.

Family Centered Care:

The emphasizes here is on the delivery of professional health care that fosters family unity while maintaining the physical safety of the child bearing unit- the mother, father and the infant. The nurses counsels and educate all age group.

Labor, Delivery, Recovery and Post-Partum Care (LDRP):

LDRP also called single room maternity care was devised as a replacement for traditional maternity unit. In it the mother labors, delivers and recovers in the same room and the same bed. The LDRP has the advantage of providing comprehensive care with single setting.

Mother Baby Couplet Care:

Here one nurse care for the post-partum mother and her new born as a single unit. It focuses and adapts to both the physical and psychological needs of the mother, the family and the neonate and fosters family unity.

1.2 THE MIDWIFERY WORKFORCE – A GLOBAL VIEW

Midwives and others with midwifery competencies form an important part of the health workforce in many countries. They work with women in their homes and communities, and in antenatal clinics, health centers, hospitals and maternities. They are at the front line of maternal health service provision,

interacting with colleagues across primary, secondary and **tertiary care** services. Well-trained midwives and others who possess all the midwifery competencies are able to manage the health needs of women and newborns during pregnancy, birth and beyond. They are at hand to give routine care during uneventful deliveries, and they are able to identify and manage complications of childbirth before they become life threatening. In the event of a more serious complication or emergency, midwives and others with midwifery competencies will arrange for immediate referral for a caesarean section or other care that they are not authorized to provide.

Tertiary care, is a level above secondary health care, that has been defined as highly specialized medical care, usually provided over an extended period of time, that involves advanced and complex diagnostics, procedures and treatments performed by medical specialists in state-of-the-art facilities.

1.2.1 The Development of Midwifery as a Health Care Profession

The original meaning of the word midwife is 'being with woman'. Over the centuries the midwifery profession has evolved alongside developments in scientific medicine. Midwifery schools in the Netherlands extend back to the 1600s, and in Sweden the first school opened in 1711. In France, midwives were recognized as part of the educated elite in the 18th and 19th Centuries and provided with houses and land. The first midwifery schools in Chile and Argentina were established in the 1800s, and in Chile midwives have been employed as policy makers within the Ministry of Health since that time. During the late 1800s, midwives in Europe campaigned for midwifery to be recognized as a regulated profession. In 1902, the Midwives Act was passed in British Parliament, acknowledging midwives as practitioners in their own right. In 1919, just after World War I, more than 1,000 midwives from across Europe met in Brussels, Belgium to discuss issues of standards and practice. During this meeting the ICM was established to support the ongoing development of the profession.

During the 20th Century, professional midwifery was introduced to various countries in Africa and Asia. French colonies across sub-Saharan Africa followed the French model of midwifery care and developed independent midwifery education programmes (direct-entry) and an autonomous profession. At the same time, British colonies in Africa, Asia and the Caribbean followed the British model, with a post-nursing midwifery education. A third pathway is combined nursing/midwifery. All

three education pathways continue to operate in the present day. Nursing and midwifery acts were passed and councils of nursing were established. These provided registration for midwives, and in many instances separate licensure for midwifery practice, allowing midwives to be distinctly recognized and protected to practise. During the 1970s and 1980s, separate licensure was stopped in some of these countries. This has reduced the visibility of the midwifery profession and created difficulties in identifying practicing midwives and tracking their competencies and deployment.

1.2.2 Skilled Birth Attendants

The global health discourse has increasingly referred to professional cadres under the collective description of 'skilled birth attendants' (SBAs). This was partly influenced by the health MDGs and the need to distinguish from traditional birth attendants (TBAs), who have no formal education. In 2004, WHO together with ICM and FIGO jointly agreed to define a skilled birth attendant as "an accredited health professional — such as a midwife, doctor or nurse — who has been educated and trained to proficiency in the skills needed to manage normal (uncomplicated) pregnancies, childbirth and the immediate postnatal period, and in the identification, management and referral of complications in women and newborns".

During the first 10 years of this century, in an effort to revitalize primary health care, many countries trained new cadres of health workers variously identified as auxiliary nurses, community midwives, health extension workers and community birth attendants. These cadres were trained in varying midwifery skill sets with differing curricula and lengths of training. Many of these cadres, however, may be inadvertently identified and reported as skilled birth attendants, without having fulfilled the WHO definition. Few of these health cadres have been trained to the full competencies of a midwife, and there has been no standardized education or regulation/licensure process across countries. There is increasing confusion regarding who is a skilled birth attendant.

1.2.3 Competencies: The Foundation of Practice

Being 'skilled' is only one element of a more complex reality. Recent and emerging evidence indicate that there is often a significant difference between the number of health workers designated as skilled birth attendants and those with midwifery competencies meeting evidence-based standards. Counting all individuals within professional health cadres to determine the supply of skilled birth attendants may therefore be misleading. The correlation between the proportion of births that are attended by a so-called 'skilled attendant' and a country's maternal mortality ratio may be weak because quality of attendance is simply not taken into account. The focus has shifted to competencies — the combination of knowledge, skills, attitude, and professional behavior that quality midwifery care requires. Recent guidance (2011) from WHO on 'Sexual and Reproductive Health Core Competencies in Primary Care' and the continuing investigation into the optimization of competencies to deliver essential maternal and newborn services is evidence of this shift.

Matching competencies to essential packages of care is the logical extension for human resource management. WHO's recommendations on 'Packages of Interventions for Family Planning, Safe Abortion Care, Maternal, Newborn and Child Health' set out the essential services across the continuum of care. This organizes effective interventions through pre-pregnancy (family planning and safe abortion care), pregnancy, childbirth, postpartum, newborn care and care of the child. The packages are defined for community and/or facility levels and provide guidance on the essential components needed to assure adequacy and quality of care.

It enables countries to match competencies to essential packages to improve service outputs and health outcomes. As evident in Figure 1, educating midwives in all the competencies enables the delivery of WHO's recommended interventions across the continuum of maternal and newborn care.

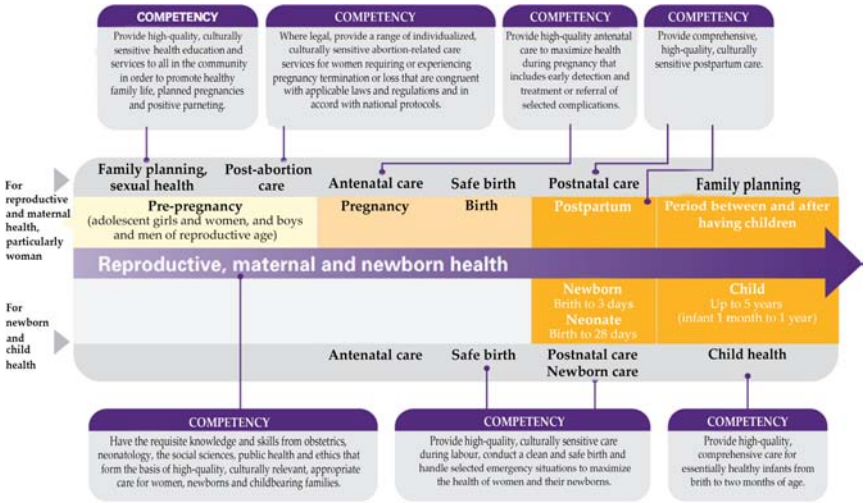


Figure 1. WHO's essential care packages and the role of midwifery competencies across the continuum of care.

1.2.4 Enabling Policies and Environment

All health providers are empowered or constrained by the national context in which they operate, including socio-economic, cultural and gender dimensions. The way that health systems are designed and operated is a crucial factor in developing and maintaining an effective and efficient midwifery workforce.

The midwifery workforce — as with other health care personnel — requires an enabling environment to maximize their contribution to health. The enabling environment required goes beyond having the necessary drugs and supplies available at the right moment and in the right place (e.g. in the labor ward). The maternal health care team also needs adequate infrastructure, communication tools and functioning referral systems. Regular and emergency services need to be provided night and day, throughout the year. The midwifery workforce also needs supervision, professional collaboration, appropriate remuneration and a policy framework that allows them to perform life-saving interventions.

These elements of a health system go a long way to maintaining a motivated midwifery workforce and ultimately saving the lives of mothers and newborns, even more so where improving women's and children's health is a national priority

supported by political leadership at the highest level. It is also important that the policy framework be consistent across the multiple sectors and instruments within a national context.

A recent analysis by WHO and the Partnership for Maternal, Newborn and Child Health (PMNCH) suggests this is not always the case. In an assessment of 24 countries, the review identified a lack of policy coherence between poverty reduction, health and maternal health plans. Although achieving MDGs 4 and 5 was indicated to be a high priority in national health and development plans (including Poverty Reduction Strategy Plans), this was not always supported by operational plans and the appropriate financial and human resources to convert policy into practice. In other words, the priorities did not result in development and implementation of evidence-based interventions, such as scaling up midwifery services.

1.2.5 Three Pillars of a Quality Workforce

In addition to the health system design and operation, midwifery education programmes, regulatory frameworks and association development are three critical pillars for creating a high-quality midwifery workforce. They should be regarded as a package (education, regulation and association) as well as a continuum for midwifery workforce development.

Education

There are many pathways that prepare (preservice) and maintain (in-service) a well-educated midwifery workforce. Education programmes designed to prepare midwives, either through direct entry, in combination with nursing or postnursing education, vary widely within and between countries. Variation is evident in entry requirements, length of training, curricula, faculty capacity and quality, tutor/student ratios and time spent in clinical practice. Many existing programmes may therefore be graduating health workers who do not meet the ICM competencies.

WHO published global standards for the initial education of nurses and midwives. 'Initial education' refers to the programme of education required for a person to qualify as a professional nurse or midwife. These global standards, developed with inputs

from ICM and the International Council of Nurses (ICN), seek to develop competency-based outcomes and ensure the future health workforce meets population health needs. More recently, ICM has developed global standards that are specific to midwifery education, where a fully qualified midwife has a formal education based on ICM essential competencies. The standards include:

- Entry level of students is completion of secondary education;
- Minimum length of a direct-entry midwifery education programme is three years;
- Minimum length of a post-nursing/ health care provider programme is eighteen months;
- Midwifery curriculum includes both theory and practice elements with a minimum of 40% theory and a minimum of 50% practise.

The standards also provide specific guidance for schools, educators and regulators to promote quality education needed to achieve the essential midwifery competencies. These can be adapted to reflect country-specific needs for curriculum content and cultural appropriateness.

Acquiring professional competence demands theoretical knowledge as well as regular, tailored, supervised, hands-on practice in a variety of clinical settings. Training in a clinical setting helps to close the gap between the theoretical teaching and the clinical reality and prepares midwives and others with midwifery competencies for team-work and health care provision along the full continuum of care. One of the reasons this is often difficult is due to the lack of clinical training opportunities with supervision by experienced practitioners.

Increasing the number of teachers, trainers, tutors and the quality of their training is therefore integral, especially for practical training in maternities where each student must be given as many hands-on opportunities as possible. Tutor to student ratios during clinical practice may vary according to multiple factors (e.g. the level of the learner, the competencies to be learned, volume of clinical experiences available, and the teaching competency of the tutor) but a benchmark of one tutor for two students is good practice in the delivery environment. Maintaining the competencies of the midwifery workforce

through continuing education and in-service training is equally important and increasingly available through information and communication technologies. Continuing education is essential for public safety and is a professional responsibility. It underpins certification, regulation and other professional validation mechanisms. It is also a path to career opportunities for those who want to become educators, supervisors and researchers.

Regulation

The purpose of regulation and the process of regulating combine first and foremost to serve and protect the public. Regulation is a way to oversee whether health professionals are competent to practise. It is an essential accountability function for a government to fulfil its responsibility to protect its citizens and ensure their right to health, including the obligation to grant special care and attention to women during a reasonable period before and after childbirth. Conversely, a health care system that relies on midwives or other cadres who are less than competent to provide care throughout their professional careers is dangerous to women, newborns, families and communities.

The mechanisms used to regulate the health professions differ from country to country, but in general a regulatory authority oversees a recognized health profession or group of professions. These bodies usually function at national or state level. They license and register individuals (including those educated overseas) and address the practice of those practitioners who fall short of the required competence standards. In addition, they play a lead role in setting and maintaining standards of education programmes. ICM's recently developed 'Global Standards for Midwifery Regulation', propose that a regulatory authority for midwives has six main functions:

- Setting the scope of midwifery practice;
- Setting the requirements for preregistration midwifery education;
- Registering and licensing midwives;
- Relicensing and ensuring the continuing competence of midwives;
- Handling complaints and disciplining midwives; and
- Setting codes of conduct and ethics for midwives.

In both developed and developing countries, midwifery is often regulated by a council (be it a midwifery, nursing or a nursing and midwifery variant) that is independent from the government. This is consistent with the dual regulation of other professions, such as medical and dental councils. In countries where midwifery is not established as an autonomous profession and various other cadres provide midwifery services, there will be challenges in establishing standards and competencies for midwifery professionals to ensure public protection.

Association

A strong professional association, supported by its members and recognized by the government, regulatory authority and education programmes, is the third pillar to promote a high-quality midwifery workforce. This may either be an independent midwives association or a nursing association that includes midwives in its membership and acts in their particular interests.

Association development involves creating viable organizations with well-documented policies and procedures guiding association activities and governance. Organizational development moves associations beyond promoting midwives, nursemaid wives and midwifery to contributing to leadership in policy- and decision-making for maternal and child health services at all levels of the health system.

Associations that represent midwives have several roles and responsibilities, including:

- Advancing professional practice by promoting professional standards and quality of care;
- Providing input into the development and support of national educational programmes;
- Partnering with regulatory authorities to ensure development of in-service training requirements and standards;
- Working with other health care professional associations and the ministry of health and district health authorities to develop **reproductive health**, maternal and newborn care policies and standards;

- Promoting professional networking and interdisciplinary practice;
- Negotiating appropriate compensation and salaries with the government and enabling positive working environments; and
- Partnering with women's groups and other advocates to promote women's reproductive health and newborn and child health.

Reproductive health is a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity, in all matters relating to the reproductive system and to its functions and processes.

To fulfil these roles and responsibilities, these associations need to have appropriate capacity — effective governance, competent technical expertise and adequate administrative and financial management procedures. They also need to be recognized as an authority within the national, regional and district health systems so that they can take part in policy development and implementation and be appropriately resourced. This is not currently the case in all countries.

1.3 ROLE OF NURSES IN MIDWIFERY AND OBSTETRICAL NURSING

The main role of obstetrical and midwifery nursing in the healthcare sector includes services to women during maternity. It includes gynaecological examinations, prescriptions, delivery and labor care, contraceptive counselling and many more. Furthermore, this research includes the responsibilities of several midwifery nurses, the duty of nurses involved in Obstetrical nursing. Obstetrical and midwifery nursing consists of several responsibilities such as monitoring fetal growth, treating health conditions that arise at the time of pregnancy and maternal health. Hence, these nurses attend the birth at birthing centers and in several hospitals as they have to provide care to patients during pregnancy complications and they also take care during delivery and labor.

1.3.1 Responsibilities of Midwifery Nurses

The midwives are the specialists during any childbirth and normal pregnancy. In addition, the main role of a midwifery nurse is taking care of pregnant women and also their babies during their birth and labor up to 28 days after the birth of the baby.

Furthermore, they also provide several services and professional care during the time of childbirth and pregnancy. The staff working and midwives within the maternity care prepare the women at the time of pregnancy stages and labor at the early period of postnatal. The midwife nurses provide a specialized care during delivery, labor and also after birth. The midwifery nurses are having responsibilities and roles such as Caregiver and here the midwives provide the high quality postnatal and antenatal care for maximizing the health of women after and during pregnancy and they also detect early problems and also they refer or manage several complications. Secondly, in the role of Coordinator, here the midwives coordinate the care for all women and they also ensure the social, voluntary and holistic services for the pregnant women.

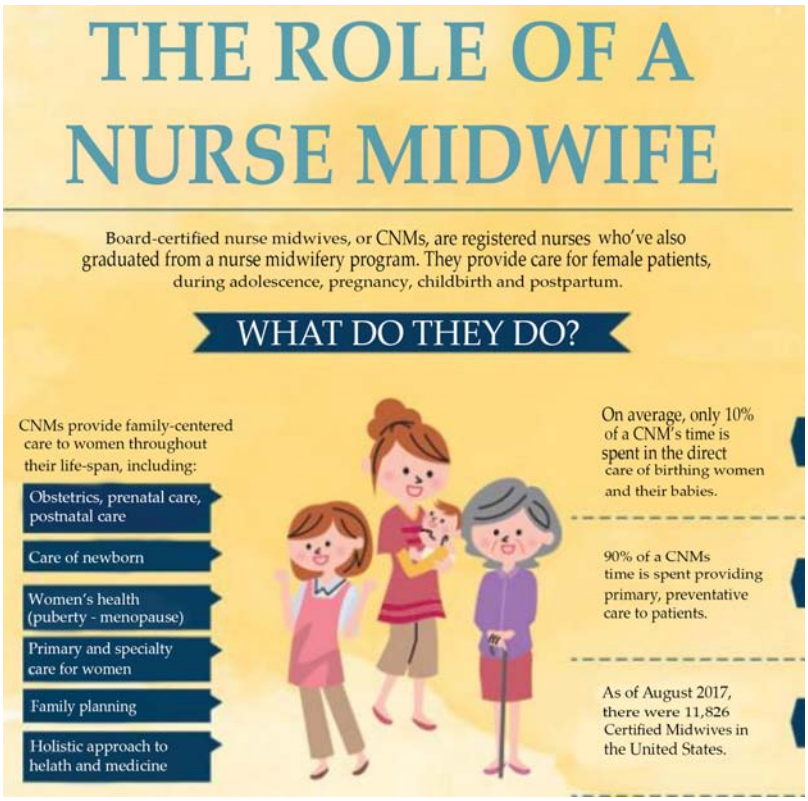


Figure 2. Roles of Midwifery nurses.

Furthermore, the nurses act as a Leader and the main role of the leader is to review, provide and plan about the care of women with their agreement and input. It is done to the period of postnatal from the antenatal assessment in an initial stage.

The leading role of the Midwife reduces the admission process to any hospital and also results in less intervention during the time of birth. Fourthly, they also act as a good Communicator as the midwives always understand the overall effectiveness of the communication process. However, it also helps in developing a trusting relationship with the family members and pregnant women. The midwife also has to communicate in an effective manner with family members and pregnant women as they can freely share their own problems. Another duty is as a Manager, here the midwife nurses manage several circumstances that are appropriate and they can also refer and recognize the women to an obstetrician at any emergency time.

The midwife nurses also act as a Counsellor and they counsel the pregnant women along with providing several information's on the parental self-care that includes hygiene, nutrition, danger signs of childbirth and pregnancy and breastfeeding. The nurses are also the Family planner as they counsel several people and provide several pieces of information regarding the methods of family planning; they also help the couples in taking decisions regarding childbirth. Furthermore, the midwives act as an Adviser and they advise to develop the birth plan and also promote several concepts regarding birth preparedness. The nurses also advise on several situations that are complicated and it helps the couples in making decisions.

Remember

The nurses also act as an Educator and they provide a high-quality education of sensitive health for promoting a healthy lifestyle and also positive parenting.

1.3.2 Duties of Obstetrical Nursing

The nurses, who are included in Obstetrical (OB) nursing help in providing the testing and parental care, care at the time of delivery and labor and the care of several patients that are experiencing the complications of pregnancy. The obstetrical nurses are working closely with nurse practitioners, midwives and obstetricians. The obstetrical nurses are the most unique nursing professionals that are responsible for welcoming new babies into this world. Furthermore, they also care for the overall family at the time of childbirth and also they are instrumental figures within the lives of both babies and parents both. The OB nurses are taking several day-to-day responsibilities and they might walk through several birthing processes with moms that are going to deliver. Hence, it also helps the parents in adjusting to the latest and new roles after the delivery process.



Figure 3. Duties of Obstetric Nurses.

Adequate nutrition is essential not merely for the maintenance of their physical efficiency but also to promote their resistance to disease.

The obstetrical nurses are having several responsibilities such as Delivery and labor tasks and the nurses are much more responsible in taking care of mom within the delivery room. The OB nurses also provide emotional support to the nervous or anxious partners and also help the pregnant mother from the admission process to the released date. The obstetrical nurses are having another responsibility that is the Post-delivery responsibility. The nurses help several mothers after the birth of the baby and also closely monitor the baby and their mom for several hours before they are going to the postpartum care. At this time the OB nurses help the mom by doing several tasks such as assisting moms with breastfeeding and the formula for ensuring the requirements of **adequate nutrition**.

Further, they also manage and monitor the vital signs of baby and mom both and also they monitor several complications for the delivery and pregnancy process. Another responsibility of OB nurses is the postpartum care and the nurses monitor both mom and baby after birth and after that, they are transferred for the postpartum care. At this time the nurses are much more responsible for several factors such as administering the pain medications, giving ice packs, monitoring bleeding and swelling. The nurses also help the moms in moving and also in the recovery process, help in drawing the blood tests, administering the necessary shots and many more.

The OB nurses are having several responsibilities that are required during the pregnancy and post-pregnancy. The skills are emotional stability and it is essential for the nurses to cope up with the traumatic experiences and also handle the hardships in a regular basis. Another skill is the critical thinking and by this, the OB nurses are capable of thinking quickly and critically for finding better solutions for the patients. Furthermore, the nurses are also capable of communicating their insights and thoughts with several patients and also with several other members of the medical team. One of the skills is compassion and by this, the nurses are working in the delivery and labor ward that is much more difficult and inside that ward, the nurses are taking special care to the mom and also to the baby.

1.3.3 Accessible and Affordable Healthcare in Rural Areas

Several countries are having the universal access for the maternity care of women and also have better practices regarding midwifery and nursing processes. Furthermore, the government is trying to fulfil the lack of access for the higher quality services of maternal health within the rural communities. For this, there are several factors that include the obstetric and hospitality department closure, shortage of the workforces and also the access to the challenges of caring and these arise from several determinants of the healthcare that is to be contributed for several disparities within the maternal healthcare of rural babies and women. However, these challenges might result in negative outcomes in maternal health but they will also improve the higher quality services of maternal care within the rural communities.

1.4 LEGAL AND ETHICAL ISSUE IN OBSTETRICAL AND GYNECOLOGICAL NURSING

Legitimate methods adjusting to or allowed by law or built up rules Ethics is the control managing what is acceptable and awful and with moral obligation and commitment. Maternity specialists are required to ensure, advance, and streamline wellbeing administration through anticipation of injury to the

patient. In spite of different patient wellbeing rules and gauges, less consideration is paid to the moral and lawful parts of this issue. The fundamental objective of patient security in the wellbeing framework can be concentrated from two perspectives as a commonsense worth, in which principle center is its positive results and benefits or as a virtue by concentrating on the assurance and advancement of humankind and human respect. It ought to be accentuated that the two viewpoints are significant in the wellbeing system. However; prosecutions are in every case more in obstetrics, in light of exclusive requirements. Everybody will be sitting tight for a positive outcome. So Nurses and birthing specialists needs to exhibit their insight and aptitudes of moral practice so as to: Recognize moral quandaries and make suitable move, Inform customer/staff individuals from moral issues influencing customer care, Practice in a way reliable with a code of morals for enrolled attendants and Evaluate results of mediations to advance moral practice.

1.4.1 Ethical Practices and Frameworks for Nurses and Midwifes

1) Ethical Principles in Nursing
2) Ethical Rights of Patient
3) The ICN code of ethics for nurses
4) Code of ethics for nurses in India
5) Code of professional conduct for nurses in India
6) Legal rights and responsibilities
7) Legal terms that nurse must be familiar with include these:

Ethical issues and Recommendation

S. No	Ethical Issue	Recommendation
1	Family planning	Support informed voluntary decisions on childbearing and the implementation of individual family planning methods of choice, as well as ensuring the availability of methods for controlling fertility which are not contrary to the law
2	Guidelines in emergency contraception	The medical profession would promote, at a public policy level, that emergency contraceptives be readily available and affordable to all women at all times.
3	Ethical aspects of induced abortion for non-medical reasons	Abortion should never be marketed as family planning tool
4	Ethical aspects of the introduction of contraceptive methods for women	Informed choice is a mechanism by which a woman can make free choices about future health treatments and put decision-making in the hands of women
5	Ethical issues in the management of severely disabled women with gynecological problems	Disabilities must be treated without prejudice, according to existing standards of care and management that apply to all women.
6	Female contraceptive sterilization	No woman can be sterilized without her prior informed consent, without any pressure
7	Ethical aspects concerning neonatal screening	Where a screening plan is put forward for adoption, the benefit-to-harm ratio must be favorable.
	Ethical guidelines on resuscitation of newborns	Newborn babies should be regarded with reverence as the most vulnerable members of society; they are entitled to treatment before, during and immediately after birth.

1.4.2 Ethical Decision Making Process

These functions are performed by the midwife through:

- Provision of reliable family planning information and advice;
- Diagnosis of pregnancies and monitoring normal pregnancies; carrying out the examinations necessary for the monitoring of the development of normal pregnancies;
- Prescribing or advising on the examinations necessary for the earliest possible diagnosis of pregnancies at risk;
- Provision of programmes of parenthood preparation and complete preparation for childbirth including advice on hygiene and nutrition;

- Caring for and assisting the mother during labor and monitoring the condition of the foetus in utero by the appropriate clinical and technical means;
- Conducting spontaneous deliveries including where required episiotomies and in urgent cases breech deliveries;
- Recognizing the warning signs of abnormality in the mother or infant which necessitate referral to a doctor and assisting the latter where appropriate; taking the necessary emergency measures in the doctor's absence, in particular the manual removal of the placenta, possibly followed by manual examination of the uterus;
- Examining and caring for the new-born infant; taking all initiatives which are necessary in case of need and carrying out where necessary immediate resuscitation;
- Caring for and monitoring the progress of the mother in the post-natal period and giving all necessary advice to the mother on infant care to enable her to ensure the optimum progress of the new-born infant;
- Carrying out treatment prescribed by doctors;
- Preparing the necessary written reports

ROLE MODEL



INA MAY GASKIN: AMERICAN MIDWIFE

On 8 March 1940, Gaskin was born to Ruth Stinson and Talford Middleton in Marshalltown, Iowa. Gaskin was her parents' second child, with an older brother and two younger sisters. Her grandmother ran an orphanage, so Gaskin grew up on farms and was surrounded by children at a young age. Her mother taught home economics, and her father was a farmer first but later became a salesman. Gaskin's brother died in a gun accident when he was fifteen. In an interview, Gaskin said the accident taught her compassion and the importance of grieving after the loss of a loved one. Gaskin attended Marshalltown High School in Marshalltown, Iowa.

After graduating from high school in 1958, Gaskin studied English at Iowa State University in Ames, Iowa. In 1959, she married Michael Kelley, though they later divorced in the 1970s. A year after graduating in 1962 with her Bachelor of Arts in English, Gaskin became a member of the Peace Corps and taught English in Malaysia for the next two years. Gaskin came back to the US and in 1967 obtained her Master of Arts degree in English from Northern Illinois University in DeKalb, Illinois. After Gaskin's graduation, she and Kelley had a daughter named Sydney in the late 1960s. According to Gaskin, the experience of delivering her first child fueled her desire to find a better way to give birth. Gaskin further explained that during the birth of her first child, her physicians gave her anesthesia without her consent and used forceps to pull her child out of her uterus. That was a practice that Gaskin disagreed with due to the fact that forceps, which are sharp tong-like instruments, could either cause injury to a woman's vagina or urinary tract, or could result in injuries to the infant's skull or face.

In 1968, while living in San Francisco, California, Gaskin and her first husband Kelley went to hear several lectures by Stephen Gaskin, a lecturer at San Francisco State College in San Francisco, California. In his lectures, called Monday Night Class, he presented his spiritual insights, such as his thoughts on religion and morality. Gaskin and her first husband Kelley, along with Stephen Gaskin and his wife, began what Gaskin

called a four-marriage, with the four of them having intimate, spouse-like relationships with each other. After Stephen's audience grew, he went on the road to promote his message of spiritual exploration on a lecture tour. Gaskin, now in her second pregnancy, along with some of his other followers, joined him. The group travelled in school buses and caravans.

According to Gaskin in her book *Spiritual Midwifery*, in 1970 while she was on the road during the lecture tour, she realized that the women would need to give birth with only the guidance of the other women on the tour. She states that the group felt they would be unable to afford for each woman to give birth at a hospital, and they were looking for a way to give birth the way they wanted, which meant without unnecessary interventions. In the late 1970s, it was becoming more common for women to receive an epidural injection, which reduced her pain during labor. It was also common for women to be separated from their infant after birth due to healthcare providers monitoring the infant's heartbeat. However, according to Gaskin, some women wanted to be able to give birth inside of a hospital without the interventions. Additionally, they wanted to be able to have their husbands present at the birth, which was not common due to many physicians, in hospitals, wanting to keep the husbands away from the medical procedures, according to Judith Walzer Leavitt, a professor and author, in her article about the role of men in delivery rooms.

The first birth on the lecture tour was in a parking lot at Northwestern University in Evanston, Illinois. When one of the women went into labor, Gaskin was one of the few women who had already given birth, so she volunteered to assist in the delivery. She continued to assist women with their births on the lecture tour, acting as the main midwife, despite having no formal education on the topic. After the third infant was delivered, a Rhode Island obstetrician Louis La Pere volunteered to teach Gaskin and one of her assistants, Margaret Nofzinger, how to deal with possible complications during labor. That included what to do if the umbilical cord was wrapped around the infant's neck. When a fetus has an umbilical cord wrapped around its neck it can lead to serious injury, such as lack of blood flow to the fetus, or death. Nine births later, on the lecture tour, Gaskin went into labor prematurely, and the infant died, most likely due to his small size and difficulty breathing, according to Gaskin in *Spiritual Midwifery*. There was a total of eleven births on the tour, with Gaskin's being the only one to end in the infant's death.

At the end of his lecture tour in 1971, Stephen Gaskin and his followers decided to settle in Summertown, Tennessee, to form a commune that they called the Farm. During Gaskin's time at the Farm, she focused on midwifery practices, while her and other women on the Farm became the caretakers of the community. The primary education of Gaskin and her assistant midwives was informal. At first, they each read publications written for physicians. Some of those publications included *Physician's Desk Reference*, a resource to prescription drugs available within the US, and *Merck Manual*

of Diagnosis and Therapy, a medical reference textbook. Later in 1971, they met a local physician, John Orlando Williams Jr., who had assisted nearby Amish communities and was familiar with homebirths, meaning births that occur outside of the hospital and often without any medication. With William's advice, Gaskin and her assistant midwives led a midwifery center at the Farm that served the community's members and nearby residents. The Farm Midwifery Center had low intervention and mortality rates despite caring for women with complicated births. Such cases included women delivering twins, women delivering after five or more births, and women delivering breech births, when the infant's buttocks are delivered before the head. In 1976, Gaskin married Stephen and took his last name, after divorcing Kelley some time before. Together, they had three children named Eva, Samuel, and Paul.

While on a trip to Guatemala in 1976 to help earthquake victims, Gaskin learned of a technique that indigenous women used to help prevent and resolve shoulder dystocia, a condition in which a part of an infant's body is delivered during birth, but the rest of the body is stuck inside the birth canal. Once Gaskin returned to the Farm, she began to use the technique from Guatemala successfully. She taught the technique to others as well as published various articles about her findings. In the US, that technique became known as the Gaskin maneuver, or the all-fours maneuver. It is a technique where the laboring woman kneels down onto her hands and knees. The Gaskin maneuver is one of the first obstetrical procedures to be named after a midwife. The Gaskin Maneuver is a safe, effective, and fast way to reduce shoulder dystocia in laboring women by widening the pelvis and the birth canal through the woman's position and a small amount of pressure on the fetus's head. The low-intervention method does not require the use of an episiotomy, surgical cutting of the opening of the vagina, or a cesarean section, which delivers the infant by cutting through the wall of a woman's abdomen. The use of the technique among women in both hospital and home births has resulted in decreased rates of protracted labors, which are abnormally slow labors, as well as a decreased number of routine episiotomies, and better survival rates in breech and twin births.

In 1982, Gaskin and other midwives founded a professional membership organization called Midwives Alliance of North America, or MANA, with focuses on furthering the practice of midwifery by increasing survival rates for women and infants. Gaskin served as president of MANA from 1996 to 2002. The formation of MANA led to the creation of the Midwifery Education and Accreditation Council, or MEAC, and North American Registry of Midwives, or NARM, which created a competency-based certification for US midwives. Prior to the formation of those groups, there was not a similar certification available for midwives in the US. Because of that, it was difficult to know and accurately access a midwife's qualifications. The certification process expanded the legal practice of midwifery in twenty-seven states by granting the title of certified professional midwife, or CPM, based on competency and not requiring a nursing degree.

Gaskin is the author of many works, some of which include *Spiritual Midwifery*, *Ina May's Guide to Childbirth*, *Birth Matters: A Midwife's Manifesta*, and *Birth Gazette*. Published in 1975, *Spiritual Midwifery* is a book that contains a compilation of women's birth stories on the Farm and information about midwifery care. Gaskin's work, *Ina May's Guide to Childbirth*, was published in 2003 and gives information about how to give birth without technological intervention. In Gaskin's 2009 publication, titled *Ina May's Guide to Breastfeeding*, she provides advice and stories about how and why breastfeeding is beneficial to women and infants. Furthermore, Gaskin's work, titled *Birth Matters: A Midwife's Manifesta* was published in 2011. In *Birth Matters: A Midwife's Manifesta*, Gaskin asserts motherhood as a women's right issue by enabling women to trust themselves and value the experience of giving birth as fundamentally human. Gaskin also published a quarterly *Birth Gazette* for twenty-two years, which covered health care, childbirth, and midwifery issues. She created the Safe Motherhood Quilt Project, a project focused on members making quilts made up of patches with the names of women who died in childbirth or pregnancy-related causes in the US since 1982, highlighting the national statistics of maternal deaths and honoring the women who died. Gaskin states on the project's website that the Safe Motherhood Quilt Project was created to draw attention to the current maternal death rates in the US as well as, what she calls, the gross underreporting of maternal deaths.

Gaskin has received many awards for her work in midwifery and women's health advocacy. In 1997, she was awarded the ASPO Lamaze Irwin Chabon Award from Lamaze International, an organization which provides information to families to promote safe and healthy pregnancies and births. Later that year she also received the Tennessee Perinatal Association Recognition Award. Furthermore, Morse College of Yale University in New Haven, Connecticut, appointed Gaskin a Visiting Fellow in 2003. In 2009 she received the title Honorary Doctor by Thames Valley University in London, England. In 2011, Gaskin was one of four people to co-win the 2011 Right Livelihood Award, also known as the Alternative Nobel Prize, where she was recognized for her work in teaching and advocating woman-centered childbirth methods that promote maternal and child health. In 2013, she received an Honorary Doctor of Science from Shenandoah University in Winchester, Virginia. That same year, Gaskin was inducted into the National Women's Hall of Fame for her achievements in science.

As of 2019, Gaskin lives at the Farm in Summertown, Tennessee, and frequently travels to promote low-intervention methods that made the Farm Midwifery Center successful to midwives and physicians around the world. As of 2019, Gaskin still acts as a midwife to local women, including those who still live at the Farm, as well as women from around the world who come to the Farm Midwifery Center to deliver.

SUMMARY

- Obstetrics and midwifery are two distinct but overlapping fields of medical knowledge and practice which focus on the care of the pregnant and parturient (laboring) woman. Obstetrics focuses on the problems and difficulties of pregnancy and labor; midwifery emphasizes the normalcy of pregnancy while acknowledging the vulnerability associated with the reproductive process.
- Midwives are healthcare providers who deal with pregnancy, childbirth, newborn care and postpartum health. Some midwives provide routine reproductive care like pelvic exams, Pap tests, or counseling on birth control. Midwives tend to be more holistic and supportive of natural approaches to pregnancy and birth.
- Obstetrical nursing is a specialty in which nurses provide medical care for pregnant women through all stages of their pregnancy. Obstetrical nursing is one of the most meaningful and exciting occupational fields.
- A certified nurse midwife (CNM) is a registered nurse who receives additional training in pregnancy and childbirth and has a master's degree in nurse midwifery. CNMs are considered part of the mainstream medical establishment and are certified by the American Midwifery Certification Board.
- A direct entry midwife (DEM) practices independently and has learned midwifery through a midwifery school, apprenticeship, or college program in midwifery. DEMs provide complete prenatal care and attend home births or deliveries in birth centers.
- Midwifery benefits pregnant women in several ways. Midwives encourage women to actively participate in health care decisions. They teach women how to best care for themselves through proper nutrition and exercise, giving women greater control over their pregnancies and birth experiences. Many women find this level of participation satisfying.
- Midwives and others with midwifery competencies form an important part of the health workforce in many countries. They work with women in their homes and communities, and in antenatal clinics, health centers, hospitals and maternities.
- All health providers are empowered or constrained by the national context in which they operate, including socio-economic, cultural and gender dimensions. The way that health systems are designed and operated is a crucial factor in developing and maintaining an effective and efficient midwifery workforce.

MULTIPLE CHOICE QUESTIONS

1. **Which of the following is NOT a common complication during labor and delivery?**
   a. Postpartum hemorrhage
   b. Pre-eclampsia
   c. Gestational diabetes
   d. Cephalopelvic disproportion
2. **What is the role of a midwife in prenatal care?**
   a. To deliver the baby
   b. To provide emotional support
   c. To perform ultrasounds
   d. To administer medication
3. **What is the purpose of the APGAR score?**
   a. To assess a newborn's overall health
   b. To determine the mother's pain level during labor
   c. To measure the strength of a newborn's cry
   d. To evaluate the mother's blood pressure after delivery
4. **What is the most common method of pain relief during labor?**
   a. Epidural anesthesia
   b. Nitrous oxide
   c. Hypnosis
   d. Acupuncture
5. **What is the recommended position for a woman to give birth?**
   a. Lying on her back with her legs in stirrups
   b. Standing up and leaning forward
   c. Sitting on a birth stool
   d. Any position that is comfortable for the mother
6. **What is the purpose of a cervical ripening agent?**
   a. To induce labor
   b. To soften the cervix
   c. To speed up the delivery process
   d. To prevent preterm labor

7. **What is the most common type of assisted delivery?**
   a. Forceps delivery
   b. Vacuum extraction
   c. Cesarean section
   d. Induced labor
8. **What is the main risk associated with a breech presentation?**
   a. Postpartum hemorrhage
   b. Pre-eclampsia
   c. Cephalopelvic disproportion
   d. Cord prolapse
9. **A health care system that relies on midwives or other cadres who are less than competent to provide care throughout their professional careers is dangerous to women, newborns, families and communities.**
   a. True
   b. False
10. **Midwifery curriculum includes both theory and practise elements with a minimum of 40% theory and a minimum of 50% practise.**
   a. True
   b. False

REVIEW QUESTIONS

1. What is a midwife? Discuss the benefits of midwife.
2. What is obstetrical nursing?
3. What are the types of midwives?
4. Differentiate between certified nurse midwife (CNM) and certified midwife (CM).
5. What is current trends in midwifery and obstetrical nursing?
6. What are the role of nurses in midwifery and obstetrical nursing?

Answers

1. (c)	2. (b)	3. (a)	4. (a)	5. (d)
6. (b)	7. (b)	8. (d)	9. (a)	10. (a)

REFERENCES

1. Amiri, A., 2020. Role of nurses and midwives in improving patient safety during childbirth: evidence from obstetric trauma in OECD countries. Applied Nursing Research, 56, p.151343.
2. Anderson G. (2011) Students as valuable but vulnerable participants in research: Getting the balance right using a feminist approach and focus group interviews Evidence Based Midwifery 9(1): 30-4.
3. Belay, A.S. and Kassie, A., 2021. Emotional intelligence and clinical performance of undergraduate nursing students during obstetrics and gynecology nursing practice; Mizan-Tepi University, South West Ethiopia.Advances in Medical Education and Practice, 12, p.913.
4. Bradshaw, C., Tighe, S.M. and Doody, O., 2018. Midwifery students' experiences of their clinical internship: A qualitative descriptive study. Nurse education today, 68, pp.213-217.
5. Cunningham, E.M., Doyle, E.I. and Bowden, R.G., 2018. Maternity nurses' perceptions of implementation of the ten steps to successful breastfeeding.MCN: The American Journal of Maternal/Child Nursing, 43(1), pp.38-43.
6. Herron M, Sinclair M, Kernohan WG, Stockdale DJ. (2011) Ethical issues in undertaking internet research of user-generated content: a review of the literature. Evidence Based Midwifery 9(1): 9-15.
7. Higgins, A., Downes, C., Monahan, M., Gill, A., Lamb, S.A. and Carroll, M., 2018. Barriers to midwives and nurses addressing mental health issues with women during the perinatal period: The Mind Mothers study. Journal of clinical nursing, 27(9-10), pp.1872-1883.
8. Kennedy, H.P., Balaam, M.C., Dahlen, H., Declercq, E., De Jonge, A., Downe, S., Ellwood, D., Homer, C.S., Sandall, J., Vedam, S. and Wolfe, I., 2020. The role of midwifery and other international insights for maternity care in the United States: An analysis of four countries. Birth, 47(4), pp.332-345.
9. Perkins BB. The medical delivery business: health reform, childbirth, and the economic order. New Brunswick: Rutgers University Press, 2003.
10. Population Division of the Department of Economic and Social Affairs of the United Nations Secretariat. World population prospects: the 2012 revision. 2013. http://esa.un.org/unpd/wpp/ index.htm (accessed July 31, 2013).
11. Souza JP, Gülmezoglu AM, Vogel J, et al. Moving beyond essential interventions for reduction of maternal mortality (the WHO multicountry survey on maternal and newborn health): a cross-sectional study. Lancet 2013; 381: 1747–55.



CHAPTER 2

Anatomy and Physiology of Female Reproductive System

"Humans are the reproductive organs of technology."

—*Kevin Kelly*

LEARNING OBJECTIVES

After studying this chapter, you will be able to:

1. Understand the embryology of female genital system
2. Identify the female reproductive anatomy
3. Describe the female reproductive organs
4. Learn about physiology of menstrual cycle

INTRODUCTION

The female reproductive system consists of organs concerned with menstruation, coitus, fertilization, pregnancy, and parturition. They can be divided into the following categories:

- External genitalia: Vulva
- Internal genitalia: Vagina, uterus, cervix, fallopian tubes, ovaries
- Accessory reproductive organs: Mammary glands

The female reproductive system can also be divided into the lower genital tract (vulva and vagina) and the upper tract (cervix, uterus, fallopian tubes, and ovaries).

2.1 EMBRYOLOGY OF FEMALE GENITAL SYSTEM

Soon after the delivery, everybody wants to know the sex of the baby. If the external genitalia of the newborn are ambiguous, the obstetrician faces a profound dilemma and constitutes a true medical emergency. Gender identity disorders have grave psychological and social problems. The gender of individual depends on chromosomes, hormones, and social environment. **Sex differentiation** is a complex phenomenon. It is classified into the following categories:

- Differentiation of gonads
- Differentiation of internal genital organs
- Differentiation of external genital organs

Genital system development begins in embryonic period and ends at puberty. The gonads do not acquire male or female morphologic characteristics until the seventh week of development. Testis-determining factor (TDF) gene is the key to sexual dimorphism that is situated on the short arm of Y chromosome. The gonads are formed by proliferation of the celomic epithelium and condensation of the underlying mesenchyme on the medial aspect of intermediate cell mass. The gonads appear initially as a pair of longitudinal ridges known as gonadal or genital ridges. The primordial germ cells appear among the endoderm cells in the wall of the yolk sac close to allantois. They migrate by ameboid movement along the dorsal mesentery of the hindgut and invade the genital ridges in the sixth week of development. Here they form primitive sex cords. In the absence of TDF, medullary cords disappear and get replaced by a vascular stroma (ovarian medulla). Cortical cords develop and surround one or more primitive germ cells. The germ cells subsequently develop into oogonia, while the surrounding epithelial cells form the follicular cells. This differentiates undifferentiated gonads into ovaries. Stroma of ovary develops from basal mesenchyme. Granulosa and theca cells develop from celomic epithelium.

Sexual differentiation is the process of development of the sex differences between males and females from an undifferentiated zygote.

2.1.1 Development of Genital Ducts

Development of genital duct system and the external genitalia occurs under the influence of hormones circulating in the fetus. Sertoli cells in the fetal testes produce a nonsteroidal substance known as Müllerianinhibiting substance (MIS) that causes regression of Müllerian ducts. Androgen from the fetal testes causes masculinization of external genitalia. In the absence of MIS, Müllerian ducts develop and mesonephric duct system regresses. In the absence of androgen, external genitalia differentiate into female phenotype. The Müllerian duct develops between the fifth and sixth weeks lateral to intermediate cell mass and Wolffian duct. The Müllerian duct has the following three parts:

- Cranial vertical portion that opens into celomic cavity. Later it differentiates into fallopian tubes.
- Horizontal part crosses the mesonephric duct.
- Caudal vertical part that fuses with its partner from opposite side. This fused part later differentiates into uterus, cervix, and upper one-third of the vagina.

The dorsal celomic epithelium (which forms Müllerian duct) remains open at its site of origin and ultimately forms the fimbriated ends of the fallopian tubes. At their point of origin, each of the Müllerian ducts forms a solid bud. Each bud penetrates the mesenchyme lateral and parallel to the Wolffian duct. As the solid buds elongate, a lumen appears in the cranial part, beginning at each celomic opening. The caudal end of each Müllerian duct crosses the ventral aspect of the **Wolffian duct**. The most cranial parts of the Müllerian ducts form the fallopian tubes (Fig. 1).

Wolffian duct is a paired organ that develops in the early stages of embryonic development in humans and other mammals.

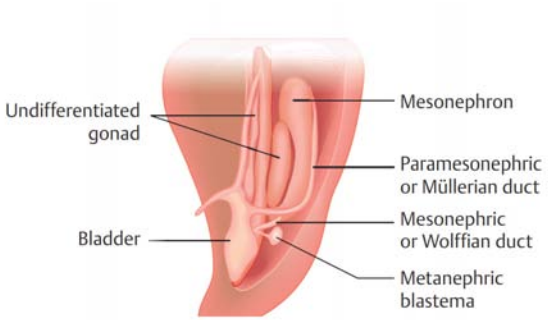


Figure 1. Six-week-old human embryo.

The caudal segments of the Müllerian ducts fuse to form the uterus and part of the vagina. The congenital absence of the uterus, the vagina with normal ovarian function, and 46,XX karyotype is the characteristic of women with Müllerian agenesis. The small rudimentary uterine bulbs are usually present with rudimentary fallopian tubes in Müllerian agenesis. This is frequently associated with skeletal, urologic, and especially renal anomalies. The ovarian and broad ligaments develop from the genital ligament. The vagina has dual origin. Upper part derives from the Müllerian duct, while the lower portion develops from the sinovaginal bulb from the urogenital sinus. By the fifth month of development, vaginal outgrowth is entirely canalized. If there is any anomaly in the development of the Müllerian ducts at any time between their origin from the celomic epithelium at 5 week of embryonic age and their fusion with the urogenital sinus at 8 weeks, the sinovaginal bulb will fail to proliferate from the urogenital sinus and the uterus and vagina will fail to develop. Congenital absence of the vagina is known as Mayer-Rokitansky-Küster-Hauser (MRKH) syndrome. The MRKH syndrome is associated with heterogenous group of disorders that have a variety of genetic, endocrine, and metabolic manifestation and associated anomalies of other organs. The lumen of the vagina is separated from the urogenital sinus by a thin tissue transverse septum, known as the hymen. The remnants of mesonephric ducts (epoophoron, paroophoron) are occasionally found in mesovarium and vagina wall.

2.1.2 Development of External Genitalia

In the third week of development, mesenchyme cells migrate around the cloacal membrane to form a pair of slightly elevated cloacal folds (Fig. 2).

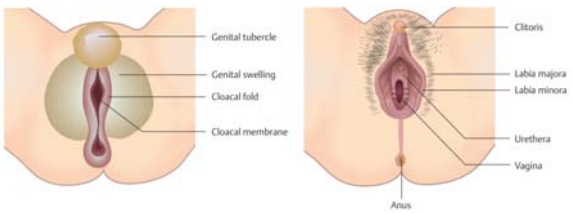


Figure 2. Diagrammatic representation of external genitalia.

Anterior to cloacal membrane, cloacal folds unite to form the genital tubercle by the fourth to fifth week of gestation. Caudally, the folds are subdivided into urethral folds anteriorly and anal folds posteriorly. The genital tubercle elongates only slightly and forms the clitoris and urethral folds do not fuse, as in the male, but develop into the labia minora. Genital swellings enlarge and form the labia majora. Urogenital membrane breaks in between to expose the lower part of urogenital sinus or groove. The urogenital groove opens centrally and forms the vestibule, urethra, and lower one-third of the vagina.

2.2 FEMALE REPRODUCTIVE ANATOMY

The female reproductive system functions to produce a female egg (gamete), reproductive hormones, support a developing fetus and deliver it into the outside world. Unlike its male counterpart, the female reproductive system is located primarily inside the pelvic cavity.

2.2.1 Perineum

The perineum is a strong, muscular area between the vaginal opening and the anus. The elastic fibers and connective tissue of the **perineum** allow stretching to permit the birth of the fetus.

The arrangement of the superficial and deep fasciae in the urogenital region results in the formation of two triangular spaces, the superficial and deep perineal spaces.

Perineum is the space between the anus and scrotum in the male, or between the anus and the vulva in the female.

Superficial Perineal Space

This space is situated superficial to the perineal membrane (urogenital diaphragm) and is also known as the superficial compartment of the perineum. The perineal membrane forms the inferior portion of the anterior pelvic floor. It is a triangular sheet of dense fibromuscular tissue that spans the anterior half of the pelvic outlet. This space contains the following structures:

- Colles fascia
- The clitoris and its crura
- Ischiocavernosus muscle

- Bulbocavernosus muscle
- Greater vestibular glands
- Superficial transverse perineal muscles (Fig. 3)

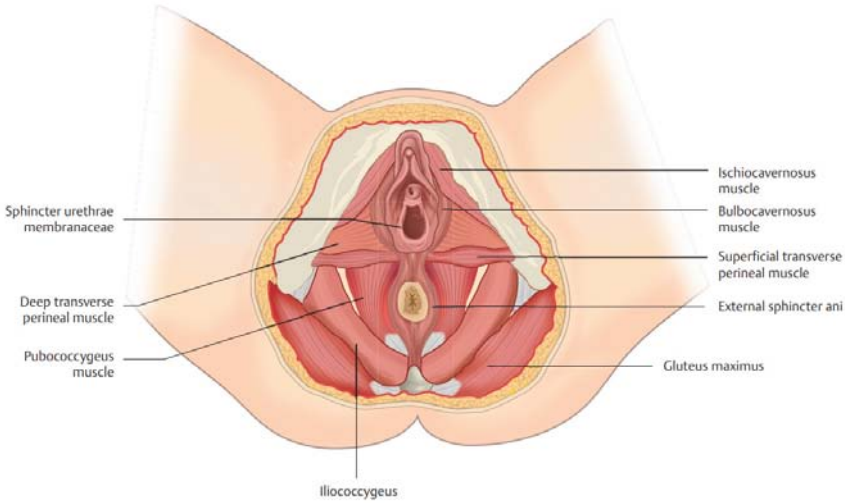


Figure 3. Diagrammatic representation of perineal muscles.

Deep Perineal Space

This is the space deep to the perineal membrane. It contains deep perineal muscle, compressor urethrae, and uretherovaginal sphincter.

2.2.2 Perineal Body

Within the area bounded by the lower vagina, perineal skin and anus is a mass of connective tissue called the perineal body or the central tendon of the perineum. It is attached to the inferior pubic rami and ischial tuberosities through the perineal membrane and superficial transverse perineal muscles. On its lateral margins the upper portions of the perineal body are connected with some fibers of the pelvic diaphragm. Posteriorly, the perineal body is indirectly attached to the coccyx by the external anal sphincter that is embedded in the perineal body (Fig. 4). Constituent elements of endopelvic fascia are listed in below.

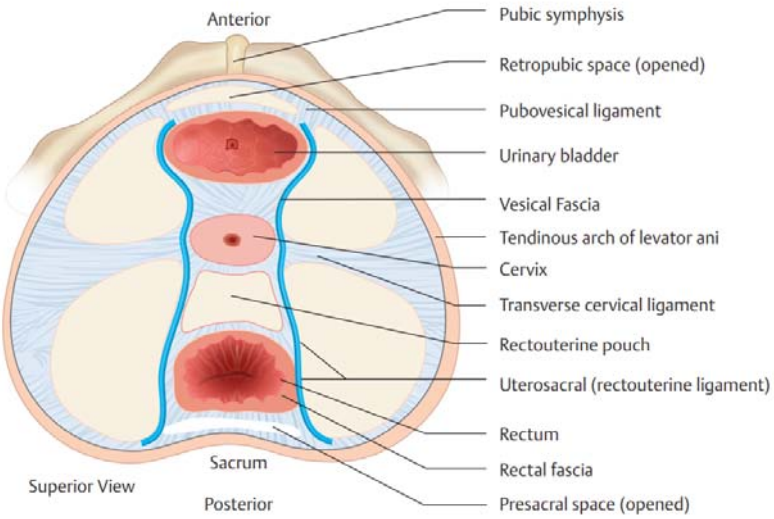


Figure 4. Transverse section of the pelvic fascia.

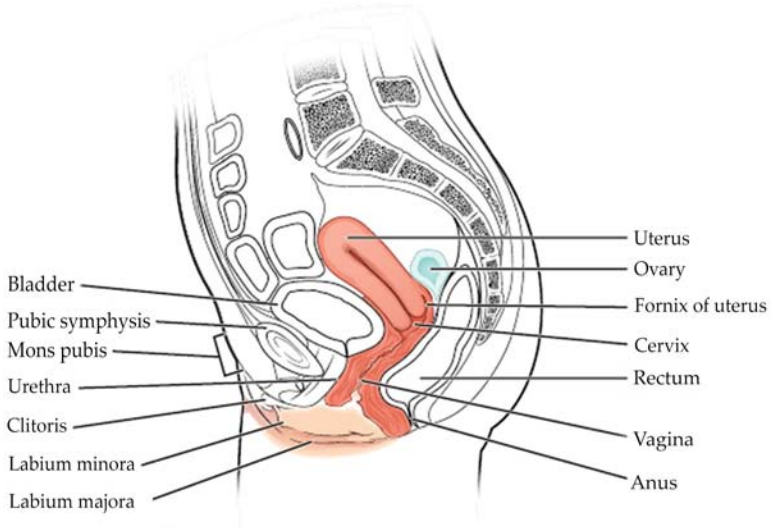
Components of the Endopelvic Fascia

- Parietal fascia
  - Obturator fascia
  - Levator ani fascia
  - Coccygeus fascia (sacrospinous ligament)
  - Piriform fascia
- Visceral fascia
  - Covering the uterus, vagina, bladder, rectum
- Deep endopelvic connective tissue
  - Contains six pericervical ligaments: Two pubocervical, two cardinal, and two uterosacral ligaments
  - Septae
- Pubocervical, rectovaginal septum
  - Pericervical ring

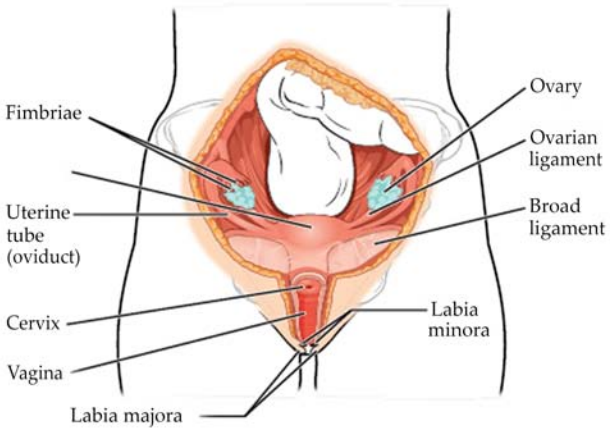
2.3 FEMALE REPRODUCTIVE ORGANS

The female reproductive system functions to produce gametes and reproductive hormones, just like the male reproductive system; however, it also has the additional task of supporting the

developing fetus and delivering it to the outside world. Unlike its male counterpart, the female reproductive system is located primarily inside the pelvic cavity. Recall that the ovaries are the female gonads. The gamete they produce is called an oocyte.



(a) Human female reproductive system: lateral view



(b) Human female reproductive system: anterior view

Figure 5. The major organs of the female reproductive system are located inside the pelvic cavity.

The female reproductive system consists of external genitalia, internal genitalia, and accessory structures such as the mammary glands (breasts).

2.3.1 External Female Genitalia

The female external reproductive organs are the secondary sex organs that are visible externally.

Vulva (Pudendum)

The female external genitalia or vulvae include the mons pubis, labia majora, labia minora, clitoris, vestibule, vestibular bulb, and the greater vestibular glands (Fig. 6).

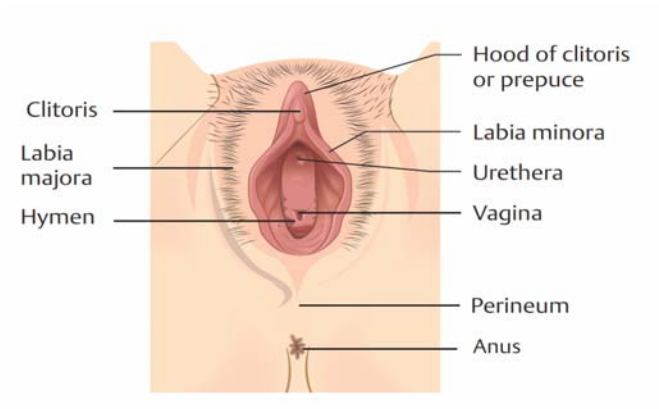


Figure 6. Parts of the vulva.

Mons Pubis

The mons pubis (mons veneris) is a pad of fatty tissue covered by coarse skin and hair. It protects the symphysis pubis and contributes to the rounded contour of the female body.

The mons pubis is the rounded area of the skin over the pubic symphysis and the adjacent pubic bone. It bears hair over it. Before puberty, the mons pubis is relatively flat and the labia minora are poorly formed. During adolescence, coarse hair forms over the mons and labia majora and the **labia minora** become more prominent and flap-like. In adult females, the mons is covered by coarse hair that is limited above by a horizontal boundary. After the menopause, pubic hair thins and labial tissue atrophies slightly.

Labia Majora

Labia minora are two flaps of skin that are part of the human vulva, extending outwards from the vaginal and urethral openings to encompass the vestibule.

The labia majora are two prominent, longitudinal folds of the skin that extend back from the mons pubis to the perineum. They form the lateral boundaries of the vulva. Each labium has an external pigmented surface covered with hairs and a smooth, pink internal surface with large sebaceous follicles.

Labia Minora

The labia minora are two small cutaneous folds, devoid of fat, that lie between the labia majora. These are lined by nonkeratinized squamous epithelium and contain elastic tissues, veins, a few smooth muscles, and abundant nerve endings. These extend from the clitoris obliquely down, laterally, and back flanking the vaginal orifice. Anteriorly, each labium minus bifurcates. The upper layer of each side passes above the clitoris to form a fold, the hood or prepuce, which overhangs the glans of the clitoris. The lower layer of each side passes below the clitoris to form the frenulum of the clitoris. Posteriorly, the labia minora unite in the midline to form a thin ridge of skin called fourchette.

Fourchette

The fourchette is a fold of tissue just below the vagina, where the labia majora and the labia minora meet. It is also known as the obstetrical perineum.

Vaginal Vestibule

The vestibule is the cavity that lies between the labia minora. It contains the vaginal and external urethral orifice and the openings of the two greater vestibular (Bartholin's) glands and of numerous mucous, lesser vestibular glands. The vaginal vestibule is the area seen when the labia minora are separated and includes five structures:

1. The urethral meatus lies approximately 2 cm below the clitoris. It has a foldlike appearance with a slit type of opening, and it serves as the exit for urine.
2. Skene ducts (paraurethral ducts) are located on each side of the urethra and provide lubrication for the urethra and the vaginal orifice.

3. The vaginal introitus is the division between the external and internal female genitalia.
4. The hymen is a thin elastic membrane that closes the vagina from the vestibule to various degrees.
5. The ducts of the Bartholin glands (vulvovaginal glands) provide lubrication for the vaginal introitus during sexual arousal and are normally not visible.

Urethra

The urethra opens into the vestibule about 2.5 cm below the clitoris and above the vaginal opening via a short, sagittal cleft with slightly raised margins, the urethral meatus. The ducts of the paraurethral glands (Skene's glands) open on each side of the lateral margins of the urethra.

Vaginal Orifice

The vaginal orifice lies in the posterior end of the vestibule posterior to the urethral opening. It is incompletely guarded by a septum of mucous membrane called the hymen.

Greater Vestibular Glands (Bartholin's Glands)

The greater vestibular glands are homologues of the male bulbourethral glands. They consist of two small, round or oval, reddish-yellow bodies that flank the vaginal orifice at about the 4 and 8 o' clock position under the bulbospongiosus muscle. Each opens into the posterolateral (junction of anterior two-thirds and posterior one-third) part of the vestibule by a 2-cm duct, situated in the groove between the hymen and the labium minus (3–4 mm outside the hymenal ring). The glands are composed of tubuloacinar tissue. The secreting cells are columnar and secrete alkaline clear or whitish mucus with lubricant properties. They are stimulated by sexual arousal. The duct is lined by columnar epithelium but near its opening by stratified squamous epithelium. When the Bartholin's gland is blocked and the gland becomes enlarged filled with secretions, this condition is known as Bartholin's gland cyst and if this gets infected and inflammed, the condition is called Bartholin's abscess, which is painful (Fig. 7).

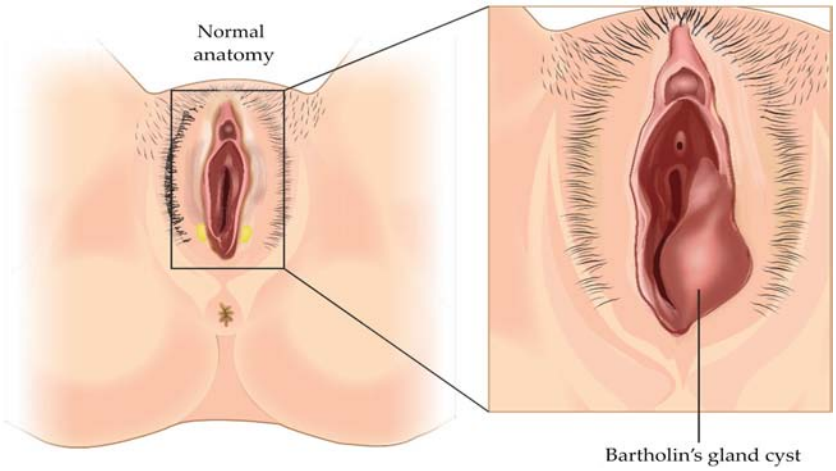


Figure 7. Bartholin's gland cyst.

Bulbs of the Vestibule

The bulbs of the vestibule lie on each side of the vestibule. They are two elongated masses of erectile tissue, 3 cm long, which flank the vaginal orifice and unite anterior to it by a narrow commissural bulborum (pars intermedia). They are homologous to the bulb of the penis in the male. However, it is split to be bilateral. Posterior ends of vestibular bulbs if torn in labor, may cause severe hemorrhage.

Clitoris

The clitoris is a small, erectile body in the most anterior portion of the labia minora. It is similar in structure to the penis. Functionally, it is the most erotic, sensitive part of the female genitalia.

The clitoris is an erectile structure partially enclosed by the anterior bifurcated ends of the labia minora. It has a root, a body, and a glans. The body can be palpated through the skin. It contains two corpora cavernosa, composed of erectile tissue, and enclosed in dense fibrous tissue. The glans clitoris is a small round tubercle of spongy erectile tissue at the end of the body and connected to the bulbs of the vestibule by thin bands of erectile tissue. It is exposed between the anterior ends of the labia minora. Its epithelium has high cutaneous sensitivity important in sexual responses.

Vascular Supply and Lymphatic Drainage of the Vulva

- *Arterial Supply:* The arterial blood supply of the female external genitalia is derived from the superficial and deep external pudendal branches of the femoral artery and the internal pudendal artery, a branch of internal iliac artery on each side.
- *Venous Drainage:* Venous drainage of the vulval skin is via external pudendal veins to the long saphenous vein. Venous drainage of the clitoris is via deep dorsal veins to the internal pudendal vein and superficial dorsal veins to the external pudendal and long saphenous veins. The veins form plexuses and drain into pudendal and saphenous veins along with vesical or vaginal venous plexus. In rare circumstances, varicosities of vulva develop that can cause severe bleeding.
- *Lymphatic Drainage:* The lymphatics drain into superficial and deep inguinal lymph nodes. There are 12 to 20 superficial lymph nodes that are spread parallel to and 1 cm below the inguinal ligament and extending down along the saphenous vein.
- *Innervations:* The anterior third of the labium majus is supplied by the ilioinguinal nerve (L1), the posterior two-thirds are supplied by the labial branches of the perineal nerve (S3), and the lateral aspect is also innervated by the perineal branch of the posterior cutaneous nerve of the thigh (S2).

2.3.2 Internal Genitalia

The female internal reproductive organs are the vagina, uterus, Fallopian tubes, and ovaries.

Vagina

The vagina is a fibromuscular distensible tube lined by nonkeratinized stratified squamous epithelium. It extends from the vestibule (the opening between the labia minora) to the cervix. The upper end of the vagina surrounds the vaginal projection of the uterine cervix. The annular recess between the cervix and the vagina is the fornix. The different parts of this recess

are given separate names, that is, anterior, posterior, and lateral (right and left side) fornices, but they are continuous. The vagina ascends posterior and upward. It forms an angle of 45 degrees with the horizontal in the erect posture. The width of the vagina increases as it ascends. The vaginal mucosa is attached to the uterine cervix on all sides. The anterior wall is approximately 7.5 cm long and the posterior wall is approximately 9 cm long. The anterior wall of the vagina is related to the base of the bladder. The posterior wall is separated from the rectum by the rectouterine pouch superiorly, and by Denonvilliers' fascia in its middle half. Laterally are levator ani and pelvic fascia. As the ureters pass anteromedially to reach the fundus of the bladder, they pass close to the lateral fornices and at this point each ureter is crossed transversely by a uterine artery.

The vagina opens externally through introitus. The size of the introitus varies; it is capable of great distension during childbirth and to a lesser degree during sexual intercourse. The hymen is a thin fold of mucous membrane situated just within the vaginal orifice. The internal surfaces of the folds are normally in contact with each other and the vaginal opening appears as a cleft between them.

Vascular Supply and Lymphatic Drainage of the Vagina

Arterial Supply

The arterial supply of the vagina is derived from the internal iliac arteries. Two azygos arteries descend on the vagina and supply the mucous membrane. The uterine, internal pudendal, and middle rectal branches of the internal iliac artery also contribute to the blood supply.

Venous Drainage

The vaginal veins drain into the internal iliac and internal pudendal veins.

Lymphatic Drainage

Upper lymphatic vessels drain in the internal and external iliac nodes; intermediate vessels drain in the internal iliac nodes,

and the lower vessels drain the vagina below the hymen in the superficial inguinal nodes.

Innervations

The lower vagina is supplied by the pudendal nerves (S2, S3, and S4). The upper vagina is supplied by the splanchnic nerves (S2, S3, and sometimes S4).

Functions of the Vagina

- Excretory duct for the menstrual fluid
- Coital canal for sexual pleasure, it brings vaginal lubrication
- Receptacle for semen to supply sperms to cervical canal, helps in capacitation of sperm
- Protective function—acidic vaginal pH prevents infection
- Absorptive function—seminal prostaglandin is absorbed to cause contraction of the myometrium and the fallopian tube
- Birth canal for delivery of the baby

Vaginal Secretion

The newborn has influence of maternal estrogen on the genital tract. Doderlein's bacilli appear by the third or fourth day and the vaginal pH is same as of an adult. By 10 to 14 days the estrogen stimulus is lost and the vaginal epithelium becomes atrophic and devoid of glycogen. The pH then rises to 7 and remains same till the puberty. The vaginal pH from the puberty to the menopause is acidic because of the presence of Doderlein's bacilli that produce lactic acid from glycogen present in exfoliated cells. The pH varies with estrogenic activity and ranges from 4 to 5. During pregnancy the glycogen is increased to maximum and the pH is high (3.5–4.5).

Uterus

The uterus (womb) is a hollow muscular organ in which a fertilized ovum is implanted, an embryo forms, and a fetus develops. It is shaped like an upside-down pear or light bulb.

In a mature, nonpregnant woman, it weighs approximately 60 g and is 7.5 cm long, 5 cm wide, and 1 to 2.5 cm thick. The uterus lies between the bladder and the rectum above the vagina.

The uterus is separated into three parts: fundus, corpus, and cervix. The fundus (upper part) is broad and flat. The fallopian tubes enter the uterus on each side of the fundus. The corpus (body) is the middle portion, and it plays an active role in menstruation and pregnancy.

The fundus and the corpus have three distinct layers:

1. The perimetrium is the outermost or serosal layer that envelops the uterus.
2. The myometrium is the middle muscular layer that functions during pregnancy and birth.
3. The endometrium is the inner or mucosal layer that is functional during menstruation and implantation of the fertilized ovum. It is governed by cyclical hormonal changes.

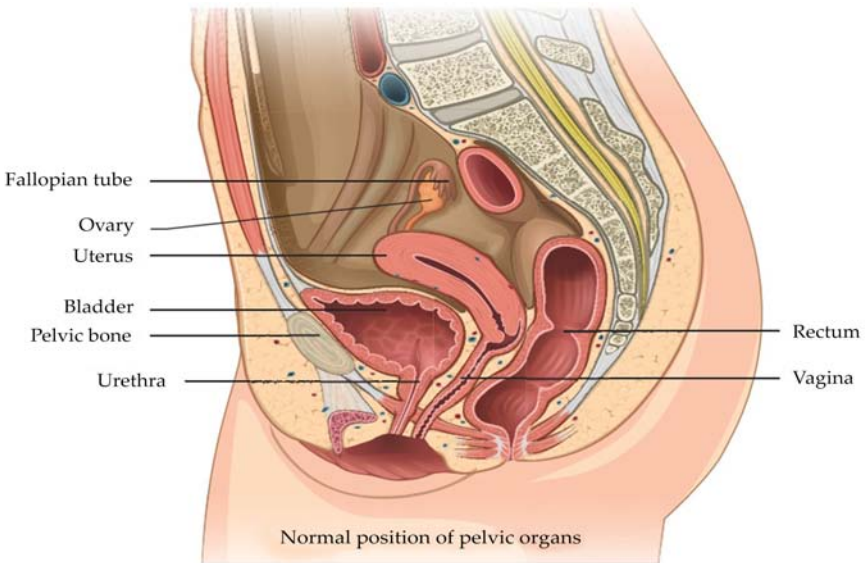


Figure 8. Sagittal section of the female pelvis.

Cervix is the lower part of the uterus (womb) in the human female reproductive system.

The uterus is a thick-walled, fibromuscular organ situated in the pelvis. It lies posterior to the bladder and uterovesical space and anterior to the rectum and rectouterine pouch (Fig. 8). It is mobile, which means its position varies with distension of the bladder and rectum. The uterus is divided into two main

regions: the body of the uterus (corpus uteri) forms the upper two-thirds, and the cervix (cervix uteri) forms the lower third. In the adult nulliparous state the cervix tilts forward relative to the axis of the vagina (anteversion), and the body of the uterus tilts forward relative to the cervix (anteflexion). In 10 to 15% of women the whole uterus leans backward at an angle to the vagina and is said to be retroverted. A uterus that angles backward on the **cervix** is described as retroflexed.

Body

The body of the uterus is pear shaped and extends from the fundus superiorly to the cervix inferiorly. Near its upper end, the uterine tubes enter the uterus on both sides at the uterine cornua. Inferoanterior to each cornu is the round ligament and inferoposterior is the ovarian ligament. The dome-like fundus is superior to the entry points of the uterine tubes and covered by peritoneum that is continuous with that of neighboring surfaces. The fundus is in contact with small intestine and distended sigmoid colon. The lateral margins of the body are convex, and on each side their peritoneum is reflected laterally to form the broad ligament, which extends as a flat sheet to the pelvic wall. The anterior surface of the uterine body is covered by densely adherent peritoneum that is reflected onto the bladder as the uterovesical fold. This normally occurs at the level of the internal os. The posterior surface of the uterus is covered with densely adherent peritoneum till the cervix and upper vagina and is then reflected back to the rectum along the surface of the rectouterine pouch (Douglas'), which lies posterior to the uterus. The cavity of the uterine body usually measures 6 cm from the external os of the cervix to the fundus and is flat in its anteroposterior plane. The ratio of the cervix and the uterus is 2:1 in childhood. After puberty, the corpus grows faster than the cervix. The same ratio becomes 1:3 or 1:4 in reproductive age. After climacteric, the uterus shrinks and becomes fibrotic due to atrophy.

Uterus has serosal layer outside derived from visceral peritoneum. Myometrium is middle layer which contains muscular layer arranged in outer longitudinal layer, middle criss cross fibers and inner circular layer. It is lined internally by endometrium which is lined by columnar epithelium which

extends below the anatomical internal os of cervix and that level is known as histological os. Mesenchymal stroma below columnar epithelium contains stromal cells, endometrial glands, vessels, and nerves.

Vascular Supply and Lymphatic Drainage of Uterus

Arterial Supply

The arterial supply to the uterus comes from the uterine artery. This arises as branch of the anterior division of the internal iliac artery. From its origin, the uterine artery crosses the ureter anteriorly in the broad ligament before branching as it reaches the uterus at the level of the cervicouterine junction (internal os). One major branch ascends the uterus tortuously within the broad ligament until it reaches the region of the ovarian hilum, where it anastomoses with the branches of the ovarian artery. Another branch descends to supply the cervix and anastomoses with branches of the vaginal artery to form two median longitudinal vessels, the azygos arteries of the vagina, which descend anterior and posterior to the vagina. Although there are anastomoses between the ovarian and vaginal arteries, the dominance of the uterine artery is indicated by its marked hypertrophy during pregnancy.

The tortuosity of the vessels as they ascend in the broad ligaments is repeated in their branches within the uterine wall. Each uterine artery gives off numerous branches. These enter the uterine wall, divide and run circumferentially as groups of anterior and posterior arcuate arteries. They ramify and narrow as they approach the anterior and posterior midline so that no large vessels are present in these regions. However, the left and right arterial trees anastomose across the midline and unilateral ligation of the uterine artery can be done without serious effects. Terminal branches in the uterine muscle are tortuous and are called helical arterioles. They provide a series of dense capillary plexuses in the myometrium and endometrium. From the arcuate arteries many helical arteriolar rami pass into the endometrium. Their detailed appearance changes during the menstrual cycle. In the proliferative phase helical arterioles are less prominent, whereas they grow in length and caliber, becoming even more tortuous in the secretory phase.

Venous Drainage

The uterine veins extend laterally in the broad ligaments, running adjacent to the arteries and passing behind the ureters. They drain into the internal iliac veins. The uterine venous plexus anastomoses with the vaginal, ovarian, and cervical venous plexuses.

Lymphatic Drainage

Uterine lymphatics exist in the superficial (subperitoneal) and deep parts of uterine wall. Collecting vessels from the body of the uterus and cervix pass laterally in the parametrium to three main groups of lymph nodes: the external iliac, internal iliac, and the obturator nodes. The external nodes surround their corresponding arteries. The obturator nodes lie in the obturator fossa between the external and internal iliac vessels. The obturator nerve passes through the lower part of this group of lymph nodes.

Lymph vessels from the fundus of the uterus and the uterine tubes may accompany the lymph drainage of the ovaries to para-aortic nodes. The region surrounding the isthmus of the uterine tube may drain along the round ligament to the superficial inguinal nodes.

Innervation

The nerve supply to the uterus is predominantly from the inferior hypogastric plexus. Some branches ascend with, or near, the uterine arteries in the broad ligament. They supply the uterine body and tubes, and connect with the tubal nerves from the inferior hypogastric plexus and with the ovarian plexus. The uterine nerves terminate in the myometrium and endometrium, and usually accompany the vessels. Nerves to the cervix form a plexus that contains small paracervical ganglia. Sometimes one ganglion is larger and is termed the uterine cervical ganglion. Branches may pass directly to the cervix uteri or may be distributed along the vaginal arteries.

Efferent preganglionic sympathetic fibers are derived from neurons in the last thoracic and first lumbar spinal segment. The sites where they synapse on their postganglionic neurons

are unknown. Preganglionic parasympathetic fibers arise from neurons in the second to fourth sacral spinal segments and relay in the paracervical ganglia. Sympathetic activity may produce uterine inhibition and vasodilatation, but these activities are complicated by hormonal control of uterine functions.

Cervix

The cervix (lower part) is narrow and tubular and opens into the upper vagina. The cervix consists of a cervical canal with an internal opening near the uterine corpus (internal os) and an opening into the vagina (the external os).

The mucosal lining of the cervix has four functions:

1. Lubricates the vagina.
2. Acts as a bacteriostatic agent.
3. Provides an alkaline environment to shelter deposited sperm from the acidic pH of the vagina.
4. Produces a mucous plug in the cervical canal during pregnancy.

The adult, nonpregnant cervix is narrower and more cylindrical than the body of the uterus and is typically 2.5 cm long. The upper end opens into the uterine body via the internal os while the lower end opens into the vagina at the external os. In nulliparous women, the external os is usually a circular aperture, whereas after childbirth, it is a transverse slit (like the appearance of a fish mouth). The narrower isthmus forms the upper third of the cervix. Although unaffected in the first months of pregnancy, it gradually merges with the uterine body to form "lower uterine segment." The supravaginal part is separated anteriorly from the bladder by cellular connective tissue, the parametrium, which also passes to the sides of the cervix and laterally between the two layers of the broad ligaments.

Endocevix is lined by mucin secreting columnar epithelium. Part of cervix outside external os is ectocervix which is lined by nonkeratinizing stratified squamous epithelium which meets columnar epithelium at external os. Zone of transition is called the transformation zone.

Fallopian Tubes

The uterine tubes are attached to the upper part of the body of the uterus and their ostia open into the uterine cavity. The medial opening of the tube (the uterine os) is located at the superior angle of the uterine cavity. The tube passes laterally and superiorly and consists of four main parts: intramural, isthmus, ampulla, and fimbria. The intramural part is 0.7 mm wide, 1 cm long, and lies within the myometrium. It is continuous laterally with the isthmus, which is 1 to 5 mm wide and 3 cm long and is rounded, muscular, and firm. The isthmus is continuous laterally with the ampulla, the widest portion of the tube with a maximum luminal diameter of 1 cm. The ampulla is 5 cm long and has a thin wall and a tortuously folded luminal surface. Typically, fertilization takes place in its lumen. The ampulla opens into the trumpet-shaped infundibulum at the abdominal os. Fimbriae, numerous mucosal fingerlike folds, 1 mm wide, are attached to the ends of the infundibulum and extend from its inner circumference beyond the muscular wall of the tube. One of these, the ovarian fimbria, is longer and more deeply grooved than the others, and is typically applied to the tubal pole of the ovary. At the time of ovulation, the fimbriae swell and extend as a result of engorgement of the vessels in the lamina propria, which aids capture of the released oocyte. All fimbriae are covered, such as the mucosal lining throughout the tube, by a ciliated epithelium whose cilia beat toward the ampulla.

Fallopian tubes have three layers. They are serosa, muscle layer, and mucus membrane thrown into folds. It is lined by tall columnar ciliated secretory cells, ciliated columnar cells, and peg cells.

Did You Know?

The fallopian tube was first described as a structure linked to fertilization by the Greek physician Soranus of Ephesus (1st century AD). The fallopian tubes were named by Vesalius after his assistant the 16th-century Italian anatomist Gabriele Falloppio, the first person to provide a detailed description of the tubes. He thought they resembled trumpets, tube in Italian, which was misunderstood and became the English "tube".

Vascular Supply and Lymphatic Drainage of Fallopian Tubes

Arterial Supply

The blood supply to the uterine tubes is derived from the ovarian and uterine arteries. The lateral third of the tube is supplied by the ovarian artery, which continues in the mesosalpinx to anastomose with branches from the uterine artery. The medial two-thirds of the tube is supplied by the uterine artery.

Venous Drainage

Venous drainage is similar to the arterial supply. The venous drainage of the lateral one-thirds of the uterine tube is via the pampiniform plexus to the ovarian veins that open into the inferior vena cava on the right side and the renal vein on the left side. The medial two-thirds of the tube drain via the uterine plexus to the internal iliac vein.

Lymphatic Drainage

Lymph drainage is via ovarian vessels to the para-aortic nodes and uterine vessels to the internal iliac chain. It is possible for lymph to reach the inguinal nodes via the round ligament.

Innervation

The uterine tube is innervated by autonomic fibers that are distributed mainly with the ovarian and uterine arteries. Most of the tube has a dual sympathetic and parasympathetic supply. Preganglionic parasympathetic fibers are derived from the vagus for the lateral half of the tube and the pelvic splanchnic nerves for the medial half. Sympathetic supply is derived from neurons in the tenth thoracic to the second lumbar spinal segments. Visceral afferent fibers travel with the sympathetic nerves and enter the cord through the corresponding dorsal roots. They may also travel via parasympathetic fibers. The ampullary submucosa contains modified Pacinian corpuscles.

Ovaries

The **ovaries** are the female gonads. Paired ovals, they are each about 2 to 3 cm in length, about the size of an almond. The ovaries are located within the pelvic cavity, and are supported by the mesovarium, an extension of the peritoneum that connects the ovaries to the broad ligament.

In the adult nonpregnant state, the ovaries lay on each side of the uterus close to the lateral pelvic wall, suspended in the pelvic cavity by a double fold of peritoneum, the mesovarium, which is attached to the upper limit of the posterior aspect of the broad uterine ligament. They are dull white in color and consist of dense fibrous tissue in which ova are embedded.

Before regular ovulation begins, they have a smooth surface, but thereafter their surfaces are distorted by scarring that follows the degeneration of successive corpora lutea. Prior to the first menstrual period (menarche), the ovaries are about a third of the normal reproductive adult size; they gradually increase in size with body growth. After the menopause, the average size of the ovary reduces to 2 × 1.5 × 0.5 cm and further to 1.5 × 0.75 × 0.5 cm in late menopause.

The lateral surface of the ovary contacts parietal peritoneum in the ovarian fossa. Behind the ovarian fossa are retroperitoneal structures, including the ureter, internal iliac vessels, obturator vessels and nerves, and the origin of the uterine artery. The medial surface faces the uterus, uterine vessels in the broad ligament, and the peritoneal recess here is termed the ovarian bursa. Above the superior extremity are the fimbria and distal section of the uterine tube. The inferior extremity points downward toward the pelvic floor. The anterior border faces the posterior leaf of the broad ligament and contains the mesovarium. The posterior border is free and faces the peritoneum, which overlies the upper part of the internal iliac artery and vein, and the ureter. On the right side, superior and lateral to the ovary, are the ileocecal junction, cecum and appendix. On the left side, the sigmoid colon passes over the superior pole of the ovary and joins the rectum, which lies between the medial of both the ovaries. In embryonic and early fetal life, the ovaries are situated in the lumbar region near the kidneys. They gradually descend along the gubernaculum, stopping at the lesser pelvis. Accessory ovarian tissue may occur in the mesovarium or along the course of the gubernacula. Rarely, the ovaries may descend along the whole course of the gubernacula and are found in the labia majora. During pregnancy, the ovaries are lifted high in the pelvis and, by 14 weeks of gestation, become partly abdominal structures. By the third trimester, they are totally abdominal structures and lie vertically behind and lateral to the parous uterus.



Vascular Supply and Lymphatic Drainage of Ovaries

Arterial Supply

The ovarian arteries are branches of the abdominal aorta and originate below the renal arteries. Each descends behind the peritoneum, and at the brim of the pelvis crosses the external iliac artery and vein to enter the true pelvic cavity. Here the artery turns medially in the ovarian suspensory ligament and splits into a branch to the mesovarium of that ligament, below the uterine tube, and supplies the tube. There are variations in the site of the division to the ovary and tube. On each side, a branch accompanies the round ligaments through the inguinal canal to the skin of the labium majus and the inguinal region. Early in intrauterine life the ovaries flank the vertebral column inferior to the kidneys, and so the ovarian arteries are relatively short; they gradually lengthen as the ovaries descend into the **pelvis**.

Pelvis is the lower part of the trunk, between the abdomen and the thighs (sometimes also called pelvic region), together with its embedded skeleton.

Venous Drainage

The ovarian veins emerge from the ovary as a plexus (pampiniform plexus) in the mesovarium and suspensory ligament. Two veins emerge from the plexus and ascend with the ovarian artery; they usually merge into a single vessel before entering either the inferior vena cava on the right side, or the renal vein on the left side.

Lymphatic Drainage

The main lymphatic drainage of the ovaries is along the vessels that follow the ovarian veins to para-aortic nodes situated near the origin of the renal arteries. Drainage may also occur via pelvic nodes into lower para-aortic nodes, and rarely may follow the round ligament to the inguinal nodes.

Innervation

The ovarian innervation is derived from autonomic plexuses. The upper part of the ovarian plexus is formed from branches of the renal and aortic plexuses, and the lower part is reinforced from the superior and inferior hypogastric plexuses. These plexuses consist of postganglionic sympathetic, parasympathetic, and visceral afferent fibers. The efferent sympathetic fibers are derived from the 10th and 11th thoracic spinal segments and are probable vasoconstrictor, whereas the parasympathetic fibers, from the inferior hypogastric plexuses, are probably vasodilator.

The Ovarian Cycle

The ovarian cycle is a set of predictable changes in a female's oocytes and ovarian follicles. During a woman's reproductive years, it is a roughly 28-day cycle that can be correlated with, but is not the same as, the menstrual cycle. The cycle includes two interrelated processes: oogenesis (the production of female gametes) and folliculogenesis (the growth and development of ovarian follicles).

Oogenesis

Gametogenesis in females is called oogenesis. The process begins with the ovarian stem cells, or oogonia. Oogonia are formed during fetal development, and divide via mitosis, much like spermatogonia in the testis.

Unlike spermatogonia, however, oogonia form primary oocytes in the fetal ovary prior to birth. These primary oocytes are then arrested in this stage of meiosis I, only to resume it years later, beginning at puberty and continuing until the woman is near menopause (the cessation of a woman's reproductive functions). The number of primary oocytes present in the ovaries

declines from one to two million in an infant, to approximately 400,000 at puberty, to zero by the end of menopause.

The initiation of ovulation—the release of an oocyte from the ovary—marks the transition from puberty into reproductive maturity for women. From then on, throughout a woman's reproductive years, ovulation occurs approximately once every 28 days. Just prior to ovulation, a surge of luteinizing hormone triggers the resumption of meiosis in a primary oocyte. This initiates the transition from primary to secondary oocyte. However, as you can see in Figure 9, this cell division does not result in two identical cells. Instead, the cytoplasm is divided unequally, and one daughter cell is much larger than the other. This larger cell, the secondary oocyte, eventually leaves the ovary during ovulation. The smaller cell, called the first polar body, may or may not complete meiosis and produce second polar bodies; in either case, it eventually disintegrates. Therefore, even though oogenesis produces up to four cells, only one survives.

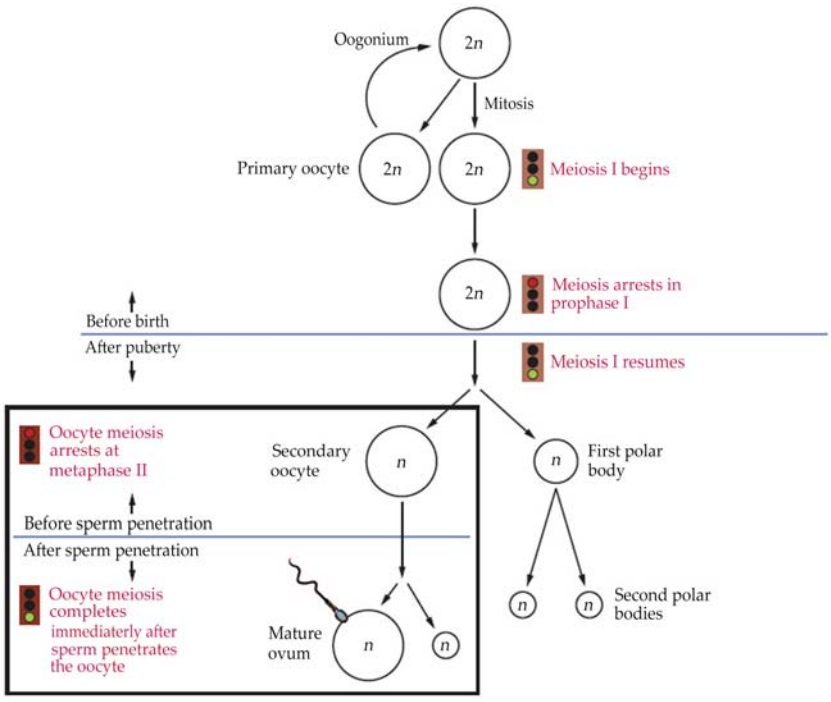


Figure 9. The unequal cell division of oogenesis produces one to three polar bodies that later degrade, as well as a single haploid ovum, which is produced only if there is penetration of the secondary oocyte by a sperm cell.

How does the diploid secondary oocyte become an ovum—the haploid female gamete? Meiosis of a secondary oocyte is completed only if a sperm succeeds in penetrating its barriers. Meiosis II then resumes, producing one haploid ovum that, at the instant of fertilization by a (haploid) sperm, becomes the first diploid cell of the new offspring (a zygote). Thus, the ovum can be thought of as a brief, transitional, haploid stage between the diploid oocyte and diploid zygote.

The larger amount of cytoplasm contained in the female gamete is used to supply the developing zygote with nutrients during the period between fertilization and implantation into the uterus. Interestingly, sperm contribute only DNA at fertilization —not cytoplasm. Therefore, the cytoplasm and all of the cytoplasmic organelles in the developing embryo are of maternal origin. This includes mitochondria, which contain their own DNA. Scientific research in the 1980s determined that mitochondrial DNA was maternally inherited, meaning that you can trace your mitochondrial DNA directly to your mother, her mother, and so on back through your female ancestors.

Folliculogenesis

Again, ovarian follicles are oocytes and their supporting cells. They grow and develop in a process called folliculogenesis, which typically leads to ovulation of one follicle approximately every 28 days, along with death to multiple other follicles. The death of ovarian follicles is called atresia, and can occur at any point during follicular development. Recall that, a female infant at birth will have one to two million oocytes within her ovarian follicles, and that this number declines throughout life until menopause, when no follicles remain. Follicles progress from primordial, to primary, to secondary and tertiary stages prior to ovulation—with the oocyte inside the follicle remaining as a primary oocyte until right before ovulation.

Folliculogenesis begins with follicles in a resting state. These small primordial follicles are present in newborn females and are the prevailing follicle type in the adult ovary. Primordial follicles have only a single flat layer of support cells, called granulosa cells, that surround the oocyte, and they can stay in this resting state for years—some until right before menopause.

After puberty, a few primordial follicles will respond to a recruitment signal each day, and will join a pool of immature growing follicles called primary follicles. Primary follicles start with a single layer of granulosa cells, but the granulosa cells then become active and transition from a flat or squamous shape to a rounded, cuboidal shape as they increase in size and proliferate. As the granulosa cells divide, the follicles—now called secondary follicles—increase in diameter, adding a new outer layer of connective tissue, blood vessels, and theca cells—cells that work with the granulosa cells to produce estrogens.

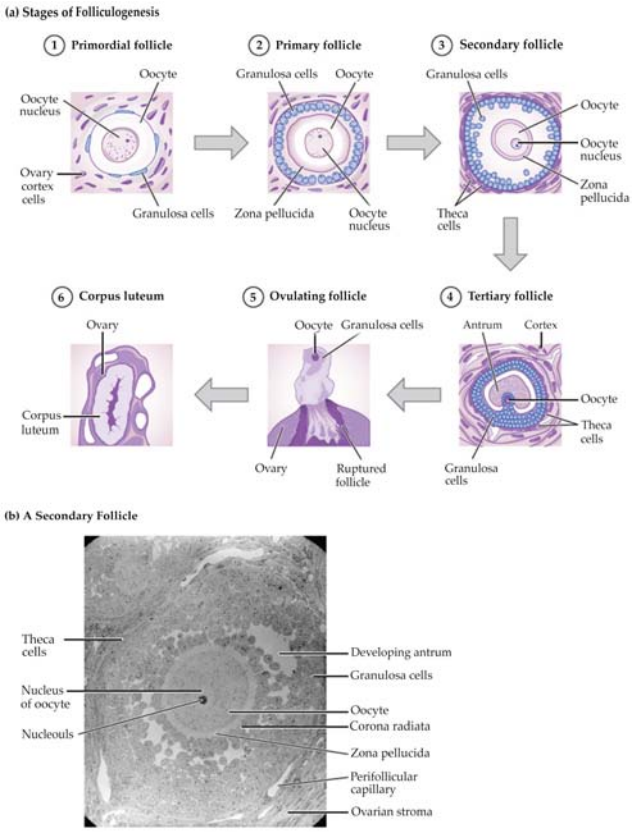


Figure 10. (a) The maturation of a follicle is shown in a clockwise direction proceeding from the primordial follicles. FSH stimulates the growth of a tertiary follicle, and LH stimulates the production of estrogen by granulosa and theca cells. Once the follicle is mature, it ruptures and releases the oocyte. Cells remaining in the follicle then develop into the corpus luteum. (b) In this electron micrograph of a secondary follicle, the oocyte, theca cells (thecae folliculi), and developing antrum are clearly visible.

Remember

Keep in mind that most follicles don't make it to this point. In fact, roughly 99 percent of the follicles in the ovary will undergo atresia, which can occur at any stage of folliculogenesis.

Within the growing secondary follicle, the primary oocyte now secretes a thin acellular membrane called the zona pellucida that will play a critical role in fertilization. A thick fluid, called follicular fluid, that has formed between the granulosa cells also begins to collect into one large pool, or antrum. Follicles in which the antrum has become large and fully formed are considered tertiary follicles (or antral follicles). Several follicles reach the tertiary stage at the same time, and most of these will undergo atresia. The one that does not die will continue to grow and develop until ovulation, when it will expel its secondary oocyte surrounded by several layers of granulosa cells from the ovary.

Hormonal Control of the Ovarian Cycle

The process of development that we have just described, from primordial follicle to early tertiary follicle, takes approximately two months in humans. The final stages of development of a small cohort of tertiary follicles, ending with ovulation of a secondary oocyte, occur over a course of approximately 28 days. These changes are regulated by many of the same hormones that regulate the male reproductive system, including GnRH, LH, and FSH.

As in men, the hypothalamus produces GnRH, a hormone that signals the anterior pituitary gland to produce the gonadotropins FSH and LH. These gonadotropins leave the pituitary and travel through the bloodstream to the ovaries, where they bind to receptors on the granulosa and theca cells of the follicles. FSH stimulates the follicles to grow (hence its name of follicle-stimulating hormone), and the five or six tertiary follicles expand in diameter. The release of LH also stimulates the granulosa and theca cells of the follicles to produce the sex steroid hormone estradiol, a type of estrogen. This phase of the ovarian cycle, when the tertiary follicles are growing and secreting estrogen, is known as the follicular phase.

The more granulosa and theca cells a follicle has (that is, the larger and more developed it is), the more estrogen it will produce in response to LH stimulation. As a result of these large follicles producing large amounts of estrogen, systemic plasma estrogen concentrations increase. Following a classic negative feedback loop, the high concentrations of estrogen will stimulate the hypothalamus and pituitary to reduce the production of

GnRH, LH, and FSH. Because the large tertiary follicles require FSH to grow and survive at this point, this decline in FSH caused by negative feedback leads most of them to die (atresia). Typically only one follicle, now called the dominant follicle, will survive this reduction in FSH, and this follicle will be the one that releases an oocyte. Scientists have studied many factors that lead to a particular follicle becoming dominant: size, the number of granulosa cells, and the number of FSH receptors on those granulosa cells all contribute to a follicle becoming the one surviving dominant follicle.

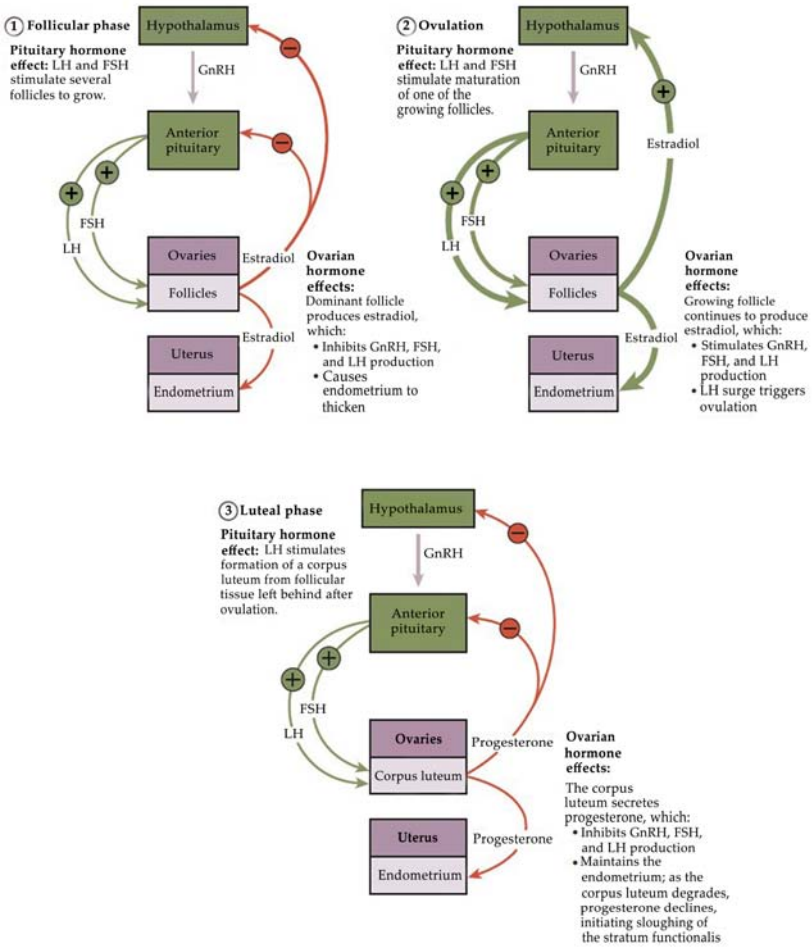


Figure 11. The hypothalamus and pituitary gland regulate the ovarian cycle and ovulation. GnRH activates the anterior pituitary to produce LH and FSH, which stimulate the production of estrogen and progesterone by the ovaries.

When only the one dominant follicle remains in the ovary, it again begins to secrete estrogen. It produces more estrogen than all of the developing follicles did together before the negative feedback occurred. It produces so much estrogen that the normal negative feedback doesn't occur. Instead, these extremely high concentrations of systemic plasma estrogen trigger a regulatory switch in the anterior pituitary that responds by secreting large amounts of LH and FSH into the bloodstream. The positive feedback loop by which more estrogen triggers release of more LH and FSH only occurs at this point in the cycle.

It is this large burst of LH (called the LH surge) that leads to ovulation of the dominant follicle. The LH surge induces many changes in the dominant follicle, including stimulating the resumption of meiosis of the primary oocyte to a secondary oocyte. As noted earlier, the polar body that results from unequal cell division simply degrades. The LH surge also triggers proteases (enzymes that cleave proteins) to break down structural proteins in the ovary wall on the surface of the bulging dominant follicle. This degradation of the wall, combined with pressure from the large, fluid-filled antrum, results in the expulsion of the oocyte surrounded by granulosa cells into the peritoneal cavity. This release is ovulation.

The surge of LH also stimulates a change in the granulosa and theca cells that remain in the follicle after the oocyte has been ovulated. This change is called luteinization (recall that the full name of LH is luteinizing hormone), and it transforms the collapsed follicle into a new endocrine structure called the corpus luteum, a term meaning "yellowish body". Instead of estrogen, the luteinized granulosa and theca cells of the corpus luteum begin to produce large amounts of the sex steroid hormone progesterone, a hormone that is critical for the establishment and maintenance of pregnancy. Progesterone triggers negative feedback at the hypothalamus and pituitary, which keeps GnRH, LH, and FSH secretions low, so no new dominant follicles develop at this time.

The post-ovulatory phase of progesterone secretion is known as the luteal phase of the ovarian cycle. If pregnancy does not occur within 10 to 12 days, the corpus luteum will stop secreting progesterone and degrade into the corpus albicans, a nonfunctional "whitish body" that will disintegrate in the ovary

over a period of several months. During this time of reduced progesterone secretion, FSH and LH are once again stimulated, and the follicular phase begins again with a new cohort of early tertiary follicles beginning to grow and secrete estrogen.

2.3.3 Broad Ligament

The ovaries and tubes form the uterine adnexa. They are covered by a specialized series of peritoneal folds called the broad ligament. During the embryonic development, the paired Müllerian ducts and ovaries arise from the lateral abdominopelvic wall. As they migrate medially and fuse, the peritoneum is pulled out of the pelvic wall from the cervix upward. This leaves the midline uterus connected on either side to the pelvic wall by a double layer of peritoneum. This peritoneal fold on either side is called the broad ligament. In the upper part of it, lies fallopian tube, round ligament, and ovarian ligament. The cardinal and uterosacral ligaments are at the lower margin of the broad ligament. They are not "pure ligament" but condensed fibromuscular connective tissue. The ovary, tube, and round ligament have peritoneal fold similar to mesentery, called mesovarium, mesosalpinx, and mesoteres, respectively. The mesosalpinx contains vascular anastomoses between the uterine and ovarian vessels, the **epoophoron**, the paroophoron. The mesovarium projects from the posterior aspect of the broad ligament, of which it is the smaller part, is attached to the hilum of the ovary and carries vessels and nerves to the ovary. At the lateral end of the fallopian tube and ovary, the broad ligament ends where the infundibulopelvic ligament blends with the pelvic wall.

Epoophoron is a remnant of the mesonephric tubules that can be found next to the ovary and fallopian tube.

Mesometrium

The mesometrium is the largest part of the broad ligament, and extends from the pelvic floor to the ovarian ligament and uterine body. The uterine artery passes between its two peritoneal layers typically 1.5 cm lateral to the cervix; it crosses the ureter shortly after its origin from the internal iliac artery and gives off a branch that passes superiorly to the uterine tube, where it anastomoses with the ovarian artery. This ligament continues laterally over the external iliac vessels as a distinct fold.

Infundibulopelvic (Suspensory) Ligament

The suspensory or infundibulopelvic ligament of the ovary is a peritoneal fold, which is attached to the upper part of the lateral surface of the ovary. It contains the ovarian vessels and nerves. On the right side the infundibulopelvic ligament is attached to a fold of peritoneum that is posterior and inferior to the cecum and appendix.

On the left side, the peritoneal attachment is higher than on the right side and lateral to the junction of the descending and sigmoid colon. As it joins the peritoneum that covers the psoas major, it passes superiorly over the genitofemoral nerve, external iliac vessels, and the ureter.

2.3.4 Ligaments of the Pelvis

The ligaments of the pelvis consist of the round, uterosacral, transverse cervical, and pubocervical ligaments.

Round Ligament

The round ligaments are narrow, somewhat flattened bands, 10 to 12 cm long. Each is attached medially to the upper part of the uterus just below and anterior to the lateral cornua. From here, each passes laterally within the upper part of the broad ligament to the pelvic side wall.

At the start of the inferior epigastric artery, the round ligament enters the deep inguinal ring. It traverses the inguinal canal and splits into strands that merge with the surrounding connective tissue before terminating in the mons pubis above the labium majus. Near the uterus, the round ligament contains a considerable amount of smooth muscle, but this gradually diminishes and the terminal portion is purely fibrous. The round ligament contains blood vessels, nerves, and lymphatics. The lymphatics drain the uterine region around the entry of the uterine tube to the superficial inguinal lymph nodes.

In the fetus a projection of peritoneum (processus vaginalis) is carried with the round ligament for a short distance into the inguinal canal. This is generally obliterated in adults, although it is sometimes patent even in old age. In the canal the ligament

receives the same coverings as the spermatic cord, although they are thinner and blend with the ligament itself, which may not reach the mons pubis. The round and ovarian ligaments both are developed from the gubernaculum and are continuous.

Uterosacral, Transverse Cervical, and Pubocervical Ligaments

The uterosacral ligaments contain fibrous tissue and smooth muscle. They pass back from the supravaginal cervix and uterine body on both sides of the rectum, and they are attached to the front of the sacrum. The ligaments can be palpated on rectal examination. On vaginal examination, these can be felt as thick bands of tissue passing downward on both sides of the posterior fornix.

The transverse cervical ligaments (cardinal ligaments, Mackenrodt's ligaments) extend from the side of the supravaginal cervix and lateral fornix of the vagina to attach extensively on the pelvic wall. At the level of the cervix some fibers interdigitate with fibers of the uterosacral ligaments. They are continuous with the fibrous tissue around the lower parts of the ureters and pelvic blood vessels. Fibers of the pubocervical ligament pass forward from the anterior aspect of the cervix and upper vagina to diverge around the urethra. These fibers are attached to the posterior aspect of the pubic bones.

2.3.5 Peritoneal Folds

The parietal peritoneum is reflected over the upper genital tract to produce anterior (uterovesical), posterior (rectovaginal), and lateral peritoneal folds. The anterior cul-de-sac is a recess between the dome of the bladder and the anterior surface of the uterus. The peritoneum is loosely applied in the region of uterovesical fold. This allows the bladder expansion without stretching its overlying peritoneum. The peritoneal fold here can be lifted and incised easily. The rectovaginal pouch (pouch of Douglas) extends approximately 4 cm along the posterior vaginal wall. It has important clinical significance, collections such as blood or pus may be aspirated through vagina as culdocentesis. The pouch may enlarge due to traction or pulsion to form enterocele.

Pelvic Spaces

The space between the bladder and pubis bone is space of Retzius. Behind the bladder and urethra is vesicovaginal or vasicocervical space. Vesicovaginal space is bounded laterally by "bladder pillars." The space between the rectum and vagina is called rectovaginal space.

2.4 PHYSIOLOGY OF MENSTRUAL CYCLE

Now that we have discussed the maturation of the cohort of tertiary follicles in the ovary, the build-up and then shedding of the endometrial lining in the uterus, and the function of the uterine tubes and vagina, we can put everything together to talk about the three phases of the menstrual cycle—the series of changes in which the uterine lining is shed, rebuilds, and prepares for implantation.

The timing of the menstrual cycle starts with the first day of menses, referred to as day one of a woman's period. Cycle length is determined by counting the days between the onset of bleeding in two subsequent cycles. Because the average length of a woman's menstrual cycle is 28 days, this is the time period used to identify the timing of events in the cycle. However, the length of the menstrual cycle varies among women, and even in the same woman from one cycle to the next, typically from 21 to 32 days.

Just as the hormones produced by the granulosa and theca cells of the ovary "drive" the follicular and luteal phases of the ovarian cycle, they also control the three distinct phases of the menstrual cycle. These are the menses phase, the proliferative phase, and the secretory phase.

2.4.1 Menses Phase

The menses phase of the menstrual cycle is the phase during which the lining is shed; that is, the days that the woman menstruates. Although it averages approximately five days, the menses phase can last from 2 to 7 days, or longer. As shown in Figure 12, the menses phase occurs during the early days of the follicular phase of the ovarian cycle, when progesterone, FSH, and

LH levels are low. Recall that progesterone concentrations decline as a result of the degradation of the corpus luteum, marking the end of the luteal phase. This decline in progesterone triggers the shedding of the stratum functionalis of the endometrium.

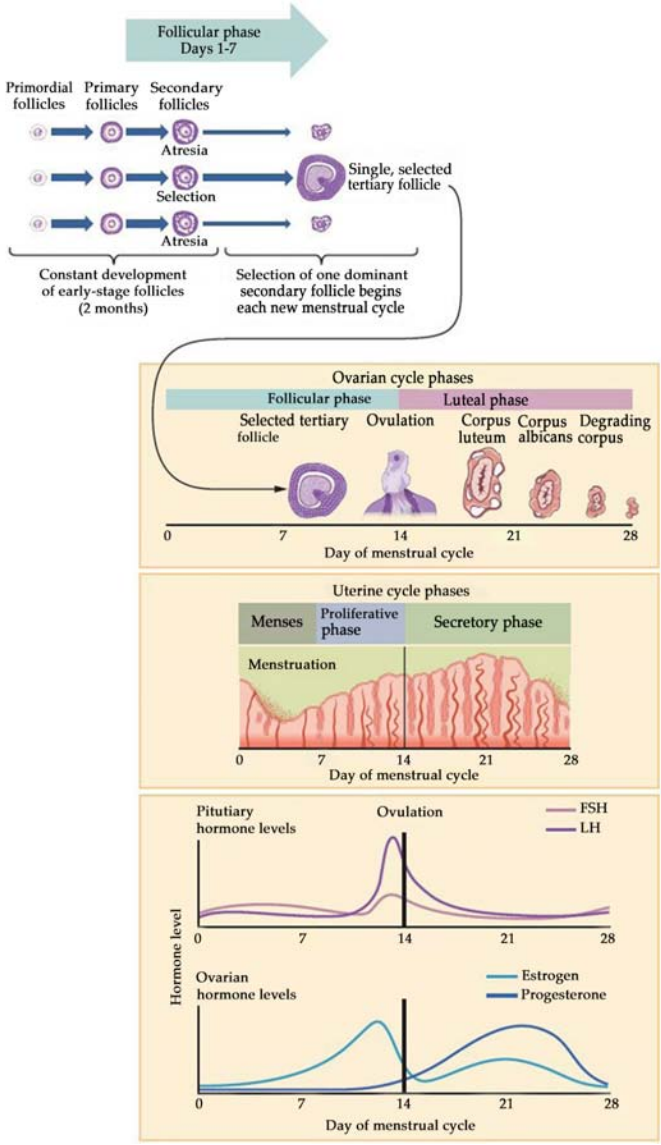


Figure 12. The correlation of the hormone levels and their effects on the female reproductive system is shown in this timeline of the ovarian and menstrual cycles. The menstrual cycle begins at day one with the start of menses. Ovulation occurs around day 14 of a 28-day cycle, triggered by the LH surge.

2.4.2 Proliferative Phase

Once menstrual flow ceases, the endometrium begins to proliferate again, marking the beginning of the proliferative phase of the menstrual cycle. It occurs when the granulosa and theca cells of the tertiary follicles begin to produce increased amounts of estrogen. These rising estrogen concentrations stimulate the endometrial lining to rebuild.

Recall that the high estrogen concentrations will eventually lead to a decrease in FSH as a result of negative feedback, resulting in atresia of all but one of the developing tertiary follicles. The switch to positive feedback—which occurs with the elevated estrogen production from the dominant follicle—then stimulates the LH surge that will trigger ovulation. In a typical 28-day menstrual cycle, ovulation occurs on day 14. Ovulation marks the end of the proliferative phase as well as the end of the follicular phase.

2.4.3 Secretory Phase

In addition to prompting the LH surge, high estrogen levels increase the uterine tube contractions that facilitate the pick-up and transfer of the ovulated oocyte. High estrogen levels also slightly decrease the acidity of the vagina, making it more hospitable to sperm. In the ovary, the luteinization of the granulosa cells of the collapsed follicle forms the progesterone-producing corpus luteum, marking the beginning of the luteal phase of the ovarian cycle. In the uterus, progesterone from the corpus luteum begins the secretory phase of the menstrual cycle, in which the endometrial lining prepares for implantation. Over the next 10 to 12 days, the endometrial glands secrete a fluid rich in glycogen. If fertilization has occurred, this fluid will nourish the ball of cells now developing from the zygote. At the same time, the spiral arteries develop to provide blood to the thickened stratum functionalis.

If no pregnancy occurs within approximately 10 to 12 days, the corpus luteum will degrade into the corpus albicans. Levels of both estrogen and progesterone will fall, and the endometrium will grow thinner. Prostaglandins will be secreted that cause constriction of the spiral arteries, reducing oxygen supply. The

endometrial tissue will die, resulting in menses—or the first day of the next cycle.

2.4.4 The Breasts

Whereas the breasts are located far from the other female reproductive organs, they are considered accessory organs of the female reproductive system. The function of the breasts is to supply milk to an infant in a process called lactation. The external features of the breast include a nipple surrounded by a pigmented areola, whose coloration may deepen during pregnancy.

The areola is typically circular and can vary in size from 25 to 100 mm in diameter. The areolar region is characterized by small, raised areolar glands that secrete lubricating fluid during lactation to protect the nipple from chafing. When a baby nurses, or draws milk from the breast, the entire areolar region is taken into the mouth.

Breast milk is produced by the mammary glands, which are modified sweat glands. The milk itself exits the breast through the nipple via 15 to 20 lactiferous ducts that open on the surface of the nipple. These lactiferous ducts each extend to a lactiferous sinus that connects to a glandular lobe within the breast itself that contains groups of milk-secreting cells in clusters called **alveoli**.

The clusters can change in size depending on the amount of milk in the alveolar lumen. Once milk is made in the alveoli, stimulated myoepithelial cells that surround the alveoli contract to push the milk to the lactiferous sinuses. From here, the baby can draw milk through the lactiferous ducts by suckling. The lobes themselves are surrounded by fat tissue, which determines the size of the breast; breast size differs between individuals and does not affect the amount of milk produced. Supporting the breasts are multiple bands of connective tissue called suspensory ligaments that connect the breast tissue to the dermis of the overlying skin.

Alveoli is a general anatomical term for a concave cavity or pit.

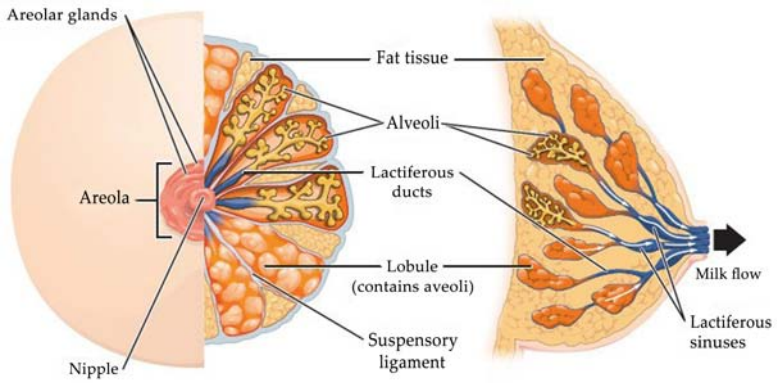


Figure 13. During lactation, milk moves from the alveoli through the lactiferous ducts to the nipple.

During the normal hormonal fluctuations in the menstrual cycle, breast tissue responds to changing levels of estrogen and progesterone, which can lead to swelling and breast tenderness in some individuals, especially during the secretory phase. If pregnancy occurs, the increase in hormones leads to further development of the mammary tissue and enlargement of the breasts.

2.4.5 Hormonal Birth Control

Birth control pills take advantage of the negative feedback system that regulates the ovarian and menstrual cycles to stop ovulation and prevent pregnancy. Typically they work by providing a constant level of both estrogen and progesterone, which negatively feeds back onto the hypothalamus and pituitary, thus preventing the release of FSH and LH.

Some birth control pills contain 21 active pills containing hormones, and 7 inactive pills (placebos). The decline in hormones during the week that the woman takes the placebo pills triggers menses, although it is typically lighter than a normal menstrual flow because of the reduced endometrial thickening. Newer types of birth control pills have been developed that deliver low-dose estrogens and progesterone for the entire cycle (these are meant to be taken 365 days a year), and menses never occurs. While some women prefer to have the proof of a lack of pregnancy that a monthly period provides, menstruation every 28 days is not required for health reasons, and there are no reported

Remember

Without FSH, the follicles do not mature, and without the LH surge, ovulation does not occur. Although the estrogen in birth control pills does stimulate some thickening of the endometrial wall, it is reduced compared with a normal cycle and is less likely to support implantation.

adverse effects of not having a menstrual period in an otherwise healthy individual.

Because birth control pills function by providing constant estrogen and progesterone levels and disrupting negative feedback, skipping even just one or two pills at certain points of the cycle (or even being several hours late taking the pill) can lead to an increase in FSH and LH and result in ovulation. It is important, therefore, that the woman follow the directions on the birth control pill package to successfully prevent pregnancy.

ROLE MODEL



GABRIELE FALLOPPIO

Gabriele Falloppio (also Gabrielle Falloppia) (1522/23 – 9 October 1562) was an Italian priest and anatomist often known by his Latin name Fallopius. He was one of the most important anatomists and physicians of the sixteenth century, giving his name to the Fallopian tube.

Life

Falloppio grew up in Modena. His father died early but thanks to the support of affluent relatives he enjoyed a thorough humanist education in Modena, learning Latin and Greek and moving in the local circle of humanist scholars. He was for some years in the service of the Church, among others as a kind of warden at Modena's cathedral, but soon turned to medicine. In 1544, he performed a public anatomy in Modena. In 1545, at the latest, he began to study medicine at the University of Ferrara, at that time one of the best medical schools in Europe. It was there also that he much later, in 1552, when he was already professor in Padua, received his medical doctorate under the guidance of Antonio Musa Brasavola. He taught on medicinal plants in Ferrara but was not professor of anatomy there, as has sometimes been claimed. He also was never a personal student of Andreas Vesalius as is often falsely maintained (he explicitly called himself a student of Vesalius in the sense only that he had read his works). In 1548, he took the chair of anatomy at the University of Pisa. In 1551, he was invited to occupy the chair of anatomy and surgery at the University of Padua and also lectured on medicinal plants or botany. In Padua, he shared his house over years with the German botanist Melchior Wieland which gave rise to some suspicions about the nature of their relationship and got Falloppia involved in Wieland's vitriolic controversy with the irascible botanist Pietro Andrea Mattioli. Falloppia was a very popular teacher and had numerous students. He also ran an extensive medical and surgical practice and took his students with him so they could learn from him. He died in Padua in October 1562, not even 40 years old. His plans for a major illustrated anatomical textbook were thus never realized.

Contributions

Falloppio published only one major work during his lifetime, the *Observationes anatomicae*, which first came out in 1561. Here he presented his numerous new anatomical findings, correcting and expanding on the works of Galen and Vesalius. Some of his findings referred to the head and the brain. He added much to what was known before about the internal ear and described in detail the tympanum and its relations to the osseous ring in which it is situated. He also described minutely the circular and oval windows (fenestræ) and their communication with the vestibule and cochlea. He was the first to point out the connection between the mastoid cells and the middle ear. His description of the lacrimal ducts in the eye was a marked advance on those of his predecessors and he also gave a detailed account of the ethmoid bone and its cells in the nose. The aquaeductus Fallopii, the canal through which the facial nerve passes after leaving the auditory nerve, is also named after him. He also described the Fallopian hiatus, an opening in the anterosuperior part of the petrosal bone.

His contributions to the anatomy of the bones and muscles were very valuable as well. He discovered among other the muscle that lifts the upper eyelid. He studied the reproductive organs in both sexes, and gave the first precise description of the uterine tube, which leads from the ovary to the uterus and bears his name to this day. He was the first to describe the ileocecal valve, which prevents a reflux of fecal matter from the colon to the small intestines, and demonstrated its function to his students. He also was the first to identify the vessels in the abdomine which were later called lacteals because of their milky appearance after meals.

His contributions to practical medicine were also important. He was the first to use an aural speculum for the diagnosis and treatment of diseases of the ear, and his writings on surgical subjects are still of interest. After his death, some of his students published their lectures, in particular, on ulcers, tumors, medical cosmetics, and other surgical topics and on botany and mineral waters. In his lectures, Falloppio also described, around 1555, a linen sheath that previously had been soaked in medicinal substances and then dried and some authors have praised him as the inventor of condom. The sheath was not to be used during intercourse, however. A man who had intercourse with a woman he suspected of being infected with the French disease or syphilis was to put the sheath over the glans penis after intercourse and leave it there for several hours to destroy infectious matter that might have entered the skin. Some authors have taken Falloppio's claim seriously - which is clearly phantastical - that he tested this sheath on a thousand or more men.

Falloppio also lectured extensively on mineral waters and their medicinal qualities and presented the results of his chemical analysis of the waters from various springs by means of distilliation. He argued against Fracastor's theory of fossils, as described as follows in Charles Lyell's *Principles of Geology*:

Falloppio of Padua conceived that petrified shells had been generated by fermentation in the spots where they were found, or that they had in some cases acquired their form from 'the tumultuous movements of terrestrial exhalations.' Although a celebrated professor of anatomy, he taught that certain tusks of elephants dug up in his time at Puglia were mere earthy concretions, and, consistently with these principles, he even went so far as to consider it not improbable, that the vases of Monte Testaceo at Rome were natural impressions stamped in the soil.

Legacy

Various anatomical structures were described by Falloppio, including Fallopian tube, Fallopian canal, and Fallopian ligament.

A genus of about 12 species of flowering plants bears his name (*Fallo*pia).

Several – quite different – portraits which claim to represent Falloppio have survived but there is no conclusive evidence that any of them is authentic.

SUMMARY

- The female reproductive system consists of organs concerned with menstruation, coitus, fertilization, pregnancy, and parturition.
- The female reproductive system functions to produce a female egg (gamete), reproductive hormones, support a developing fetus and deliver it into the outside world. Unlike its male counterpart, the female reproductive system is located primarily inside the pelvic cavity.
- The perineum is a strong, muscular area between the vaginal opening and the anus. The elastic fibers and connective tissue of the perineum allow stretching to permit the birth of the fetus.
- The female reproductive system consists of external genitalia, internal genitalia, and accessory structures such as the mammary glands (breasts).
- The female external genitalia or vulvae include the mons pubis, labia majora, labia minora, clitoris, vestibule, vestibular bulb, and the greater vestibular glands.
- The mons pubis (mons veneris) is a pad of fatty tissue covered by coarse skin and hair. It protects the symphysis pubis and contributes to the rounded contour of the female body.
- The uterus (womb) is a hollow muscular organ in which a fertilized ovum is implanted, an embryo forms, and a fetus develops. It is shaped like an upside-down pear or light bulb.
- The ovaries are the female gonads. Paired ovals, they are each about 2 to 3 cm in length, about the size of an almond. The ovaries are located within the pelvic cavity, and are supported by the mesovarium, an extension of the peritoneum that connects the ovaries to the broad ligament.
- The timing of the menstrual cycle starts with the first day of menses, referred to as day one of a woman's period. Cycle length is determined by counting the days between the onset of bleeding in two subsequent cycles. Because the average length of a woman's menstrual cycle is 28 days, this is the time period used to identify the timing of events in the cycle. However, the length of the menstrual cycle varies among women, and even in the same woman from one cycle to the next, typically from 21 to 32 days.

MULTIPLE CHOICE QUESTIONS

1. What are the female gonads called?

a. oocytes

b. ova

c. oviducts
d. ovaries

2. When do the oogonia undergo mitosis?

a. before birth
b. at puberty
c. at the beginning of each menstrual cycle
d. during fertilization

3. The vulva includes the _____.

a. lactiferous duct, rugae, and hymen
b. lactiferous duct, endometrium, and bulbourethral glands
c. mons pubis, endometrium, and hymen
d. mons pubis, labia majora, and Bartholin's glands

4. Where does fertilization of the egg by the sperm typically occur?

a. vagina
b. uterus
c. uterine tube
d. ovary

5. Why do estrogen levels fall after menopause?

a. The ovaries degrade.
b. There are no follicles left to produce estrogen.
c. The pituitary secretes a menopause-specific hormone.
d. The cells of the endometrium degenerate.

REVIEW QUESTIONS

1. What is a vulvae?
2. What are the three layers of the uterus?
3. What is the cervix?
4. What are the functions of the vagina?
5. Explain the hormonal regulation of the phases of the menstrual cycle.

Answers

1. (d) 2. (a) 3. (d) 4. (c) 5. (b)

REFERENCES

1. Berek, J. S. (2020). Berek & Novak's Gynecology Sixteenth Edition.
2. Bergsjø, P. (2001). Clinical Protocols in Obstetrics and Gynecology. The 'TAN' Book. Acta Obstetricia et Gynecologica Scandinavica, 80(10), 977–977. https://doi.org/10.1111/j.1600- 0412.2001.801022.pp.x
3. Bradley, R. J. (2000). Lecture Notes on Obstetrics and Gynaecology. In The Obstetrician & Gynaecologist (Vol. 2, Issue 2). https://doi.org/10.1576/toag.2000.2.2.53
4. Chan, F. Y., & Oats, J. J. N. (2002). Obstetrics and gynaecology. Medical Journal of Australia, 176(1), 28. https://doi.org/10.5694/j.1326-5377.2002.tb04261.x
5. Disaia, P. J., Creasman, W. T., & Mannel, Robert S, et all. (2018). Clinical Ginecology Oncology.
6. Gluckman, P., Hanson, M., Seng, C. Y., & Bardsley, A. (2014). Nutrition and Lifestyle for Pregnancy and Breastfeeding. 27, 432. https://books.google.com/books?id=qkaPBQAAQBAJ&pgis=1
7. Herdiana. (2013). The science of pregnancy. In Journal of Chemical Information and Modeling (Vol. 53, Issue 9).
8. Hockenberry, M. J., & David, W. (2015). Introduction to Maternity and Pediatric Nursing: Study Guide for Leifer, 8th Edition. 384.
9. Horsager, R., Roberts, S. W., Rogers, V. L., Santiago-Muñoz, P. C., Worley, K. C., & Hoffman, B. L. (2014). William Obstetric Study Guide.
10. Jayne Klossner, & Hatfield, N. (2010). Introductory Maternity & Pediatric.
11. Johnson, Joyce, Y. (2014). Maternal - Newborn Nursing Demystified.
12. Leifer, G. (2019). Introduction to Maternity and Pediatric Nursing: 8th Edition. Elsevier, 1–1756.
13. Stone, J., Eddleman, K., & Duenwald, M. (2009). Pregnancy for dummies. In --For dummies.
14. Szymanski LM, B. J. (2016). Johns Hopkins Handbook of Obstetrics and Gynecology. In Mc Graw Hill Education.
15. W. Ladewig Patricia. (2010). Contemporary Maternal-Newborn Nursing Care.
16. Webster, S. N. (2009). Creasy & Resnik's Maternal- Fetal Medicine: Principles and Practice, 6th edition. In The Obstetrician & Gynaecologist (Vol. 11, Issue 4). https://doi.org/10.1576/toag.11.4.294b.27538



CHAPTER 3

Assessment and Management of Pregnancy

"A baby is something you carry inside you for nine months, in your arms for three years, and in your heart until the day you die."

—*Mary Mason*

LEARNING OBJECTIVES

After studying this chapter, you will be able to:

1. Understand the early signs of pregnancy
2. Explain the general assessment of the pregnant woman
3. Discuss how to take care of mental health during pregnancy
4. Describe indigestion and heartburn in pregnancy
5. Manage the emotional challenges of pregnancy
6. Discuss the common pregnancy complications
7. Define healthy pregnancy

INTRODUCTION

Pregnancy is the term used to describe the period in which a fetus develops inside a woman's womb or uterus. Pregnancy usually lasts about 40 weeks, or just over 9 months, as measured from the last menstrual period to delivery. Health care providers refer to three segments of pregnancy, called trimesters.

Pregnancy is a unique, exciting and often joyous time in a woman's life, as it highlights the woman's amazing creative and nurturing powers while providing a bridge to the future. Pregnancy comes with some cost, however, for a pregnant woman needs also to be a responsible woman so as to best support the health of her future child. The growing fetus (the term used to denote the baby-to-be during early developmental stages) depends entirely on its mother's healthy body for all need.

Pregnancy usually occurs by sexual intercourse, but can also occur through assisted reproductive technology procedures. A pregnancy may end in a live birth, a miscarriage, an induced abortion, or a stillbirth. Childbirth typically occurs around 40 weeks from the start of the last menstrual period (LMP), a span known as the gestational age. This is just over nine months. Counting by fertilization age, the length is about 38 weeks. Pregnancy is "the presence of an implanted human embryo or fetus in the uterus"; implantation occurs on average 8–9 days after fertilization. An embryo is the term for the developing offspring during the first seven weeks following implantation (i.e. ten weeks' gestational age), after which the term fetus is used until birth.

Signs and symptoms of early pregnancy may include missed periods, tender breasts, morning sickness (nausea and vomiting), hunger, implantation bleeding, and frequent urination. Pregnancy may be confirmed with a pregnancy test. Methods of birth control—or, more accurately, contraception—are used to avoid pregnancy.

Pregnancy is divided into three trimesters of approximately three months each. The first trimester includes conception, which is when the sperm fertilizes the egg. The fertilized egg then travels down the Fallopian tube and attaches to the inside of the uterus, where it begins to form the embryo and placenta. During the first trimester, the possibility of miscarriage (natural death of embryo or fetus) is at its highest. Around the middle of the second trimester, movement of the fetus may be felt. At 28 weeks, more than 90% of babies can survive outside of the uterus if provided with high-quality medical care, though babies born at this time will likely experience serious health complications such as heart and respiratory problems and long-term intellectual and developmental disabilities.

Prenatal care improves pregnancy outcomes. Nutrition during pregnancy is important to ensure healthy growth of the fetus. Prenatal care may also include avoiding recreational drugs (including tobacco and alcohol), taking regular exercise, having blood tests, and regular physical examinations. Complications of pregnancy may include disorders of high blood pressure, gestational diabetes, iron-deficiency anemia, and severe nausea and vomiting. In the ideal childbirth, labor begins on its own "at term". Babies born before 37 weeks are "preterm" and at higher risk of health problems such as cerebral palsy. Babies born between weeks 37 and 39 are considered "early term" while those born between weeks 39 and 41 are considered "full term". Babies born between weeks 41 and 42 weeks are considered "late term" while after 42 weeks they are considered "post term". Delivery before 39 weeks by labor induction or caesarean section is not recommended unless required for other medical reasons.

3.1 EARLY SIGNS OF PREGNANCY

When you have decided that you're ready for a baby, sometimes waiting to see the two little lines on a pregnancy test can feel like forever. Will it be this month? When you're trying to conceive, you may overanalyze any new feeling that you're experiencing. Are you bloated? Sore breasts? Is your lunch just not sitting right on your stomach?

We break down the most common early signs of pregnancy and what you can do to feel more comfortable while your little bundle of joy is growing.

When do pregnancy symptoms start?

Every woman has their own journey to motherhood, so symptoms and timing can vary. Some women may begin noticing the first early signs of pregnancy a week or two after conception, while others will start to feel symptoms closer to four or five weeks after conception. Some women may not feel symptoms until their period is noticeably late, or even farther into pregnancy. Most women (59 percent) experienced an onset of pregnancy symptoms by their fifth or sixth week, while 71 percent reported symptoms by the end of week six and 89 percent by week eight.

If you don't feel any symptoms at all, don't worry! Some women won't feel any symptoms and go on to have healthy pregnancies – consider yourself one of the lucky ones!

1. Missed Period

If you're ready for a baby, you have probably been tracking your period and watching closely every time you use the restroom to see if it has shown up this month. A missed period is often one of the 1st symptoms of pregnancy and can be a sign that a little one is on the way. Take a home pregnancy test to see if you're pregnant. If it's positive, call your OB/GYN to schedule your first prenatal visit around 8 weeks gestation.

2. Sore Breasts

Are your breasts feeling tender and swollen? Sore breasts are another symptom that you may have conceived this cycle, but unfortunately, some women experience soreness as part of their normal menstrual cycle, so it can be hard to tell the difference. Usually, if you have conceived, the soreness gets worse over time, and you may begin noticing changes in how your breasts look.

3. Darkening Areolas

We told you that your breasts may begin to look different – have you noticed darkening of the areolas? The areolas are the area around your nipples. They can start to appear darker and larger as early as one or two weeks after conception, making this one of the more noticeable early signs of pregnancy. You may also begin to see more visible veins and little bumps popping up along the edge of the areolas. They're called Montgomery tubercles and will help lubricate your nipples to get them ready for your baby to nurse when they're here. This is only the beginning of breast changes in pregnancy!

4. Fatigue

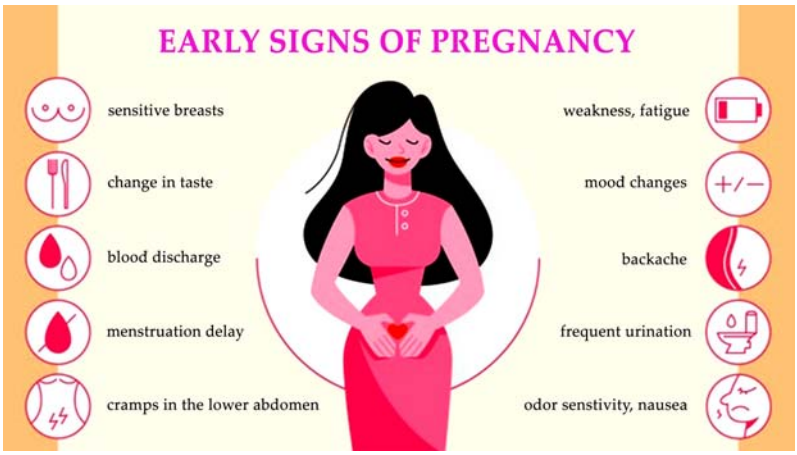
Are you feeling exhausted just by doing your normal, everyday activities? Unfortunately, fatigue may be here to stay for the duration of your pregnancy and beyond. Your body is producing more blood to carry nutrients to your growing baby. You should begin to feel a little more energy during the second trimester.

5. Heightened Sense of Smell

Is the smell of scrambled eggs that you usually make for breakfast suddenly making you feel nauseated? A heightened sense of smell is often associated with morning sickness and usually subsides after the 1st trimester.

6. Bloating

Another not-so-pleasant early pregnancy symptom is gas. An increase in progesterone and estrogen is the culprit behind this symptom and may cause abdominal pain, **bloating**, belching and passing gas. This symptom may be around for the entire 9 months of pregnancy.



Bloating is a common early pregnancy sign. In some cases, bloating can occur even before the first missed period.

7. Mood Swings

You might start to experience mood swings similar to those you feel in the days leading up to your normal period. These uncontrollable shifts in your emotions occur due to changes in your hormones, especially in the first trimester when the levels of estrogen and progesterone change dramatically.

8. Cramping

Similar to sore breasts, cramping is an early sign of pregnancy. Cramping should not be severe. If you're in intense pain, it's only on one side, or if bleeding is accompanying it and it's not your menstrual symptom, contact your doctor right away.

9. Spotting

Did you notice some spotting about 1-2 weeks after ovulation and sexual intercourse? It may be implantation bleeding. Spotting happens six to 12 days after conception, when a fertilized egg digs deep into the lining of your uterus, causing a bit of mild irritation. You may confuse it with the beginning of your period, but it can actually mean that you're expecting! Implantation bleeding is light and should not fill up a pad or tampon. It is usually light pink or brown tinge.

10. High Basal Body Temperature

Many women don't realize that their temperature may be able to give them a sign that they are pregnant. If you've been charting your basal body temp and you get a higher-than-normal reading, then you may want to buy a pregnancy test. When you're charting, your basal (or waking) temperature peaks when you ovulate, then gradually decreases during the latter part of your cycle until your period begins. But if you get pregnant during the cycle, your basal temperature won't plummet; instead, it'll stay high.

11. Frequent Urination

Are you feeling the urge to go to the bathroom more than usual? Having to urinate more frequently is definitely a common pregnancy symptom and will remain throughout your pregnancy.

12. Morning Sickness

Feeling queasy? Morning sickness is not just in the morning but can occur at any time of the day. Try some of these remedies to help ease your nausea. Usually, morning sickness will begin to subside after the 1st trimester, but some women may experience it throughout their pregnancy.

3.2 GENERAL ASSESSMENT OF THE PREGNANT WOMAN

Here, we show how to conduct a general assessment of the pregnant woman's health status during an antenatal visit. You

should make all of these assessments every time you see her for antenatal care. For each assessment, we first describe the signs and symptoms that indicate the pregnant woman is in good health. Then we describe the warning signs and symptoms that may indicate health problems that may lead to a serious complication of pregnancy, including **anaemia**, diabetes, poor nutrition, iodine deficiency, hypertension, fever, infection, lung and kidney problems.

Anemia is a condition in which you lack enough healthy red blood cells to carry adequate oxygen to your body's tissues.



3.2.1 Checking for Symptoms of Poor Nutrition or Lack of Iodine

When you begin an antenatal visit, one of the first things you should ask the pregnant woman is if she has any symptoms that suggest poor nutrition or lack of iodine in her diet. This is very important, because poor maternal nutrition is associated with poor pregnancy outcomes like a small baby, and the child may be short in stature. The questions you ask her should aim to find out if she has any of the following warning symptoms (i.e. things she notices herself):



Warning symptoms

- Not wanting to eat
- Not gaining weight
- Weakness and general ill-health
- Sores, rashes, or other skin problems
- Sore or bleeding gums
- Stomach problems or diarrhea
- Burning or numbness of the feet.

The effects of iodine deficiency are:

- Goitre (swelling in the front of the neck caused by iodine deficiency)
- Short children
- Children with deafness
- Children with cretinism, a disability that affects thinking.

If you suspect that a pregnant woman's health is poor due to inadequate nutrition, or lack of iodine in her diet, advise her about good nutrition and iodine supplementation.

3.2.2 Checking her Weight

Healthy weight gain

A woman in good health steadily gains between 9 to 12 kilograms during pregnancy. This is the same as 1 to 2 kilograms each month. However, routine weight measurement is not necessary for antenatal care because it is not a reliable indicator of pregnancy outcome. A woman with only a little weight gain can have a normal pregnancy outcome, though this is unusual.



If a woman gains weight suddenly near the end of her pregnancy, it may be a sign of twins, or pre-eclampsia (high blood pressure and protein in the urine appearing for the first time during pregnancy).

Did You Know?

About 213 million pregnancies occurred in 2012, of which, 190 million (89%) were in the developing world and 23 million (11%) were in the developed world. The number of pregnancies in women aged between 15 and 44 is 133 per 1,000 women. About 10% to 15% of recognized pregnancies end in miscarriage.

Remember

A pregnant woman who gains weight suddenly near the end of her pregnancy should be referred to the nearest health center.

3.2.3 Checking her Temperature

Body temperature is a measurement of how hot or cold the internal tissues of the body are. Although it varies a little bit in hot or cold weather, or if the person is wearing too many or too few clothes, or doing heavy physical work, it generally stays close to a value known as 'normal' temperature, unless the person is ill. Body temperature is measured using an instrument called a thermometer, which has a 'bulb' at one end, usually

filled with a silver liquid metal called mercury. (Some glass thermometers contain a red dye instead, and some use digital technology) In a glass thermometer, when the bulb of mercury is warmed by a person's body, the mercury expands and rises up the thin glass tube, which is marked with numbers showing the person's body temperature.



Healthy temperature

Normal temperature is close to 37°C, or just under 98°F. The woman does not feel hot to touch.

Warning sign

The woman has a fever — a temperature of above 37.5°C (or 100°F) or above. She feels hot to touch

How to check her temperature

If you don't have a thermometer, put the back of one hand on the woman's forehead, and the other on your own, or that of another healthy person. If the woman has a fever, you should be able to feel that her skin is hotter than that of a healthy person.

If you have a glass thermometer, clean it well with soap and clean water, or alcohol. Hold the thermometer with the 'bulb' containing the silver mercury pointing away from your hand. Shake it with a snap of the wrist, until the top of the thin column of silver mercury falls well below 'normal' body temperature, i.e. less than 36°C (or 96°F).

Put the bulb end of the thermometer under the woman's tongue or in her armpit, and leave it there for three minutes. The woman should keep her mouth closed, or her arm close to her body.

Take the thermometer out and turn it until you see the silver line. The point where the silver stops marks the temperature. There is usually a little arrow at the 'normal' point.

Always clean the thermometer with soap and cool water, or with alcohol, after you use it. Do not use hot water — it can break the thermometer! Mercury is a very poisonous metal. Be careful with glass thermometers, and if they break, do not pick up the mercury with your bare hands. Sweep the mercury into a jar and bury it. Do not let children play with thermometers or mercury. Get a digital thermometer if you can.

What to do if the woman has a fever

A fever can be caused by:

- Sickness — for example, flu or malaria
- An infection of part of the body — like a bladder infection, or an infection of the uterus
- A mild fever can also be caused by dehydration (loss of body fluids due to not drinking enough water).

A high fever needs to be lowered right away. To lower a fever:

- Give 500 to 1,000 mg (milligrams) paracetamol by mouth every four to six hours
- Have her drink one cup of fluid every hour
- Wash her body with a cloth dipped in cool water.

3.2.4 Checking her Pulse

The pulse tells you how fast the heart is beating. Every time the heart beats (contracts) it pushes blood out into the arteries. You can feel each 'pulse' by pressing gently on an artery with your fingers. Everyone's pulse is different. That is normal. You can find the pulse in the throat or wrist.



Healthy pulse

The normal pulse rate is about 60 to 80 beats a minute when the woman is resting.

Warning sign

The pulse rate is 100 or more beats a minute when the woman is resting.

How to measure her pulse rate

Wait until the woman is resting and relaxed. Put the pads of two fingers on the pulse. Do not use your thumbs, because there is a little pulse in your own thumbs which could confuse you.

If you have a watch with a second hand, or there is a clock with a second hand, count the number of beats in the mother's pulse for one minute. Write the number down.

At first, have someone look at the watch or clock for you, and tell you when one minute has passed. Many people find it hard to count accurately while looking at a watch. They tend to count one pulse beat every second, no matter how fast the pulse is really beating.

If you do not have a watch with a second hand, check the pulse anyway. You can learn to tell if it is slow, normal, or fast compared to your own pulse, and to other women's.

What to do if the woman has a fast pulse

If her pulse rate is 100 beats or more a minute, she may have one or more of the following problems:

- Stress, fear, worry, or depression
- Anaemia
- An infection like malaria
- Bladder infection, or infection in her uterus
- Heavy bleeding
- Thyroid trouble
- Heart trouble.

3.2.5 Checking for Signs of Anaemia

When someone has anaemia, it usually means the person has not been able to eat enough foods with iron. Iron helps the red blood cells carry oxygen from the air we breathe to all parts of the body. Some kinds of anaemia are caused by illness, not lack of iron. And some kinds of anaemia are inherited (genetic) and cannot be cured by eating iron-rich foods or taking iron pills. You will learn about a blood test for anaemia, and the treatment of anaemia during pregnancy.



Healthy signs and symptoms

General good health and plenty of energy. The woman does not have pallor.

Warning signs and symptoms

- Pallor — paleness inside the eyelids, pale fingernails and gums.
- Dizziness or fainting
- Weakness or tiredness
- Fast pulse (over 100 beats a minute)
- Difficulty breathing (shortness of breath).

3.2.6 Checking for Shortness of Breath

Healthy respiration

Some shortness of breath, especially late in pregnancy, is normal. Many women get a little short of breath when they are 8 or 9 months pregnant.



Warning symptom

If shortness of breath is making a pregnant woman uncomfortable, this is a warning symptom, especially if she has other signs of illness.

Shortness of breath can also be caused by:

- Anaemia
- Heart problems
- Tuberculosis
- Asthma
- Lung infection
- A blood clot in the lung
- Allergies.

Remember

If a pregnant woman has trouble breathing all of the time, or severe trouble even once, or if you think she may have any of the illnesses listed, refer her to a health center.

3.2.7 Checking her Blood Pressure

Blood pressure (BP) refers to how hard the blood is 'pushing' on the walls of the major blood vessels as it is pumped around the body by the heart. The pressure is measured in millimeters (mm) of mercury (a liquid silver metal, which has the chemical symbol Hg), so **blood pressure** measurements are expressed as a number followed by mmHg.

Blood pressure is the pressure of blood pushing against the walls of your arteries. Arteries carry blood from your heart to other parts of your body. Your blood pressure normally rises and falls throughout the day.



Doctors and nurses call the top number the systolic pressure (pronounced 'siss toll ick'). They call the bottom number the diastolic pressure (pronounced 'dye ass toll ick').

A blood pressure measurement is two numbers written one above the other. The top number tells you the woman's blood pressure at the moment when her heart 'beats' and pushes blood out into her body. The bottom number tells you her blood pressure when her heart relaxes between each beat, so it can refill with blood.

Healthy blood pressure

Normal blood pressure stays between 90/60 mmHg (you say this aloud as 'ninety over sixty millimeters of mercury',) and below 140/90 mmHg ('one hundred and forty over ninety millimeters of mercury'). It does not go up much during pregnancy.

Warning signs

High blood pressure is known medically as hypertension and is a warning sign. The woman has high blood pressure if either of these is true:

- The top number is 140 or above.
- The bottom number is 90 or above.

Very low blood pressure (less than 90/50 mmHg) is also a warning sign, which is usually caused only by heavy bleeding or shock (a dangerous reduction in blood flow throughout the body). This is a very dangerous situation.

A woman with very low blood pressure should be referred to the nearest health center immediately.

The heart is like a pump, pumping blood through the body. High blood pressure means that the heart must work harder to press the blood through tight or shrunken blood vessels (veins and arteries). Blood pressure numbers show how hard the blood has to press. Note that blood pressure is not the same as pulse. You can have a slow pulse with a high blood pressure.

It is very important to check the mother's blood pressure at every antenatal visit and refer her to a health center if it is too high.

When a woman has high blood pressure during pregnancy, it is harder for her blood to bring food and oxygen to the

baby via the placenta. The baby then grows too slowly. Very high blood pressure can also cause the woman to have kidney problems, bleeding in the uterus before birth, or bleeding in the brain (stroke). It can also be a sign of pre-eclampsia, which can cause premature birth, bleeding, convulsions, or even death for the mother.

How to check blood pressure?

There are several types of blood pressure equipment.



Manual Semi-Automatic Automatic

When you take the woman's blood pressure, first tell her what you are going to do, and why. Make sure she is sitting or lying comfortably and feels relaxed.

As the air leaks out, you will start to hear the woman's pulse through your stethoscope. Notice where the needle is, or where the column of mercury stops if you have a tall gauge.

You can record the woman's blood pressure:

- when you start to hear the pulse (this will be the top number), and
- when the pulse disappears or gets very soft (this will be the bottom number). Check the woman's blood pressure at each visit

Sept 13	100/60
Oct 12	110/62
Nov 15	94/58
Dec 10	100/66
Jan 12	110/72

This woman's blood pressure goes up and down a little from month to month. This is normal.

- Write the blood pressure down on her antenatal record card so you can check for changes over time. If her blood pressure is going up, ask her to come back every week until you are sure that it is not still rising.

3.2.8 Checking for Diabetes

When a woman has diabetes, her body cannot use all the sugar in her blood, so it stays too high and some of it may appear in her urine.



Warning signs and symptoms

If a woman has some of the following warning signs, she may have diabetes. Women with diabetes do not always have all of these signs. But the more signs a woman has, the more likely it is that she has diabetes.

- She had diabetes in a past pregnancy.
- One of her past babies was born very big (more than 4 kilograms); this is because the excess sugar in the mother's blood makes the baby put on excess weight.
- One of her past babies was very ill or died at birth and no one knows why.
- She is fat.

- She is thirsty all the time.
- She has frequent itching and a bad smell coming from her vagina.
- Her wounds heal slowly.
- She has to urinate more often than other pregnant women.
- Her uterus is bigger than normal for how many months she has been pregnant.

Urine tests for diabetes

There is a urine test for diabetes that you can do at the Health Post and a more reliable blood test that can only be done at a health center.

The dipstick test

If a woman has the warning signs or symptoms listed above, and you suspect she may have diabetes, test her urine in the following way. You will need the urine testing 'dipsticks' supplied for your Health Post. The dipsticks have strips of a chemical at one end that changes color when it reacts with sugar.

- Ask the woman to urinate in a clean container. If possible, collect a sample of 'mid-stream' urine (i.e. the urine she produces after the first trickle; stop collecting before she completely empties her bladder).
- Hold the dipstick by the end opposite the chemical strips, and dip the end with the chemical strips into the fresh urine. Take it out immediately.
- Remove excess urine from the dipstick by drawing it along the rim of the container.
- Hold the dipstick horizontally before reading the result.
- If there is excess sugar in the urine, it will react with the chemical on the dipstick. The color will change from light green to brown, depending on the amount of sugar in the urine.

If a woman has the warning signs and symptoms listed on the previous page, but she seems reluctant to visit a health center for the blood test, or you don't have dipsticks to test

her urine, you can advise her on a simple test she can do at home. Ask her to urinate into a clean container like a pot or a cup, and leave the container outside. If ants climb into the container, there is probably sugar in the woman's urine — a sign of diabetes. Tell the woman to make sure she tells you if the sign is there! Seeing the evidence herself may be enough to convince her to go to the health center for confirmation of the diagnosis and to get treatment.

Sometimes diabetes in pregnancy will improve if the woman eats a good diet and exercises. She must eat a variety of healthy foods, avoid candy and sugar, and eat frequent, small meals. But diabetes can make a woman very sick and can make childbirth more dangerous. Her baby may be very big, have birth defects, or it may become very ill and die after the birth. Sometimes medicine is needed to prevent serious problems.

3.2.9 Checking for a Vaginal Infection

Vaginal discharge is a clear, white or off-white fluid that comes out of your vagina. Uterus, cervix and vagina produce vaginal discharge, which is mainly made up of cells and bacteria. It helps clean and lubricate your vagina, and helps fight off bad bacteria and infection

The normal **vaginal discharge** is not smelly, it is small in amount, and it does not stain or wet the underwear.



Warning symptoms

- If a pregnant woman has an infection in her vagina, the signs are:
- Whitish or curd-like discharge

- Bad-smelling discharge
- Itching of the external genitalia
- The vulva could be swollen
- There may be burning during urination
- The woman may report she has pain during sex

3.3 TAKING CARE OF MENTAL HEALTH DURING PREGNANCY

Pregnancy brings a mix of feelings, and not all of them are good. If you're feeling worried, you're not alone. Worry is common, especially during a woman's first pregnancy or an unplanned one. It can be even harder if you're dealing with depression or anxiety.

For your health and your baby's, take care of yourself as much as you can. Be sure to eat well, exercise, get enough sleep, and take your prenatal vitamins.

If you're feeling worried, sad, or nervous, talk to someone about it — and know when to reach out for help.



What Feelings can happen?

Mood swings are normal during pregnancy. But if you feel nervous or down all the time, it could be a sign of something deeper going on. Stress over being pregnant, changes in your body during the pregnancy, and everyday worries can take a toll.

Some pregnant women may have depression or anxiety:

- Depression is sadness or feeling down or irritable for weeks or months at a time. Some women may have depression before getting pregnant. But it also can start during pregnancy for a number of reasons — for example, if a woman isn't happy about being pregnant or is dealing with a lot of stress at work or at home.
- Anxiety is a feeling of worry or fear over things that might happen. If you worry a lot anyway, many things can stress you out during pregnancy. You might worry that you won't be a good mother or that you can't afford to raise a baby.

Pregnant women may have other mental health issues, such as:

- bipolar disorder (episodes of low-energy depression and high-energy mania)
- post-traumatic stress disorder (PTSD)
- panic attacks (sudden, intense physical responses with a feeling of unexplained and paralyzing fear)
- **obsessive-compulsive disorder (OCD)**
- eating disorders (like bulimia or anorexia nervosa)

It's important to treat mental health concerns during pregnancy. Mothers who are depressed, anxious, or have another issue might not get the medical care they need. They might not take care of themselves, or they may use drugs and alcohol during the pregnancy. All of these things can harm a growing baby.

If you have a mental health issue, talk with your doctor so you can get the help you need during and after your pregnancy.



How Can we Get Help?

If you feel anxious or depressed, talk to a doctor, counselor, or therapist, and get help right away. The sooner treatment starts, the sooner you'll feel better.

Also talk to a doctor about your overall health and any mental health issues you've had in the past. It's best for your doctor to know your full medical history, in case anything comes up during or after your pregnancy.

How are Problems Treated?

Treatment for mental health problems may include:

Prescription medicine: Always talk to a doctor before you start taking — or stop taking — any medicines during your pregnancy. If you take any kind of medicine for a mental health issue and are pregnant or planning to get pregnant, tell your doctor. Don't stop taking it unless your doctor tells you to. Some medicines may cause problems for a growing baby, but stopping your medicine may make things worse. Your doctor can make a treatment plan that is best for you and your baby.

Obsessive-compulsive disorder (OCD) is a common, chronic, and long-lasting disorder in which a person has uncontrollable, reoccurring thoughts ("obsessions") and/or behaviors ("compulsions") that he or she feels the urge to repeat over and over.

Talk therapy: Talking one-on-one with a therapist can be a great way to manage stress, deal with depression, and ease anxiety during pregnancy. Finding a support group where you can share your concerns with other mothers who know what you're going through also can help. Talking with a social worker or counselor can help you deal with money issues, worries over raising a child, or other stresses in your life.

Other approaches: Many women find comfort in activities like yoga, exercise, and meditation. If you're feeling stressed or overwhelmed, talking to a friend, family member, or faith leader can help you feel better.

Many moms feel anxious or depressed at some point in their pregnancy, and some may even need treatment for it. But a mental health problem doesn't have to be a problem for you or your baby. Get the help you need to feel better, and you'll be doing the best thing for you both.

3.4 INDIGESTION AND HEARTBURN IN PREGNANCY

Indigestion, also called heartburn or acid reflux, is common in pregnancy. It can be caused by hormonal changes and the growing baby pressing against your stomach.

You can help ease **indigestion** and heartburn by making changes to your diet and lifestyle, and there are medicines that are safe to take in pregnancy.



3.4.1 Symptoms of Indigestion and Heartburn

Indigestion is discomfort in your upper abdomen. Indigestion describes certain symptoms, such as abdominal pain and a feeling of fullness soon after you start eating, rather than a specific disease.

Symptoms of indigestion and heartburn include:

- a burning sensation or pain in the chest
- feeling full, heavy or bloated
- burping or belching
- feeling or being sick
- bringing up food

Symptoms usually come on soon after eating or drinking, but there can sometimes be a delay between eating and developing indigestion.

You can get symptoms at any point during your pregnancy, but they are more common from 27 weeks onwards.

3.4.2 Things you can do to help with Indigestion and Heartburn

Changes to your diet and lifestyle may be enough to control your symptoms, particularly if they are mild.

Eat healthily

You're more likely to get indigestion if you're very full.

If you're pregnant, it may be tempting to eat more than you would normally, but this may not be good for you or your baby.

Find out more about a healthy diet in pregnancy and foods to avoid.

Change your eating and drinking habits

You may be able to control your indigestion with changes to your eating habits.

It can help to eat small meals often, rather than larger meals 3 times a day, and to not eat within 3 hours of going to bed at night.

Cutting down on drinks containing caffeine, and foods that are rich, spicy or fatty, can also ease symptoms.

Keep upright

Sit up straight when you eat. This will take the pressure off your stomach. Propping your head and shoulders up when you go to bed can stop stomach acid coming up while you sleep.

Stop smoking

Smoking when pregnant can cause indigestion, and can seriously affect the health of you and your unborn baby. When you smoke, the chemicals you inhale can contribute to your indigestion. These chemicals can cause the ring of muscle at the lower end of your gullet to relax, which allows stomach acid to come back up more easily. This is known as acid reflux.

Smoking also increases the risk of:

- your baby being born prematurely (before week 37 of your pregnancy)
- your baby being born with a low birth weight
- **sudden infant death syndrome (SIDS)**, or "cot death"

Sudden infant death syndrome (SIDS) is the sudden, unexpected and unexplained death of an apparently healthy baby.

Avoid Alcohol

Drinking alcohol can cause indigestion. During pregnancy, it can also lead to long-term harm to the baby. It's safest to not drink alcohol at all in pregnancy.

3.4.3 When to get Medical Help

See your midwife or GP if you need help managing your symptoms or if changes to your diet and lifestyle do not work. They may recommend medicine to ease your symptoms.

You should also see your midwife or GP if you have any of the following:

- difficulty eating or keeping food down
- weight loss
- stomach pains

Your midwife or GP may ask about your symptoms and examine you by pressing gently on different areas of your chest and stomach to see whether it's painful.

If you're taking prescription medicines

Speak to your GP if you're taking medicine for another condition, such as antidepressants, and you think it may be making your indigestion worse. They may be able to prescribe an alternative medicine.

Never stop taking a prescribed medicine unless you're advised to do so by your GP or another qualified healthcare professional who's responsible for your care.

3.4.4 Medicines for Indigestion and Heartburn

Medicines for indigestion and heartburn during pregnancy include:

- antacids – to neutralize the acid in your stomach (some are available over the counter from a pharmacist)
- alginates – to relieve indigestion caused by acid reflux by stopping the acid in your stomach coming back up your gullet

You may only need to take antacids and alginates when you start getting symptoms. However, your GP may recommend taking them before symptoms come on – for example, before a meal or before bed.

If you're taking iron supplements as well as antacids, do not take them at the same time. Antacids can stop iron from being absorbed by your body.

If antacids and alginates do not improve your symptoms, your GP may prescribe a medicine to reduce the amount of acid in your stomach. 2 that are widely used in pregnancy and not known to be harmful to an unborn baby are:

- ranitidine – a tablet you take twice a day
- omeprazole – a tablet you take once a day

3.4.5 Causes of Indigestion in Pregnancy

Symptoms of indigestion come when the acid in your stomach irritates your stomach lining or your gullet. This causes pain and a burning feeling.

When you're pregnant, you're more likely to have indigestion because of:

- hormonal changes
- the growing baby pressing on your stomach
- the muscles between your stomach and gullet relaxing, allowing stomach acid to come back up
- You may be more likely to get indigestion in pregnancy if:
- you had indigestion before you were pregnant
- you've been pregnant before
- you're in the later stages of pregnancy

3.5 MANAGING THE EMOTIONAL CHALLENGES OF PREGNANCY

Take comfort in the fact that there likely isn't a mother anywhere — including yours — who didn't have some emotional ups and downs during pregnancy.

You may be surprised to hear this, but many people cite changing emotions as one of the most common side effects during pregnancy. It's frustrating, even exhausting, to hit so many highs and lows, sometimes all in the same day. You maybe don't even know which emotion you feel or why you are feeling it.

Additionally, hormonal shifts, interrupted sleep and other pregnancy related factors can make you emotional, forgetful and sluggish.



Trying to identify the emotion and understand the reason may help. For instance, starting a family is a joyous occasion, but it brings both positive and negative stress. You may find yourself more worried about your future, finances, employment, medical care and other things important to your family stability. The resulting stress contributes to emotional outbreaks.

Fear is another common feeling. In the first trimester, every unpredictable body change may make you worry something is negatively affecting your baby's health or can cause a miscarriage. As the pregnancy progresses, fear changes: you start to question other things like whether you can take care of a baby or whether something disastrous might happen during the baby's delivery. The many things you lack control of during a pregnancy contribute to fearful thoughts that can become overwhelming.

Regulating Pregnancy Emotions

Unless you are one of those rare people who doesn't experience a lot of emotional swings during pregnancy, you are probably on the roller coaster until your baby is born. But there are things you can do to make the ride more enjoyable and less bumpy.

- *Educate your partner*. You and your partner don't know what to expect, especially if this is your first pregnancy. You can share what you read and discuss in advance, rather than in the heat of the moment. Pregnancy seems to be typically accompanied by highs and lows. Your partner needs to keep in mind your highs and lows are not logical and not personal. Ask them to support you and be patient through these moments. You and your partner both need to understand how you felt and responded to certain things in the past may not be the same way you respond during pregnancy.
- *Realize that physical discomfort can contribute to feeling low*: Morning sickness, fatigue, breast tenderness and other physical discomforts during pregnancy can make your tolerance level lower for little irritations. Depending on your body image and expectations, you may feel less physically attractive as you observe body changes. Try to get more rest and use whatever means you can find to decrease your focus on your physical discomfort and self-esteem.

- *Allow for hormonal changes*: During pregnancy, women experience an increase in the production of hormones, such as progesterone and estrogen. This increase can impact your emotions and your brain's ability to monitor them. While hormones are not the only cause of emotional swings, they do contribute to moments or days that make life even more challenging. People find themselves dissolving into tears at things that would have left them unmoved pre-pregnancy. People who would define themselves as patient snap irritably at their partner over petty things. Remind yourself that these changes in your mood are temporary and talk positively to yourself to return to a calmer state of mind.
- *Get plenty of rest*: Many people have trouble sleeping well during pregnancy. Lack of sleep is proven to have a major impact on emotions. Some people say they have wild dreams, or their changing body prevents them from finding comfortable resting positions. Do what you can to help sleep come: keep the room a comfortable temperature, keep it dark, and do relaxation exercises and/or deep breathing before sleep. Experiment with sleeping positions and let your partner know if you are having difficulty sleeping. The two of you can work together to see that you get the sleep you need.
- *Eat right*: Healthy eating will help with your moods. Consuming healthy, nutritional, non-processed foods will give you better emotional stability as well as improving physical and mental health.
- *Make time for yourself*: Soak in the bathtub. Read a book purely for pleasure. Get a pedicure or massage. Choose the kind of activities that make you feel relaxed and do them.
- *Prepare where you can*: Well before your due date, you and your partner should take childbirth classes to prepare for labor and delivery. People who are prepared have less fear and pain.
- *Enjoy social activities, but pace yourself*: Baby showers, decorating the nursery, shopping for baby clothes and similar activities can all be part of the enjoyment of pregnancy. But don't push yourself to the limit. Balance your days with rest and relaxation too.

- *Accept that it is OK to be nervous*: Some women desperately want a child but are terrified of childbirth. Some desperately want a child but are terrified that they won't be a good enough mother. Whatever the fear, learning to express it and talk through it can help you better manage it. Look for someone you trust and feel comfortable talking to openly, someone who will listen and allow you to vent. If your fears are overwhelming, make an appointment with a professional therapist.
- *Know when to ask for help*: About 10% of women are affected by depression during and after pregnancy.

3.6 COMMON PREGNANCY COMPLICATIONS

When you find out you're pregnant, your thoughts and emotions may go into overdrive. You might be as excited about this new person you will bring into the world as you are terrified that something may go wrong.

Most pregnancies progress without incident. But approximately 8 percent of all pregnancies involve complications that, if left untreated, may harm the mother or the baby. While some complications relate to health problems that existed before pregnancy, others occur unexpectedly and are unavoidable.

It can be scary to hear that doctors have diagnosed a complication. You may be worried about your baby's health and your own health. You may even feel panic that perhaps something you did (or didn't do) caused this to happen. These feelings are completely normal. It may reassure you to know that nothing you did caused these complications. And beyond that —these complications are treatable. The best thing you can do for you and your baby is to get prenatal care from a provider you trust. With early detection and proper care, you increase the chances of keeping you and your baby healthy.

3.6.1 Hyperemesis Gravidarum

What is it?

While many pregnant women experience morning sickness (nausea, possibly with vomiting, generally in the morning

hours) and other discomforts during pregnancy, women with hyperemesis gravidarum (HG) have morning sickness times 1,000. HG is severe nausea that results in significant weight loss and may require hospitalization.



What are the symptoms?

Women with HG have severe nausea and vomiting. The vomiting and reduced appetite leads to weight loss and dehydration. The major difference between HG and normal morning sickness is that HG results in a weight loss of 5 percent or more of your pre-pregnancy weight.

Who is at risk?

Doctors do not yet fully understand HG, what causes it or who is more likely to experience it.

Can you prevent it?

You cannot prevent HG, but you can take steps to control and manage it during your pregnancy. The most important thing you can do for you and your baby is to get regular prenatal care. HG can lead to not getting enough nutrients, which can be harmful to both you and your baby. However, with proper treatment, there are typically no long-term effects to either mom or child after the pregnancy.

How is it treated?

If you have been diagnosed with HG, the priority is ensuring you have enough nutrients to keep you and your baby healthy. For some women, a diet of bland foods and fluids may be enough, while others may need to take medication to help relieve the nausea. In severe cases, you may need to be hospitalized to receive nutrients and fluids via intravenous (IV) line. You may feel down about having to be in the hospital during your pregnancy. But remember that you are just doing what you need to do to protect your and your baby's health!

Many women start to feel better by the 20th week of pregnancy, while some continue to experience symptoms throughout the entire pregnancy.

3.6.2 Gestational Diabetes

What is it?

Diabetes is a condition that prevents your body from breaking down sugar. Gestational diabetes mellitus (GDM) is a type of diabetes that occurs during pregnancy. One of the biggest risks of gestational diabetes is that your baby may grow much larger than normal, a condition called macrosomia. During delivery, a baby's shoulders can get stuck. If the baby is thought to be too big for a safe vaginal delivery, your doctor will recommend a cesarean section.

What are the symptoms?

Gestational diabetes has no outward signs or symptoms. Doctors screen for it between 24 and 28 weeks of pregnancy, or earlier in high-risk women such as those who are overweight or have a history of gestational diabetes.

Who is at risk?

Risk factors for gestational diabetes include being overweight or having a history of GDM in previous pregnancies. If you are at high risk, your doctor will screen for GDM earlier than 24 weeks, typically in the first trimester.

Can you prevent it?

Losing weight before pregnancy, sticking to a healthy diet and getting regular exercise can lower your risk of developing GDM.

How is it treated?

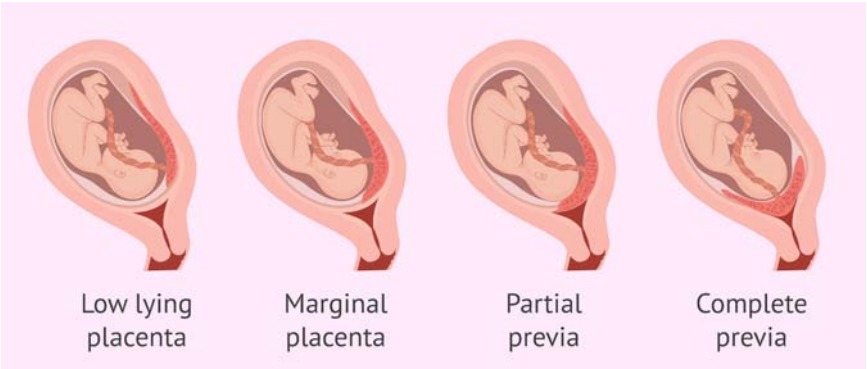
You and your doctor should discuss how you can best control the GDM. Good old diet and exercise seem to be a good place to start. A very high percentage of gestational diabetes can be controlled by diet. Still, some women with GDM will need to take medications (pills or even insulin) to control blood sugar levels.

Exercise during pregnancy, even just walking 30 minutes a day, is also great for controlling blood sugar. It's best to do something you enjoy so you'll stick with it, but you should let your doctor know what type of exercise you are doing.

3.6.3 Placenta Previa

What is it?

While you are pregnant, the placenta provides your baby with oxygen and nutrients for proper development. The placenta normally attaches to the upper part of the uterus, but in placenta previa it either totally or partially covers the cervix (which is the opening between the uterus and vagina).



Who is at risk?

You may be at higher risk if you have scarring on your uterus from previous pregnancies or from a uterine surgery, or if you have fibroids.

What are the symptoms?

The main symptom is vaginal bleeding that is not accompanied by cramping or other pain. Some women, however, do not experience any symptoms. Your doctor will confirm a diagnosis using an ultrasound or physical exam.

Can you prevent it?

There's nothing you can do to prevent placenta previa. However, you can increase your and your baby's health by getting regular prenatal care. If you are at high risk — because of a previous surgery, C-section or fibroids — make sure to tell your doctor. He or she may want to monitor you more closely during your pregnancy.

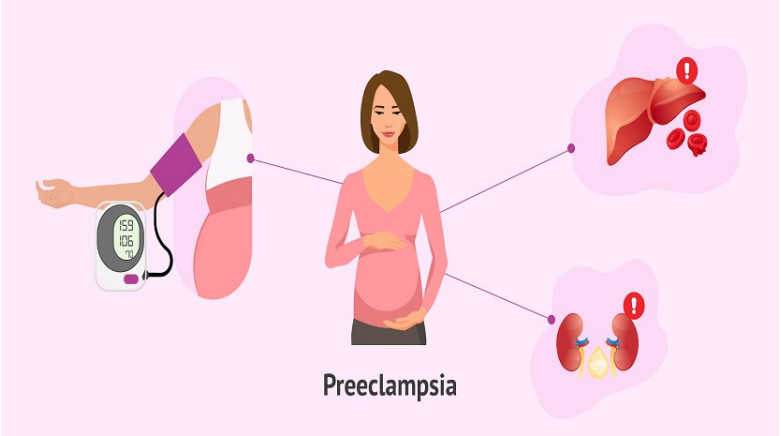
How is it treated?

Placenta previa may result in bleeding during pregnancy. Some women have no bleeding, some have spotting and others may experience heavy bleeding. If the bleeding is heavy, you may need to stay in the hospital for a period of time. Women with placenta previa will require a C-section to deliver the baby, usually scheduled two to four weeks before their due date.

3.6.4 Preeclampsia

What is it?

Preeclampsia is a condition that causes dangerously high blood pressure. It can be life-threatening if left untreated. Preeclampsia typically happens after 20 weeks of pregnancy, often in women who have no history of high blood pressure.



What are the symptoms?

Symptoms of preeclampsia may include severe headache, vision changes and pain under the ribs. However, many women don't feel symptoms right away.

The first alert is usually when a woman comes in for a routine prenatal visit and has high blood pressure. In those cases, your doctor will test for things like kidney and liver function to determine whether it's preeclampsia or just high blood pressure.

Who is at risk?

Risk factors for preeclampsia include having a history of high blood pressure, being obese (having a body mass index, or BMI, greater than 30), age (teenage mothers and those over 40 are at higher risk) and being pregnant with multiples.

Can you prevent it?

While you can't prevent preeclampsia, staying healthy during pregnancy may help. If you have risk factors, experts recommend that you see your obstetrician either before you become pregnant or very early in your pregnancy, so you and your doctor can discuss ways that you can reduce your risk.

example

Women at risk for preeclampsia are prescribed a baby aspirin after the first trimester.

Regular prenatal visits are the best way to control preeclampsia. During those routine visits, your doctor will check your blood pressure. If it's high, further tests can diagnose the condition so you can start getting the treatment you need.

How is it treated?

The condition only goes away once the baby is born, so delivery is the best way to treat preeclampsia. However, delivering the baby too early can put the baby at risk for health problems. The decision about how to treat you will largely depend on how far along the pregnancy is. You may need to be hospitalized so your team can monitor you and your baby closely.

3.7 HEALTHY PREGNANCY

To have healthy pregnancy, it is important that you have regular prenatal appointments, eat nutritious food, stay active, and refrain from eating raw or undercooked foods. You also should take a prenatal vitamin with plenty of folic acid, avoid chemicals or substances known to negatively affect pregnant people and their babies, and rest when you are tired. If you are a smoker, you should quit smoking, and if you drink alcohol, you should refrain from drinking while pregnant. Here are some additional tips on how to ensure you have a healthy pregnancy.



- See your practitioner before becoming pregnant.
- Start changing your food habits to include a healthy variety of foods.
- Exercise! Starting now will help you stay in shape during pregnancy, can lower your risk of miscarriage, and has been proven to help reduce labor complications and length.
- Educate yourself!
- Eat a new vegetable you've never tried.
- Check out a book on pregnancy.
- Decide what you'd like to do about birth control. You may need to find out how quickly after stopping birth control you can get pregnant, or how you would plan to get pregnant in conjunction with stopping your current contraception pills or birth control devices.
- Quit smoking. There are many programs to help you.
- Take a prenatal vitamin. They can be prescribed by your practitioner or you can buy them over the counter. Ensure it contains 0.4 mg of folic acid.
- Ask your partner to join you on your new healthy habit changes.
- Track your cycles. Learning what you can about your cycles will help determine when you ovulate and when you conceived. These make for more accurate due dates.
- If you need a new practitioner, interview before you become pregnant.
- Ask your friends about pregnancy and parenthood.
- Avoid chemicals that could possibly harm a developing fetus. Learn about the common dangerous chemicals that could be lurking in your home, work place, and community.
- See your dentist before you get pregnant and brush your teeth daily.
- Tell any medical professional that you may be pregnant if you are trying to get pregnant. This can prevent exposure to harmful tests and chemicals if you are pregnant and don't know it yet.

- If you have a cat, read up on the risk of toxoplasmosis and your cat's litter box.
- If possible, avoid changing the cat litter while you're pregnant.
- Remember: it can take months to become pregnant. However, if you have been trying to get pregnant for longer than a year—or for longer than six months, if you're 35 years or older—then you should see your doctor.
- Act pregnant. This includes not drinking alcohol, even while trying to conceive. There is no known safe level during pregnancy and alcohol can cause birth defects.1
- Announce your pregnancy when you're ready.
- Talk to your parents, what do you want to take from their experiences? How do you want to be different?
- Rest when you can. Nap!
- Start a journal or a pregnancy blog.
- Talk to your doctor or midwife about the safest remedies for common pregnancy problems like nausea, heartburn, and constipation.
- Drink 8 to 10 8-oz glasses of water (at least!) a day.
- Read yet another book!
- Join a prenatal yoga or exercise class.
- Keep your prenatal appointments with your midwife or doctor. This will help ensure that if you have any problems that they are caught early and kept to a minimum.
- Take an early pregnancy class.
- Remember to add 300 to 500 calories a day to your diet while pregnant.
- Tour your selection of birth facilities before making a choice if you are not having a home birth.
- Review the signs of premature labor and warnings signs for when to call your practitioner.
- Talk to local doulas and start interviewing. Doulas can help you have a shorter, safer and more satisfying birth.

- Keep a food diary to ensure that you are keeping up with your daily requirements.
- If you are decorating your house or a nursery remember to avoid fumes often associated with paint and wall paper. Perhaps have friends do the heavy work while you help make snacks for them. Keep the windows open!
- Baby sit a friend's baby and learn a bit about caring for a newborn.
- Take a childbirth class. Sign up early to ensure you get the class and dates that you want.
- Swimming is great in late pregnancy. It can help relieve a lot of aches and pains and makes you feel weightless.
- Take a breastfeeding class to help prepare you for the realities of breastfeeding.
- Stretch before bed to help prevent leg cramps.
- Continue to exercise, even if you have to slow down. This will help you recover more quickly.
- Write a birth plan. Something to help you clarify what you want or need for your birth experience. Share this with your practitioners and those you have invited to your birth.
- Have film and cameras ready!
- Practice relaxation whenever you can. Try for at least once a day.
- Do pelvic tilts to help with late pregnancy back pain. It will help relieve your pain and even encourage the baby to assume a good birth position.
- Pack your bags if you are going to a birth center or hospital. Don't forget your insurance cards, pre-registration forms, camera, birth plan, etc.
- Review the signs of labor and warning signs.
- Take a picture of yourself before the baby comes!
- Read birth stories.
- Kiss the baby!

ROLE MODEL



VIRGINIA APGAR: INVENTOR OF THE APGAR SCORE

Virginia Apgar (June 7, 1909 – August 7, 1974) was an American physician of Armenian ethnic background, obstetrical anesthesiologist and medical researcher, best known as the inventor of the Apgar Score, a way to quickly assess the health of a newborn child immediately after birth in order to combat infant mortality. In 1952, she developed the 10-point Apgar score to assist physicians and nurses in assessing the status of newborns. Given at one minute and five minutes after birth, the Apgar test measures a child's breathing, skin color, reflexes, motion, and heart rate. A friend said, "She probably did more than any other physician to bring the problem of birth defects out of back rooms." She was a leader in the fields of anesthesiology and teratology, and introduced obstetrical considerations to the established field of neonatology.

Early Life and Education

The youngest of three children, Apgar was born and raised in Westfield, New Jersey, the daughter of Helen May (Clarke) and Charles Emory Apgar. Her father was a business executive and amateur astronomer whose amateur radio work exposed an espionage ring during World War I. Her older brother died early from tuberculosis, and her other brother had a chronic illness. She graduated from Westfield High School in 1925, knowing that she wanted to be a doctor.

Apgar graduated from Mount Holyoke College in 1929, where she studied zoology with minors in physiology and chemistry. In 1933, she graduated fourth in her class from Columbia University College of Physicians and Surgeons (P&S) and completed a residency in surgery at P&S in 1937.

She was discouraged by Allen Whipple, the chairman of surgery at Columbia-Presbyterian Medical Center, from continuing her career as a surgeon because he had seen many women attempt to be successful surgeons and ultimately fail. He instead encouraged her to practice anesthesiology because

he felt that advancements in anesthesia were needed to further advance surgery and felt that she had the "energy and ability" to make a significant contribution. Deciding to continue her career in anesthesiology, she trained for six months under Ralph Waters at the University of Wisconsin–Madison, where he had established the first anesthesiology department in the United States. In a 1937 photograph of Waters and his residents, she is the only woman among Waters and fifteen other men. She then studied for a further six months under Ernest Rovenstine in New York at Bellevue Hospital. She received a certification as an anesthesiologist in 1937, and returned to P&S in 1938 as director of the newly formed division of anesthesia. She later received a master's degree in public health at Johns Hopkins School of Hygiene and Public Health, graduating in 1959.

Work and Research

Apgar was the first woman to head a specialty division at Columbia-Presbyterian Medical Center (now NewYork–Presbyterian Hospital) and Columbia University College of Physicians and Surgeons. In conjunction with Allen Whipple, she started P&S's anesthesia division. She was placed in charge of the division's administrative duties and was also tasked with coordinating the staffing of the division and its work throughout the hospital. Throughout much of the 1940s, she was an administrator, teacher, recruiter, coordinator and practicing physician.

It was often difficult to find residents for the program, as advances in the medical field had only recently elevated the practice of anesthesia to anesthesiology, a fully-fledged medical specialty. New anesthesiologists also faced scrutiny from other physicians, specifically surgeons, who were not used to having an anesthesia-specialized MD in the operating room. These difficulties led to issues in gaining funding and support for the division. With America's entrance into World War II in 1941, many medical professionals enlisted in the military to help the war effort, which created a serious staffing problem for domestic hospitals, Apgar's division included.

When the war ended in 1945, interest in anesthesiology was renewed in returning physicians, and the staffing problem for Apgar's division was quickly resolved. The specialty's growing popularity and Apgar's development of its residency program prompted P&S to establish it as an official department in 1949. Due to her lack of research, Apgar was not made the head of the department as was expected and the job was given to her colleague, Emmanuel Papper. Apgar was given a faculty position at P&S.

Obstetrics

In 1949, Apgar became the first woman to become a full professor at P&S, where she remained until 1959. During this time, she also did clinical and research work

at the affiliated Sloane Hospital for Women, still a division of New York–Presbyterian Hospital. In 1953, she introduced the first test, called the Apgar score, to assess the health of newborn babies.

Between the 1930s and the 1950s, the United States infant mortality rate decreased, but the number of infant deaths within the first 24 hours after birth remained constant. Apgar noticed this trend and began to investigate methods for decreasing the infant mortality rate specifically within the first 24 hours of the infant's life. As an obstetric anesthesiologist, Apgar was able to document trends that could distinguish healthy infants from infants in trouble.

This investigation led to a standardized scoring system used to assess a newborn's health after birth, with the result referred to as the newborn's "Apgar score". Each newborn is given a score of 0, 1 or 2 (a score of 2 meaning the newborn is in optimal condition, 0 being in distress) in each of the following categories: heart rate, respiration, color, muscle tone and reflex irritability. Compiled scores for each newborn can range between 0 and 10, with 10 being the best possible condition for a newborn. The scores were to be given to a newborn one minute after birth, and additional scores could be given in five-minute increments to guide treatment if the newborn's condition did not sufficiently improve. By the 1960s, many hospitals in the United States were using the Apgar score consistently. In the 21st century, the score continues to be used to provide an accepted and convenient method for reporting the status of the newborn infant immediately after birth.

In 1959, Apgar left Columbia and earned a Master of Public Health degree from the Johns Hopkins School of Hygiene and Public Health. From 1959 until her death in 1974, Apgar worked for the March of Dimes Foundation, serving as vice president for medical affairs and directing its research program to prevent and treat birth defects.

As gestational age is directly related to an infant's Apgar Score, Apgar was one of the first at the March of Dimes to bring attention to the problem of premature birth, now one of the March of Dimes' top priorities. During this time, she wrote and lectured extensively, writing articles in popular magazines as well as research work. In 1967, Apgar became vice president and director of basic research at The National Foundation-March of Dimes.

During the rubella pandemic of 1964–65, Apgar became an advocate for universal vaccination to prevent mother-to-child transmission of rubella. Rubella can cause serious congenital disorders if a woman becomes infected while pregnant. Between 1964 and 1965, the United States had an estimated 12.5 million rubella cases, which led to 11,000 miscarriages or therapeutic abortions and 20,000 cases of congenital rubella syndrome. These led to 2,100 deaths in infancy, 12,000 cases of deafness, 3,580 cases of blindness due to cataracts and/or microphthalmia and 1,800 cases of intellectual disability. In New York City alone, congenital rubella affected 1% of all babies born at that time.

Apgar also promoted effective use of Rh testing, which can identify women who are at risk for transmission of maternal antibodies across the placenta where they may subsequently bind with and destroy fetal red blood cells, resulting in fetal hydrops or even miscarriage.

Apgar traveled thousands of miles each year to speak to widely varied audiences about the importance of early detection of birth defects and the need for more research in this area. She proved an excellent ambassador for the National Foundation, and the annual income of that organization more than doubled during her tenure there. She also served the National Foundation as Director of Basic Medical Research (1967–1968) and vice-president for Medical Affairs (1971–1974). Her concerns for the welfare of children and families were combined with her talent for teaching in the 1972 book Is My Baby All Right?, written with Joan Beck.

Apgar was also a lecturer (1965–1971) and then clinical professor (1971–1974) of pediatrics at Cornell University School of Medicine, where she taught teratology (the study of birth defects). She was the first to hold a faculty position in this new area of pediatrics. In 1973, she was appointed a lecturer in medical genetics at the Johns Hopkins School of Public Health.

Apgar published over sixty scientific articles and numerous shorter essays for newspapers and magazines during her career, along with her book, Is My Baby All Right?. She received many awards, including honorary doctorates from the Woman's Medical College of Pennsylvania (1964) and Mount Holyoke College (1965), the Elizabeth Blackwell Award from the American Medical Women's Association (1966), the Distinguished Service Award from the American Society of Anesthesiologists (1966), the Alumni Gold Medal for Distinguished Achievement from Columbia University College of Physicians and Surgeons (1973) and the Ralph M. Waters Award from the American Society of Anesthesiologists (1973). In 1973 she was also elected Woman of the Year in Science by the Ladies Home Journal.

Apgar was equally at home speaking to teens as she was to the movers and shakers of society. She spoke at March of Dimes Youth Conferences about teen pregnancy and congenital disorders at a time when these topics were considered taboo.

Personal Life

Throughout her career, Apgar maintained that "women are liberated from the time they leave the womb" and that being female had not imposed significant limitations on her medical career. She avoided women's organizations and causes, for the most part. Though she sometimes privately expressed her frustration with sex inequalities (especially in the matter of salaries), she worked around these by consistently pushing into new fields where there was room to exercise her considerable energy and abilities.

Music was an integral part of family life, with frequent family music sessions. Apgar played the violin and her brother played piano and organ. She traveled with her violin, often playing in amateur chamber quartets wherever she happened to be. During the 1950s, a friend introduced her to instrument-making, and together they made two violins, a viola and a cello. She was an enthusiastic gardener and enjoyed fly-fishing, golfing and stamp collecting. In her fifties, Apgar started taking flying lessons, stating that her goal was to someday fly under New York's George Washington Bridge.

Apgar never married or had children, and died of cirrhosis on August 7, 1974, at Columbia-Presbyterian Medical Center. She is buried at Fairview Cemetery in Westfield.

SUMMARY

- Pregnancy is the term used to describe the period in which a fetus develops inside a woman's womb or uterus.
- Pregnancy usually lasts about 40 weeks, or just over 9 months, as measured from the last menstrual period to delivery.
- Body temperature is a measurement of how hot or cold the internal tissues of the body are.
- When someone has anaemia, it usually means the person has not been able to eat enough foods with iron. Iron helps the red blood cells carry oxygen from the air we breathe to all parts of the body.
- Blood pressure (BP) refers to how hard the blood is 'pushing' on the walls of the major blood vessels as it is pumped around the body by the heart.
- Mood swings are normal during pregnancy. But if you feel nervous or down all the time, it could be a sign of something deeper going on. Stress over being pregnant, changes in your body during the pregnancy, and everyday worries can take a toll.
- Indigestion, also called heartburn or acid reflux, is common in pregnancy. It can be caused by hormonal changes and the growing baby pressing against your stomach.
- Symptoms of indigestion come when the acid in your stomach irritates your stomach lining or your gullet. This causes pain and a burning feeling.
- To have healthy pregnancy, it is important that you have regular prenatal appointments, eat nutritious food, stay active, and refrain from eating raw or undercooked foods.

MULTIPLE CHOICE QUESTIONS

1. **Infants born to mothers who are vegan may be at increased risk of deficiency of which nutrient?**
   a. Vitamin C
   b. Folate
   c. Vitamin B12
   d. Calcium
2. **How can smoking affect breastfeeding?**
   a. Suppresses milk production
   b. Alters the composition of breast milk

c. Increases the risk of early cessation of breastfeeding
d. All of the options given are correct

3. **When does lactation start?**
   a. During pregnancy
   b. at the end of first trimester
   c. before parturition
   d. at the end of pregnancy
4. **This structure ruptures when "water breaks" in pregnancy**
   a. placenta
   b. amniotic fluid
   c. chorionic sac
   d. amniochorionic membrane
5. **Pregnancy is absolutely contraindicated in the following congenital diagnosis, in a patient who feels otherwise clinically well:**
   a. Cyanotic disease
   b. Fontan circulation
   c. Eisenmenger syndrome
   d. TGA with systemic right ventricle with mild dysfunction
   e. Left ventricular dysfunction with an ejection fraction of 40%

REVIEW QUESTIONS

1. Describe the early signs of pregnancy.
2. Why is assessment important in pregnancy? Explain.
3. Why is it important to take care of your mental health during pregnancy?
4. What are symptoms of indigestion and heartburn during the pregnancy?
5. Discuss about emotional challenges of pregnancy.
6. Deal with common pregnancy complications.
7. Write short note on healthy pregnancy.

Answers

1. (c) 2. (d) 3. (d) 4. (b) 5. (c)

REFERENCES

1. Adams EK, Johnston EM. Insuring women in the United States before, during, and after pregnancy. Am J Public Health. 2016;106(4):585–586.
2. Admon LK, Winkelman TNA, Moniz MH, et al. Disparities in chronic conditions among women hospitalized for delivery in the United States, 2005–2014. Obstet Gynecol. 2017;130(6):1319–1326.
3. Ahluwalia IB, Harrison L, Simpson P, et al. Pregnancy Risk Assessment Monitoring System and the W.K. Kellogg Foundation joint project to enhance maternal and child health surveillance: focus on collaboration. J Womens Health (Larchmt). 2015;24(4):257–260.
4. Banks J, Atrash H. Healthy Start national evaluation plan. Paper presented at: Pregnancy Risk Assessment Monitoring System national meeting, September 2015, Atlanta, GA.
5. Bombard JM, Kortsmit K, Warner L, et al. Vital signs: trends and disparities in infant safe sleep practices—United States, 2009–2015. MMWR Morb Mortal Wkly Rep. 2018; 67(1):39–46.
6. Christiansen-Lindquist L, Sahay K, Hogue C. Improving surveillance for the hidden half of fetal-infant mortality: a pilot study of the expansion of the Pregnancy Risk Assessment Monitoring System to include stillbirth. Ann Epidemiol. 2016;26(6):401–404.
7. Creanga AA, Syverson C, Seed K, Callaghan WM. Pregnancy-related mortality in the United States, 2011– 2013. Obstet Gynecol. 2017;130(2):366–373.
8. Dillman DA, Smyth JD, Christian LM. Internet, Phone, Mail and Mixed-Mode Surveys: The Tailored Design Method. 4th ed. New York, NY: John Wiley and Sons; 2014.
9. Johnston E, Adams K. State prescription contraception insurance mandates: effects on unintended births. Health Serv Res. 2017;52(6):1970–1995.
10. Martin JA, Hamilton BE, Osterman MJ, et al. Births: final data for 2016. Natl Vital Stat Rep. 2018;67(1):1–54.
11. Parrish JW, Young MB, Perham-Hester K, Gessner BD. Identifying risk factors for child maltreatment in Alaska: a population-based approach. Am J Prev Med. 2011;40(6):666–673.
12. Robbins CL, Zapata LB, Farr SL, et al. Core state preconception health indicators—Pregnancy Risk Assessment Monitoring System and Behavioral Risk Factor Surveillance System. MMWR Surveill Summ. 2014;63(3): 1–62.
13. Rosenberg KD, Hembroff L, Drisko J, et al. New options for child health surveillance by state health departments. Matern Child Health J. 2011;15(3): 302–309.

14. Shulman HB, Colley Gilbert B, Lansky A. The Pregnancy Risk Assessment Monitoring System (PRAMS): current methods and evaluation of 2001 response rates. Public Health Rep. 2006;121(1):74–83.
15. Warner L. A public health approach to responsible fatherhood. Paper presented at: Fourth Annual Summit on Fatherhood and the Health and Wellness of Boys and Men, March 2018, Washington, DC.
16. Zotti ME,Williams AM,Wako E. Post-disaster health indicators for pregnant and postpartum women and infants. Matern Child Health J. 2015;19(6):1179–1188.w



CHAPTER 4

Assessment and Management of Intranatal Period

From time immemorial inquiring minds have sought an explanation for the fact that labour usually ensues about 280 days after the appearance of the last menstrual period, but thus far no satisfactory universal cause has been discovered.

—*J. Whitridge Williams*

LEARNING OBJECTIVES

After studying this chapter, you will be able to:

1. Define labour
2. Describe – mechanism of labour
3. List the stages of labour with their features
4. Identify the false sign of labour
5. Mention management of second stage of labour
6. Mention care of mother during labour
7. Identify types of episiotomy with its indications

INTRODUCTION

Labor consists of a series of rhythmic, involuntary or medically induced contractions of the uterus that result in effacement (thinning and shortening) and dilation of the uterine cervix. The World Health Organization (WHO) defines normal birth as follows:

- The birth is spontaneous in onset and low risk at the start of labor and remains so throughout labor and delivery.
- The infant is born spontaneously in the vertex position between 37 and 42 weeks of pregnancy.
- After birth, mother and infant are in good condition.

The stimulus for labor is unknown, but digitally manipulating or mechanically stretching the cervix during examination enhances uterine contractile activity, most likely by stimulating release of oxytocin by the posterior pituitary gland.

Normal labor usually begins within 2 weeks (before or after) the estimated delivery date. In a first pregnancy, labor usually lasts 12 to 18 hours on average; subsequent labors are often shorter, averaging 6 to 8 hours.

Management of complications during labor requires additional measures (eg, induction of labor, forceps or a vacuum extractor, cesarean delivery).

4.1 PHYSIOLOGY AND MECHANISM OF LABOUR

Labor is the last few hours of human pregnancy. It is characterized by forceful and painful uterine contractions that effect cervical dilation and cause the fetus to descend through the birth canal. Extensive preparations take place in both the uterus and cervix long before this. During the first 36 to 38 weeks of normal gestation, the myometrium is in a preparatory yet unresponsive state. Concurrently, the cervix begins an early stage of remodeling yet maintains structural integrity. Following this prolonged uterine quiescence, a transitional phase follows during which myometrial unresponsiveness is suspended and the cervix undergoes ripening, effacement, and loss of structural cohesion.

The physiological processes that regulate *parturition*—the bringing forth of young—and the onset of labor continue to be defined. Three general contemporaneous theories describe labor initiation. Viewed simplistically, the first is the *functional loss of pregnancy maintenance factors.* The second focuses on *synthesis of factors that induce parturition*. The third suggests that the mature fetus is the source of the initial *signal for parturition commencement*.

Current research supports a model that draws from all three themes. However, labor onset clearly represents the culmination of a series of biochemical changes in the uterus and cervix. These result from endocrine and paracrine signals emanating from both mother and fetus. Their relative contributions vary between species, and it is these differences that complicate elucidation of the exact factors that regulate human parturition. When parturition is abnormal, then preterm labor, dystocia, or postterm pregnancy may result. Of these, preterm labor remains the major contributor to neonatal mortality and morbidity.

4.1.1 Maternal and Fetal Compartments

Uterus

The myometrial layer of the uterus is composed of bundles of smooth muscle cells surrounded by connective tissue. In contrast to skeletal or cardiac muscle, the smooth muscle cell is not terminally differentiated and therefore is readily adaptable to environmental changes. Varied stimuli such as mechanical stretch, inflammation, and endocrine and paracrine signals can modulate the transition of the smooth muscle cell among phenotypes that provide cell growth, proliferation, secretion, and contractility.

In addition to this phenotypic plasticity, several smooth muscle qualities confer advantages for uterine contraction efficiency and fetal delivery. First, the degree of smooth muscle cell shortening with contractions may be one order of magnitude greater than that attained in striated muscle cells. Second, forces can be exerted in smooth muscle cells in multiple directions. This differs from the contraction force generated by skeletal muscle, which is always aligned with the axis of the muscle fibers. Third, smooth muscle is not organized in the same manner as skeletal muscle. In **myometrium**, the thick and thin filaments are found in long, random bundles throughout the cells. This plexiform arrangement aids greater shortening and force-generating capacity. Last, greater multidirectional force generation in the uterine fundus compared with that of the lower uterine segment permits versatility in expulsive force directionality.

The **myometrium** forms the chief bulk of the substance of the uterus.

Lining the thick muscular uterine walls, the endometrium is transformed by pregnancy hormones and is then termed *decidua*. Composed of stromal cells and maternal immune cells, the decidua serves to maintain the pregnancy via unique immunoregulatory functions that suppress inflammatory signals during gestation. However, at the end of pregnancy, decidual activation ensues. With this, the decidua transitions to induce inflammatory signals and withdraw active immunosuppression, which contribute to parturition initiation.

During pregnancy, the cervix has multiple functions that include: (1) maintenance of barrier function to protect the reproductive tract from infection, (2) maintenance of cervical competence despite greater gravitational forces as the fetus grows, and (3) orchestration of extracellular matrix changes that allow progressively greater tissue compliance. In nonpregnant women, the cervix is closed and firm, and its consistency is similar to nasal cartilage. By the end of pregnancy, the cervix is easily distensible, and its consistency is similar to the lips of the oral cavity. Observations in three-dimensional sonography and magnetic resonance imaging show increases in the cross-sectional area of the cervical canal and in the cervical stroma from early to late pregnancy. Concurrent with expansion of the stroma, the cervical epithelia proliferate and exert a pregnancy-specific immunoprotection.

Placenta

In addition to providing the exchange of nutrients and waste between mother and fetus, the placenta is a key source of steroid hormones, growth factors, and other mediators that maintain pregnancy and potentially aid the transition to parturition. The fetal membranes—amnion and chorion and adjacent decidua—make up an important tissue shell around the fetus that serves as a physiological, immunological, and metabolic shield to protect against untimely parturition initiation.

The amnion provides virtually all of the fetal membranes' tensile strength to resist membrane tearing and rupture. This avascular tissue is highly resistant to penetration by leukocytes, microorganisms, and neoplastic cells (Fig. 1). It also constitutes a selective filter to prevent fetal particulate-bound lung and skin secretions from reaching the maternal compartment. In

this manner, maternal tissues are protected from amnionic fluid constituents that could prematurely accelerate decidual or myometrial activation or could promote adverse events such as amnionic fluid embolism.

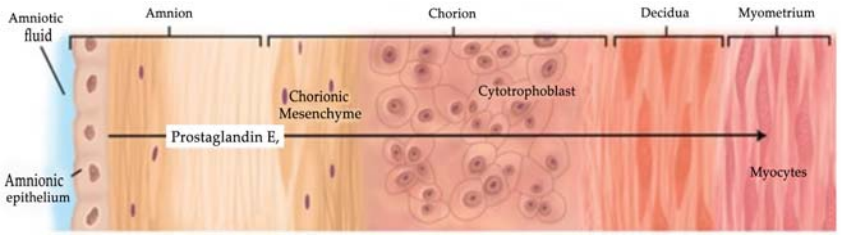


Figure 1: The amnion synthesizes prostaglandins, and late in pregnancy, synthesis is augmented by increased phospholipase A_2 and prostaglandin H synthase, type 2 (PGHS-2) activity. During pregnancy, the transport of prostaglandins from the amnion to maternal tissues is limited by expression of the inactivating enzymes, prostaglandin dehydrogenase (PGDH), in the chorion. During labor, PGDH levels decline, and amnion-derived prostaglandins can influence membrane rupture and uterine contractility. The role of decidual activation in parturition is unclear but may involve local progesterone metabolism and higher prostaglandin receptor concentrations, thus enhancing uterine prostaglandin actions and cytokine production.

The chorion is a primarily protective tissue layer and provides immunological acceptance. It is also enriched with enzymes that inactivate *uterotonins*, which are agents that stimulate contractions. Inactivating enzymes include prostaglandin dehydrogenase, **oxytocinase**, and enkephalinase.

4.1.2 Sex Steroid Hormone Role

In many species, the role of sex steroid hormones is clear—estrogen promotes and progesterone inhibits the events leading to parturition. And, the removal of progesterone, that is, progesterone withdrawal, directly precedes progression of parturition. In addition, providing progesterone to some species will delay parturition via a decline in myometrial activity and continued cervical competency. In humans, however, it seems most likely that both estrogen and progesterone are components of a broader molecular system that maintains uterine quiescence.

Oxytocinase is a type of enzyme that metabolizes the endogenous neuropeptide, oxytocin.

Plasma levels of estrogen and progesterone in normal pregnancy are enormous and in great excess of the affinity constants for their receptors. For this reason, it is difficult to comprehend how relatively subtle changes in the ratio of their concentrations could modulate physiological processes during pregnancy. The teleological evidence, however, for an increased progesterone-to-estrogen ratio in the maintenance of pregnancy and a decline in this ratio for parturition is overwhelming. In all species studied, including humans, administration of the progesterone-receptor antagonists mifepristone (RU-486) or onapristone will promote some or all key features of parturition. These include cervical ripening, greater cervical distensibility, and augmented uterine sensitivity to uterotonins.

The exact role of estrogen in regulation of human uterine quiescence and cervical competency is less well understood. That said, estrogen can advance progesterone responsiveness and, in doing so, promote uterine quiescence. At the end of pregnancy, estrogen aids processes that mediate uterine activation and cervical ripening.

Both progesterone and estrogen bind to nuclear receptors that regulate gene transcription in a cell- and context-specific pattern. Two nuclear receptors for estrogen are estrogen receptor α (ERα) and estrogen receptor β (ERβ). Nuclear receptor isoforms of the progesterone receptor (PR-A and PR-B) are encoded by differing transcripts from a single gene.

4.1.3 Prostaglandins Role

Prostaglandins are lipid molecules with varied hormone-like actions. In parturition, they play a prominent role in myometrial contractility, relaxation, and inflammation. Prostaglandins interact with a family of eight different G-protein–coupled receptors (G-Protein–Coupled Receptors), several of which are expressed in myometrium and cervix.

The major synthetic pathways involved in prostaglandin biosynthesis are shown in Figure 2. Prostaglandins are produced using plasma membrane-derived arachidonic acid, which usually is released by the action of phospholipase A_2 or C. Arachidonic acid can then act as substrate for both type 1 and 2 prostaglandin H synthase (PGHS-1 and -2), which are also called

cyclooxygenase-1 and -2 (COX-1 and -2). Both PGHS isoforms convert arachidonic acid to the unstable prostaglandin G_2 and then to prostaglandin H_2. These enzymes are the target of many nonsteroidal antiinflammatory drugs (NSAIDs). Indeed, the tocolytic actions of specific NSAIDs, were considered promising until they were shown to have adverse fetal effects.

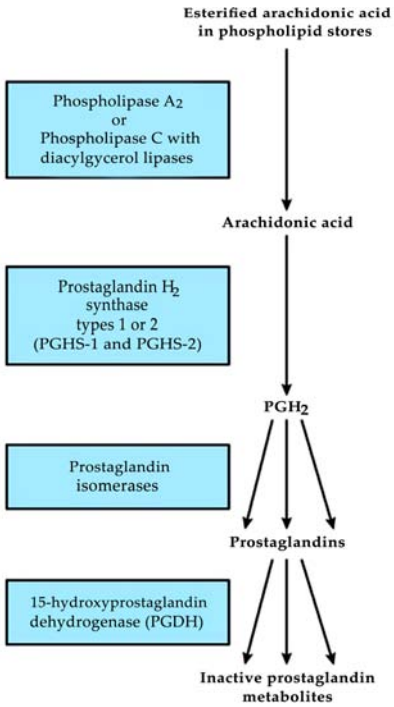


Figure 2: Overview of the prostaglandin biosynthetic pathway.

Through prostaglandin isomerases, prostaglandin H_2 is converted to active prostaglandins. These include prostaglandins E_2 (PGE_2), $F_{2\alpha}$ ($PGF_{2\alpha}$), and I_2 (PGI_2). Isomerase expression is tissue-specific and thereby controls the relative production of various prostaglandins. Another important control point for prostaglandin activity is its metabolism, which most often is through the action of 15-hydroxyprostaglandin dehydrogenase (PGDH). Expression of this enzyme is upregulated during pregnancy in the uterus and cervix, which provides the important ability to rapidly inactivate prostaglandins. Thus, myometrial responses to prostaglandins stem from a balance between prostaglandin synthesis versus metabolism, from the relative expression of various prostaglandin receptors, or from a switch in receptor-signaling pathways. It is entirely possible that prostanoids

contribute to myometrial relaxation at one stage of pregnancy and to myometrial contractions after parturition initiation.

In addition to the myometrium, the amnion synthesizes several bioactive peptides and prostaglandins that cause myometrial relaxation or contraction (see Fig. 1). Late in pregnancy, amnionic prostaglandin biosynthesis is increased, and phospholipase A_2 and PGHS-2 show greater activity. Accordingly, many hypothesize that prostaglandins regulate events leading to parturition. The amnion is likely the major source for amnionic fluid prostaglandins, and their role in the activation of cascades that promote membrane rupture is clear. The influence of amnion-derived prostaglandins on uterine quiescence and activation, however, is less delineated. This is because prostaglandin transport from the amnion through the chorion to access maternal tissues is limited by expression of PGDH.

4.1.4 Phase 1: Uterine Quiescence and Cervical Softening

As shown in Figure 3, parturition can be arbitrarily divided into four overlapping phases that correspond to the major physiological transitions of the myometrium and cervix during pregnancy. These phases of parturition include: (1) a prelude to it, (2) the preparation for it, (3) the process itself, and (4) recovery. Importantly, the *phases of parturition* should not be confused with the *clinical stages of labor,* that is, the first, second, and third stages—which make up phase 3 of parturition (Fig. 4).

The phases of parturition.

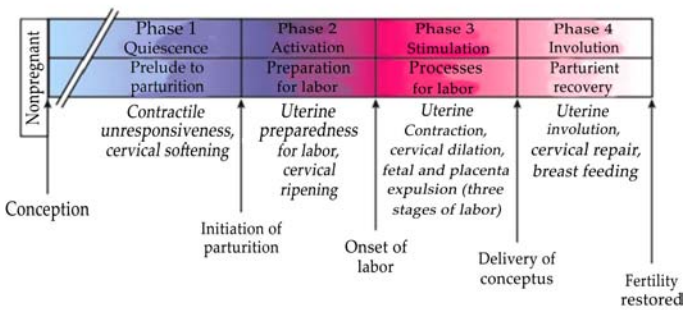


Figure 3: The phases of parturition.

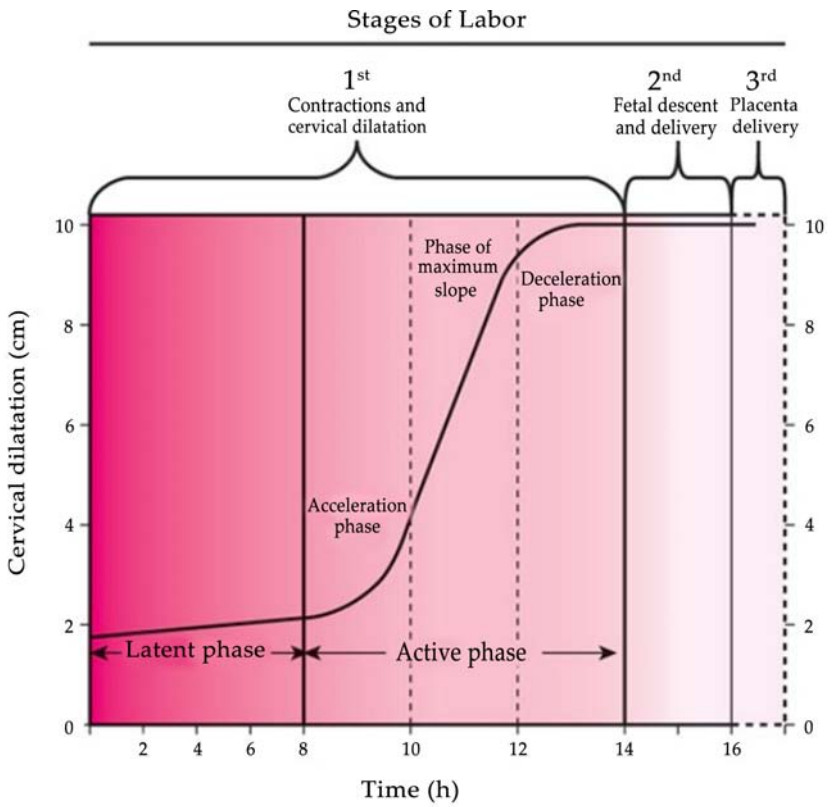


Figure 4: Composite of the average dilation curve for labor in nulliparous women. The curve is based on analysis of data derived from a large, nearly consecutive series of women. The first stage is divided into a relatively flat latent phase and a rapidly progressive active phase. In the active phase, there are three identifiable parts: an acceleration phase, a linear phase of maximum slope, and a deceleration phase.

Beginning even before implantation, a remarkably effective period of myometrial quiescence is imposed. This phase 1 normally comprises 95 percent of pregnancy and is characterized by uterine smooth muscle tranquility with maintenance of cervical structural integrity (Fig. 5). All manner of molecular systems—neural, endocrine, paracrine, and autocrine—are likely called to implement and coordinate a state of relative uterine unresponsiveness. Moreover, a complementary "fail-safe" system that protects the uterus against agents that could perturb the tranquility of phase 1 also must be in place.

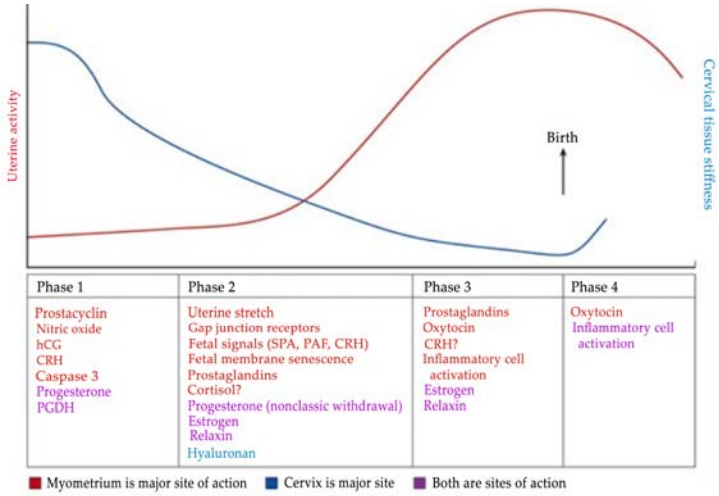


Figure 5: The key factors thought to regulate the phases of human parturition. CRH = corticotropin-releasing hormone; hCG = human chorionic gonadotropin; PAF = platelet-activating factor; PGDH = prostaglandin dehydrogenase; SPA = surfactant protein A.

During phase 1, the myometrial cells undergo a phenotypic modification to a noncontractile state, and uterine muscle is rendered unresponsive to natural stimuli. Concurrently, the uterus must initiate extensive changes in its size and vascularity to accommodate fetal growth and prepare for uterine contractions. The myometrial unresponsiveness of phase 1 continues until near the end of pregnancy. That said, some low-intensity myometrial contractions are felt during the quiescent phase, but they do not normally cause cervical dilation. These contractions are common toward the end of pregnancy, especially in multiparas, and are referred to as *Braxton Hicks contractions* or *false labor* .

The quiescence of phase 1 likely stems from: (1) actions of estrogen and progesterone via intracellular receptors, (2) myometrial-cell plasma membrane receptor-mediated increases in cyclic adenosine monophosphate (cAMP), (3) generation of cyclic guanosine monophosphate (cGMP), and (4) other systems, including modification of myometrial-cell ion channels.

Myometrial Relaxation and Contraction

The balance between myometrial relaxation and contraction is controlled by steroid- and peptide-hormone transcriptional regulation of key genes and their protein products. Quiescence

is achieved in part by: (1) diminished intracellular crosstalk and reduced intracellular Ca^{2+} ($[Ca^{2+}]_i$) levels; (2) ion- channel regulation of cell membrane potential; (3) activation of the uterine endoplasmic reticulum stress–unfolded protein response; and (4) uterotonin degradation. In contrast, contractility results from: (1) enhanced interactions between the actin and myosin proteins; (2) heightened excitability of individual myometrial cells; and (3) promotion of intracellular crosstalk that allows synchronous contractions to develop.

Actin-Myosin Interactions

Actin and myosin proteins are essential to muscle contraction. For this, actin must be converted from a globular to a filamentous form. Indeed, a potential mechanism for maintenance of relaxation is the promotion of actin into a globular form rather than into fibrils, which are required for contraction (Fig. 6). Moreover, actin must be attached to the cytoskeleton at focal points in the cell membrane to allow tension to develop.

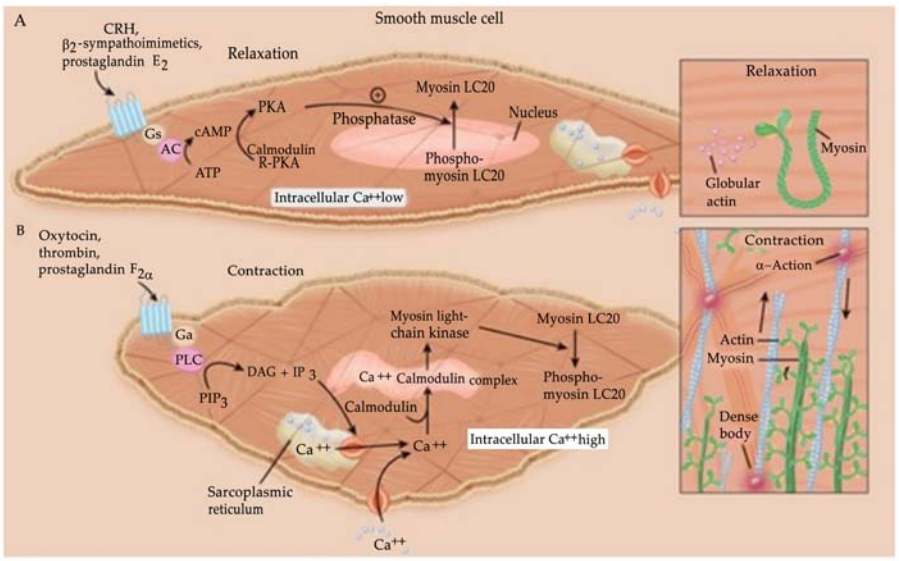


Figure 6: Uterine myocyte relaxation and contraction. **A.** Uterine relaxation is maintained by factors that increase myocyte cyclic adenosine monophosphate (cAMP) levels. This activates protein kinase A (PKA) to promote phosphodiesterase activity with dephosphorylation of myosin light-chain kinase (MLCK). Other processes serve to maintain actin in a globular form and thus to prevent the fibril formation necessary for contractions. **B.** Uterine

contractions result from reversal of these sequences. Actin now assumes a fibrillar form, and calcium enters the cell to combine with calmodulin to form complexes. These complexes activate MLCK to bring about phosphorylation of the myosin light chains. This generates ATPase activity to cause sliding of myosin over the actin fibrils, which is a uterine contraction. AC = adenylyl cyclase; Ca^{2+} = calcium; DAG = diacylglycerol; Gs and Gα = G-receptor proteins; IP_3 = inositol triphosphate; LC20 = light chain 20; PIP_3 = phosphatidylinositol 3,4,5–triphosphate; PLC = phospholipase C; R-PKA = inactive protein kinase.

Actin must partner with myosin, which is composed of multiple light and heavy chains. The coupling of myosin and actin activates adenosine triphosphatase (ATPase), hydrolyzes adenosine triphosphate, and generates force. This interaction is brought about by enzymatic phosphorylation of the 20-kDa light chain of myosin. This is catalyzed by the enzyme *myosin light-chain kinase*, which is activated by calcium. Calcium binds to *calmodulin*, a calcium-binding regulatory protein, which in turn binds to and activates myosin light-chain kinase.

Thus, logically, uterine relaxation ordinarily is promoted by conditions that lower concentrations of $(Ca^{2+})_i$. In contrast, agents that prompt contraction act on myometrial cells to augment $(Ca^{2+})_i$ levels. Or, they allow an influx of extracellular calcium through ligand- or voltage-regulated calcium channels (see Fig. 6). Voltage-gated ion channels open, additional calcium ions move into the cell, and cellular depolarization follows. For example, prostaglandin $F_{2\alpha}$ and oxytocin bind their respective receptors during labor to open ligand-activated calcium channels. Activation of these receptors also releases calcium from the sarcoplasmic reticulum to lower electronegativity within the cell. Additionally, greater localization of nonselective cation channels on the cell membrane promotes Ca^{2+} entry. The rise in $(Ca^{2+})_i$ levels is often transient. But, contractions can be prolonged by inhibition of myosin phosphatase, an enzyme which dephosphorylates myosin.

Regulation of Membrane Potentials

As just noted, myocyte excitability is regulated in part by changes in the electrochemical potential gradient across the plasma membrane. Before labor, myocytes maintain a relatively high interior electronegativity. Maintenance of a hyperpolarized

membrane potential attenuates smooth muscle cell excitation and is regulated by ion channels.

Consistent with the importance of myometrial quiescence, numerous potassium channels control membrane potential. One key regulator is the large-conductance voltage- and Ca^{2+}-activated K channel (BK_{Ca}). In normal physiology, the myometrial BK_{Ca} channel plays dual and opposing roles to maintain a balance between uterine quiescence and contractility. The BK_{Ca} channel is abundantly expressed in the myometrium. For most of pregnancy, opening the BK_{Ca} channel allows potassium to leave the cell to maintain interior electronegativity, thus preventing voltage-gated Ca^{2+} influx and contraction. Enhancing BK_{Ca} channel opening results in myometrial relaxation, whereas inhibition of the BK_{Ca} channel augments myometrial contractility. The ability of BK_{Ca} channel to regulate calcium dynamics and ultimately uterine contractility from early to late gestation may result from temporal changes in expression of the BK_{Ca} channel and/or BK_{Ca} interacting partners.

Myometrial Gap Junctions

Cellular signals that control myometrial contraction and relaxation can be effectively transferred between cells through intercellular junctional channels. Communication is established between myocytes by gap junctions, which aid the passage of electrical or ionic coupling currents as well as metabolite coupling. The transmembrane channels that make up the gap junctions consist of two protein "hemi-channels". These *connexons* are each composed of six *connexin* subunit proteins (Fig. 7). Of these, connexin-43 is expressed in myometrium, and concentrations rise near labor onset. Pairs of connexons establish a conduit between coupled cells for the exchange of small molecules that can be nutrients, waste, metabolites, second messengers, or ions. Optimal numbers and types of gap junctions are believed to be important for electrical myometrial synchrony.

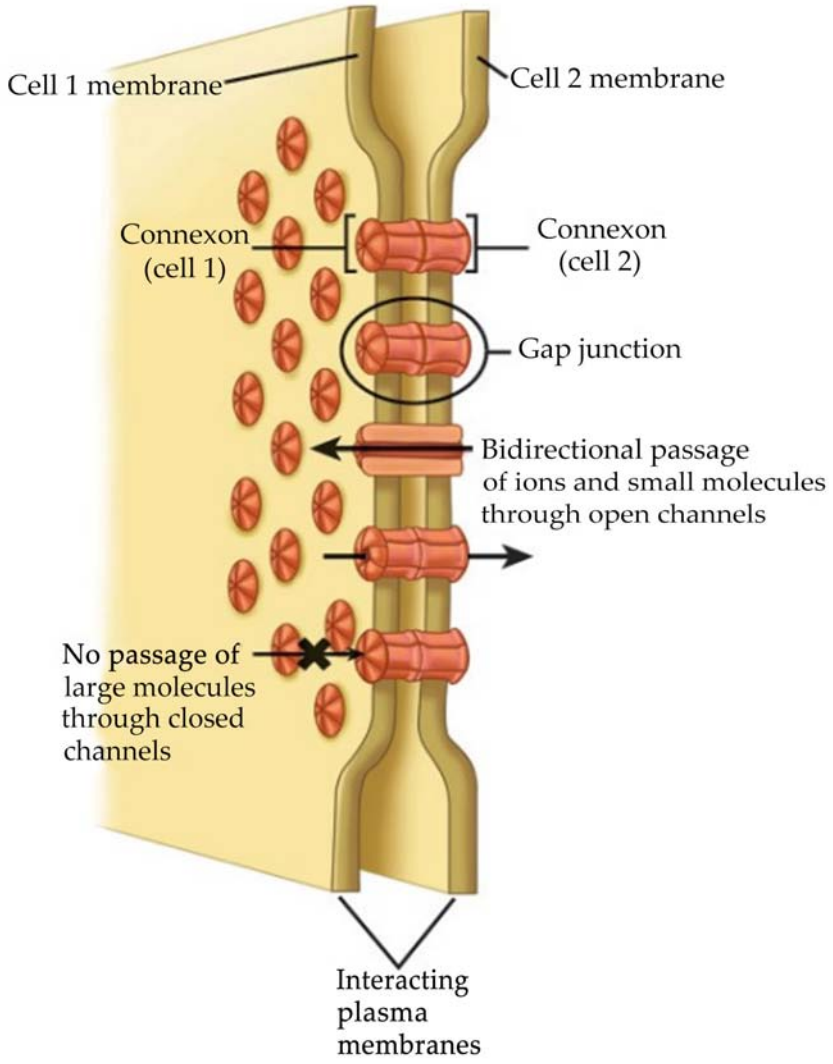


Figure 7: The protein subunits of gap junction channels are called connexins. Six connexins form a hemichannel (connexon), and two connexons (one from each cell) form a gap junction channel. Connexons and gap junction channels can be formed from one or more connexin proteins. The composition of the gap junction channel is important for these channels' selectivity with regard to passage of molecules and communication between cells.

Progesterone maintains uterine quiescence in part by mechanisms that lower expression of various key proteins needed for contractility. These *contraction-associated proteins (CAPs)* include the oxytocin receptor, prostaglandin F receptor, and connexin-43. At the end of pregnancy, increased stretch along with greater estrogen dominance raises CAP levels. Integration

of diverse regulatory pathways culminates in released inhibition of connexin-43 and **oxytocin receptor** levels to promote greater uterine contractility.

The **oxytocin receptor,** also known as OXTR, is a protein which functions as receptor for the hormone and neurotransmitter oxytocin.

Endoplasmic Reticulum Stress Response

As another potential mechanism, progesterone maintains uterine quiescence through support of myometrial *caspase 3,* which is an anticontractile agent. This protein degrades both actin and the specific gap junction protein, connexin-43.

In mice, myometrial caspase 3 activation is regulated by a pregnancy-induced *endoplasmic reticulum stress response (ERSR).* As background, the endoplasmic reticulum aids protein folding and transport. Functional irregularities cause misfolded proteins to accumulate and trigger the ERSR. The ERSR and its *unfolded-protein response (UPR)* are cellular mechanisms that work to maintain homeostasis in the face of stimuli, such as stretch and inflammation. Prolonged ERSR promotes caspase 3 activation to preserve quiescence despite these stimuli.

G-Protein–Coupled Receptors

Various cell surface receptors directly regulate myocyte contractility. Discussions thus far have described ion channel-linked receptors that regulate intracellular Ca^{2+} and membrane potential. In addition, numerous G-protein–coupled receptors appear to be modified during the phases of parturition. Several of these are present in myometrium and associated with $G_{\alpha s}$-mediated activation of adenylyl cyclase to yield higher cAMP levels. These receptors together with appropriate ligands may act with sex steroid hormones to maintain uterine quiescence. Examples are the LH receptor and corticotropin-releasing hormone receptor 1 (CRHR1), both described in this section (Fig. 8). Other G-protein–coupled myometrial receptors, instead, are associated with G-protein–mediated activation of phospholipase C, which remember releases arachidonic acid. Ligands for the G-protein–coupled receptors include numerous neuropeptides, hormones, and autacoids. Many of these are available to the myometrium during pregnancy in high concentration via *endocrine* or *autocrine* mechanisms.

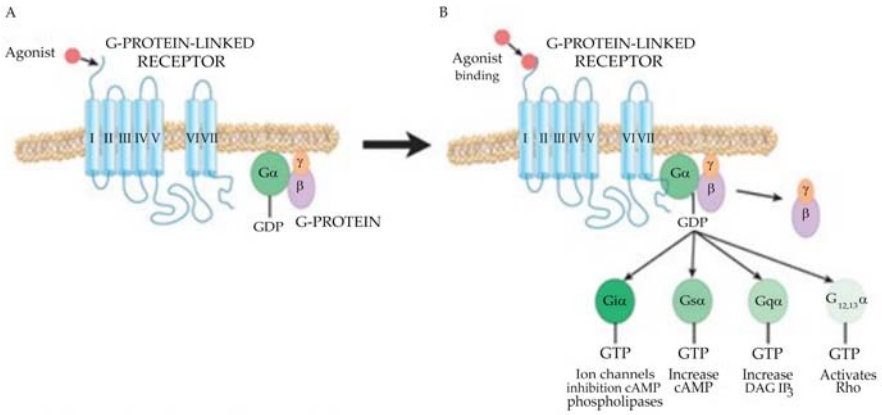


Figure 8: G-protein–coupled receptor signal transduction pathways. **A.** Receptors coupled to heterotrimeric guanosine-triphosphate (GTP)-binding proteins (G proteins) are integral transmembrane proteins that transduce extracellular signals to the cell interior. G-protein–coupled receptors exhibit a common structural motif consisting of seven membrane-spanning regions. **B.** Receptor occupation promotes interaction between the receptor and the G protein on the interior surface of the membrane. This induces an exchange of guanosine diphosphate (GDP) for GTP on the G protein α subunit and dissociation of the α subunit from the $\beta\gamma$ heterodimer. Depending on its isoform, the GTP-α subunit complex mediates intracellular signaling either indirectly by acting on effector molecules such as adenylyl cyclase (AC) or phospholipase C (PLC), or directly by regulating ion channel or kinase function. cAMP = cyclic adenosine monophosphate; DAG = diacylglycerol; IP_3 = inositol triphosphate.

β-Adrenoreceptors are prototypical examples of cAMP signaling causing myometrium relaxation. β-Adrenergic receptors mediate $G_{\alpha s}$-stimulated increases in adenylyl cyclase, elevated levels of cAMP, and myometrial cell relaxation. The rate-limiting factor is likely the number of receptors expressed and the level of adenylyl cyclase expression. Agents binding to these receptors have been used for tocolysis of preterm labor and include ritodrine and terbutaline.

LH and hCG hormones share the same receptor, and this G-protein–coupled receptor has been found in myometrial smooth muscle and blood vessels. Levels of myometrial LH-hCG receptors during pregnancy are greater before than during labor. Chorionic gonadotropin acts to activate adenylyl cyclase by way of a plasma membrane receptor $G_{\alpha s}$-linked system. This lessens contraction

frequency and force and lowers the number of tissue-specific myometrial cell gap junctions. Thus, high circulating levels of hCG may be one mechanism of uterine quiescence. In the mouse, variations in FSH-receptor density also regulate myometrial contractile activity. Prostaglandin E_2 mediates its diverse cellular effects through four G-protein–coupled receptors. Specifically, prostaglandin E receptors 1 through 4 (EP_1-EP_4) are expressed in the myometrium during pregnancy and with labor onset. EP_2 and EP_4 act through $G_\alpha s$ to raise cAMP levels and maintain myometrial cell quiescence but switch to a $G_\alpha q/11$ calcium-activating pathway during labor. EP_1 and EP_3 receptors act through $G_\alpha q$ and $G_\alpha i$ to augment intracellular Ca^{2+} and contractility.

The peptide hormone relaxin binds to the G-protein–coupled receptor named *relaxin family peptide receptor 1 (RXFP1). Binding* activates adenylyl cyclase in uterine smooth muscle cells. Adenylyl cyclase in turn prevents increased intracellular Ca^{2+} and thus promotes uterine quiescence. There are two separate human relaxin genes, designated *H1* and *H2*. Of these, *H1* is primarily expressed in the decidua, trophoblast, and prostate, whereas *H2* is primarily expressed in the **corpus luteum**. Relaxin in plasma of pregnant women is believed to originate exclusively from corpus luteum secretion. Plasma levels peak at approximately 1 ng/mL between 8 and 12 weeks' gestation. Thereafter, they decline to lower levels that persist until term.

The **corpus luteum** is a vital yet temporary organ that plays a crucial role in fertility during the luteal phase.

Corticotropin-releasing hormone (CRH) is synthesized in the placenta and hypothalamus. Discussed in Fetal Contributions to Parturition, CRH plasma levels rise dramatically during the final 6 to 8 weeks of normal pregnancy and are implicated in mechanisms that control the timing of human parturition. CRH appears to promote myometrial quiescence during most of pregnancy but then aids myometrial contractions with parturition onset. Studies suggest that these opposing actions are achieved by differential actions of CRH via its receptor CRHR1. In nonlaboring myometrium at term, the interaction of CRH with its CRHR1 receptor activates the Gs-adenylate cyclase-cAMP signaling pathway. This results in inhibition of inositol triphosphate (IP_3) and stabilization of $(Ca^{2+})_i$ levels. However, in term laboring myometrium, $(Ca^{2+})_i$ concentrations are augmented by CRH activation of G proteins Gq and Gi and prompts stimulation of IP_3 production and greater contractility.

Cyclic Guanosine Monophosphate

As just described, cAMP is an important mediator of myometrial relaxation. However, activation of guanylyl cyclase raises intracellular cyclic guanosine monophosphate (cGMP) levels. This also promotes smooth muscle relaxation. Intracellular cGMP levels are increased in the pregnant myometrium and can be stimulated by atrial natriuretic peptide (ANP), brain natriuretic peptide (BNP) receptors, and nitric oxide. All of these factors and their receptors are expressed in the pregnant uterus.

Accelerated Uterotonin Degradation

In addition to pregnancy-induced compounds that promote myometrial cell refractoriness, the activity of enzymes that degrade or inactivate endogenously produced uterotonins are strikingly increased in phase 1. Some of these degrading enzymes and their respective targets include PGDH and prostaglandins; enkephalinase and endothelins; oxytocinase and oxytocin; diamine oxidase and histamine; catechol *O*-methyltransferase and catecholamines; angiotensinases and angiotensin-II; and platelet-activating factor (PAF) and PAF acetylhydrolase. Levels of several of these enzymes decrease late in gestation.

Decidua

To ensure uterine quiescence, the synthesis in the decidua of prostaglandins, in particular $PGF_{2\alpha,}$ is markedly suppressed. Suppression of prostaglandin production here persists throughout most of pregnancy, and suppression withdrawal is a prerequisite for parturition.

Phase 1 of parturition also promotes an environment of immune tolerance to protect the fetus. Namely, decidual stromal cells proactively ensure that fetal antigens do not elicit a maternal immune response. This stems from a reduced capacity to attract T cells. This limited ability derives in part from epigenetic silencing of T cell–attracting inflammatory chemokine genes.

Cervical Softening

The initial stage of cervical remodeling—termed *softening*—begins in phase 1 of parturition. It is characterized by greater tissue

compliance, yet the cervix remains firm and unyielding. Hegar (1895) first described palpable softening of the lower uterine segment at 4 to 6 weeks' gestation, and this sign was once used to diagnose pregnancy. Clinically, the maintenance of cervical anatomical and structural integrity is essential for pregnancy to continue to term. Preterm cervical dilation, structural insufficiency, or both may forecast delivery.

Cervical softening results from increased vascularity, cellular hypertrophy and hyperplasia, and slow, progressive compositional and structural changes in the extracellular matrix. Key to matrix changes, collagen, which is the main structural protein in the cervix, undergoes conformational changes that alter tissue stiffness and flexibility. Specifically, collagen processing and the number or type of stable covalent cross-links between collagen triple helices is altered. Mature cross-links between newly synthesized collagen monomers are reduced due to diminished expression and activity of the cross-link-forming enzymes beginning in early pregnancy. These enzymes are lysyl hydroxylase and lysyl oxidase. Together, these early pregnancy changes contribute to greater tissue compliance.

Clinical evidence for the importance of matrix changes to cervical softening is supported by in vivo mechanical evaluation of the cervix. The prevalence of cervical insufficiency is also higher in those with inherited defects in the synthesis or assembly of collagen or elastic fibers. Examples are Ehlers-Danlos and Marfan syndromes. Concurrent with matrix remodeling in the softening period, genes involved in cervical dilation and parturition are actively repressed.

4.1.5 Phase 2: Preparation for Labor

To prepare for labor, the myometrial tranquility of phase 1 of parturition must be suspended—so-called *uterine awakening* or *activation*. This phase 2 of parturition is a progression of uterine changes during the last few weeks of pregnancy. Importantly, shifting events associated with phase 2 can cause either preterm or delayed labor.

Progesterone Withdrawal

Key factors in uterine activation are depicted in Figure 5. In species that exhibit progesterone withdrawal, parturition progression to labor can be blocked by administering progesterone to the mother. Whether progesterone administration in the absence of classic progesterone withdrawal in pregnant women can delay the timely onset of parturition or prevent preterm labor continues to be investigated. The possibility that progesterone-containing injections or vaginal suppositories may prevent preterm labor has been studied in several randomized trials conducted during the past 15 years.

Classic progesterone withdrawal resulting from decreased secretion does not occur in human parturition. However, a mechanism for progesterone inactivation, whereby the myometrium and cervix become refractory to progesterone's inhibitory actions, is supported by studies using progesterone-receptor antagonists. Mifepristone is a classic steroid antagonist, acting at the level of the progesterone receptor. Although less effective in inducing abortion or labor in women later in pregnancy, mifepristone appears to have some effect on cervical ripening and on increasing myometrial sensitivity to **uterotonins**.

A **uterotonic,** also known as ecbolic, are pharmacological agents used to induce contraction or greater tonicity of the uterus.

The diverse mechanisms by which functional progesterone withdrawal or antagonism is achieved is an active area of research. These include: (1) changes in the relative expression of the nuclear progesterone-receptor isoforms, PR-A, PR-B, and PR-C; (2) differential interaction of PR-A and PB-B with enhancers and inhibitors of gene expression; (3) alterations in PR activity through changes in the expression of coactivators or corepressors that directly influence receptor function; (4) local inactivation of progesterone by steroid-metabolizing enzymes or synthesis of a natural antagonist; and (5) microRNA regulation of progesterone-metabolizing enzymes and transcription factors that modulate uterine quiescence. Taken together, these observations support the concept that multiple pathways exist for a functional progesterone withdrawal.

Myometrial Changes

Phase 2 myometrial changes prepare it for labor contractions. This results from a shift in the expression of key proteins that control

uterine quiescence to an expression of contraction-associated proteins, described earlier (Myometrial Gap Junctions). Of these CAPs, myometrial oxytocin receptors and gap junction proteins, such as connexin-43, markedly rise in number. These CAPs increase uterine irritability and responsiveness to *uterotonins.*

Another critical change in phase 2 is formation of the lower uterine segment from the isthmus. With this development, the fetal head often descends to or even through the pelvic inlet—so-called *lightening.* The abdomen commonly undergoes a shape change, sometimes described by women as "the baby dropped." It is also likely that the lower segment myometrium is unique from that in the upper uterine segment, resulting in distinct roles for each near term and during labor. This is supported by human studies that demonstrate differential expression of prostaglandin receptors and CAPs within the upper- and lower-segment myometrial regions. Near term, elevated expression of the *HoxA13* gene in the lower myometrial segment compared with the upper segment also induces CAP expression and regionalized contractility of the lower segment.

Oxytocin Receptors

Because of its long-standing application for labor induction, it seemed logical that oxytocin must play a central role in spontaneous human labor. Myometrial oxytocin receptor levels do rise during phase 2 of parturition, and the level of oxytocin receptor mRNA in human myometrium at term is greater than that found in preterm myometrium. However, it is unclear whether oxytocin plays a role in the early phases of uterine activation or whether its sole function is in the expulsive phase of labor. Most studies of regulation of myometrial oxytocin receptor synthesis have been performed in rodents. Disruption of the oxytocin receptor gene in the mouse does not affect parturition. This suggests that, at least in this species, multiple systems likely ensure that parturition occurs.

Progesterone and estradiol appear to be the primary regulators of oxytocin receptor expression. Estradiol treatment in vivo or in myometrial explants raises myometrial oxytocin receptor concentrations. This action, however, is prevented by simultaneous treatment with progesterone . Progesterone also may act within the myometrial cell to enhance oxytocin receptor

degradation and inhibit oxytocin activation of its receptor at the cell surface. These data indicate that one of the mechanisms whereby progesterone maintains uterine quiescence is through inhibition of a myometrial oxytocin response.

Cervical Ripening

Before contractions begin, the cervix must undergo extensive remodeling. This eventually leads to the cervix yielding and dilating from forceful uterine contractions. Cervical modifications during phase 2 principally involve connective tissue changes—termed *cervical ripening.* The transition from the softening to the ripening phase begins weeks or days before labor. During this transformation, the cervical matrix changes its total amounts of *glycosaminoglycans*, which are large linear polysaccharides, and *proteoglycans,* which are proteins bound to these glycosaminoglycans.

Many of the processes that aid cervical remodeling are controlled by the same hormones regulating uterine function. That said, the molecular events of each are varied because of differences in cellular composition and physiological requirements. For example, the hormone relaxin regulates myometrial quiescence. It also regulates cervical ripening, but through cell proliferation and modulation of extracellular matrix components. The uterine corpus is predominantly smooth muscle. In contrast, the cervix has a high ratio of fibroblasts to smooth muscle cells, and extracellular matrix contributes significantly to overall tissue mass. Recent studies in the nonpregnant human cervix report a spatial gradient of smooth muscle cells. Specifically, smooth muscle cells make up approximately 50 percent of stromal cells at the internal os but only 10 percent at the external os.

Cervical Connective Tissue

Collagen

The cervix is an extracellular-matrix-rich tissue. Constituents of the matrix include type I, III, and IV collagen, matricellular proteins, glycosaminoglycans, proteoglycans, and elastic fibers. Of these, collagen is largely responsible for the structural disposition of the cervix. During collagen assembly, multiple collagen triple-

helical molecules are cross-linked to one another by the actions of lysyl oxidase to form fibrils. In addition, fibril size, packing, and organization determine the strength and mechanical properties of the cervix. These properties are regulated in part by collagen-binding proteoglycans such as decorin or biglycan, as well as matricellular proteins such as thrombospondin 2 (Fig. 9).

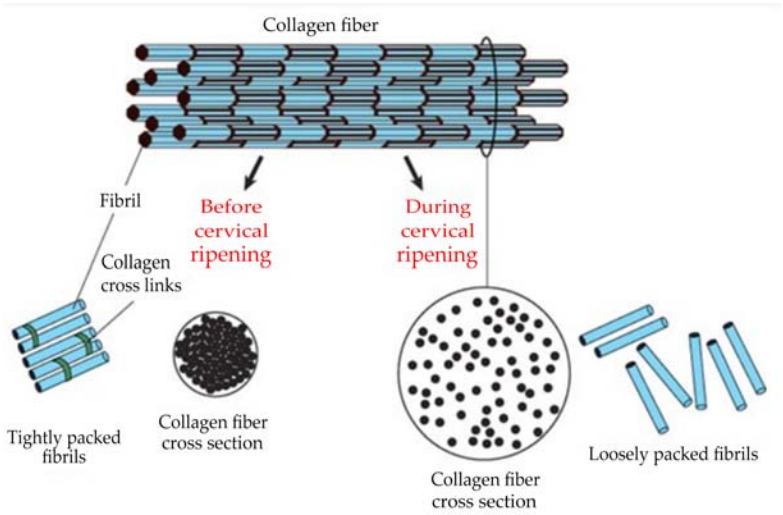


Figure 9: The collagen fiber architecture is reorganized in phases 1 and 2 of parturition to allow a gradual increase in mechanical compliance of the cervix. A collagen fiber is made up of many fibrils. Fibril size and packing are regulated in part by small proteoglycans such as decorin and by the density of collagen cross-links. In phase 1, fibril size is uniform and fibrils are well organized, although a decline in cross-link density aids softening. During cervical ripening in phase 2, fibril size is less uniform, and spacing between collagen fibrils and fibers is greater and disorganized.

Higher turnover of collagen during pregnancy likely allows the gradual replacement of mature cross-linked collagen fibrils with poorly cross-linked fibrils, which yield greater collagen disorganization. This increased turnover, rather than loss of collagen to achieve cervical remodeling, is supported by mouse and human studies that document no changes in collagen content between nonpregnant states and term pregnancy. In further support, polymorphisms or mutations in genes required for collagen assembly are associated with an elevated incidence of cervical insufficiency.

Glycosaminoglycans and Proteoglycans

Hyaluronan is a high-molecular-weight polysaccharide that functions alone, whereas most other glycosaminoglycans (GAGs) complex with proteins to form proteoglycans. Hyaluronan is a hydrophilic, space-filling molecule, and thus greater hyaluronan production during cervical ripening is thought to increase viscoelasticity, hydration, and matrix disorganization. Hyaluronan synthesis is carried out by hyaluronan synthase isoenzymes, and expression of these enzymes is elevated in the cervix during ripening.

Although not well defined, changes in proteoglycan composition are also suggested to accompany cervical ripening. At least three small leucine-rich proteoglycans are expressed in the cervix—decorin, biglycan, and fibromodulin. In other connective tissues, decorin interacts with collagen to regulate the packing, order, and strength of collagen fibrils (see Fig. 9). In addition to the cervix, these proteoglycans are expressed in the fetal membranes and uterus.

Inflammatory Changes

In phase 2, resident immune cells are localized to the cervical stroma, although a functional role for these cells in this phase of remodeling has been challenged. Microarray studies comparing gene expression patterns at term both before and after cervical ripening show little rise in proinflammatory gene expression. In contrast, proinflammatory and immunosuppressive gene expression in the cervix after delivery increases markedly compared with that during cervical ripening. Further, detailed studies in mice provide evidence that leukocyte migration but not activation takes place before labor. Once labor is underway, activation of neutrophils, proinflammatory M1 macrophages, and tissue repair M2 macrophages in the cervix is augmented. This suggests a role for inflammatory cells in postpartum cervical remodeling and repair.

Induction of Cervical Ripening

No therapies prevent premature cervical ripening. In contrast, treatment to promote cervical ripening for labor induction includes direct application of prostaglandins PGE_2 and $PGF_{2\alpha}$.

Prostaglandins likely modify extracellular matrix structure to aid ripening. Although the role of prostaglandins in the normal physiology of cervical ripening remains unclear, this property is useful clinically to assist labor induction.

In some nonhuman species, the cascades of events that allow cervical ripening are induced by dropping serum progesterone concentrations. And in humans, administration of progesterone antagonists causes cervical ripening.

Endocervical Epithelia

In addition to matrix changes, during pregnancy, endocervical epithelial cells proliferate such that endocervical glands account for a significant percentage of cervical mass. The endocervical canal is lined with mucus-secreting columnar and stratified squamous epithelia. These cells form both a mucosal barrier and a tight junctional barrier that protect against microbial invasion. The mucosal epithelium recognizes and deters pathogen invasion via expression of toll-like receptors that identify pathogens and via antimicrobial peptides and protease inhibitors. In addition, these epithelia express signals to underlying immune cells when a pathogenic challenge exceeds their protective capacity.

Fetal Contributions to Parturition

It is intriguing to envision that the mature human fetus provides the signal to initiate parturition, and evidence for fetal signaling is mounting. The fetus may give signals through blood-borne agents that act on the placenta or through secretion into the amnionic fluid.

Uterine Stretch

Fetal growth is an important component in uterine activation in phase 2 of parturition. With uterine activation, stretch is required for induction of specific CAPs. Namely, stretch increases expression of connexin-43 and oxytocin receptors. Levels of gastrin-releasing peptide, a stimulatory agonist for smooth muscle, are also augmented by stretch in the myometrium.

Clinical clues for a role of stretch come from the observation that multifetal pregnancies carry a much greater risk for preterm

labor than singleton ones. And, preterm labor is also significantly more common in pregnancies complicated by **hydramnios**. Although the mechanisms causing preterm birth in these two examples are debated, a role for uterine stretch must be considered.

Hydramnios is a condition that occurs when too much amniotic fluid builds up during pregnancy.

Cell signaling systems that are influenced by stretch to regulate the myometrial cell continue to be defined. This process—*mechanotransduction*—may include activation of cell-surface receptors or ion channels, transmission of signals through extracellular matrix, or release of autocrine molecules that act directly on myometrium.

Fetal Endocrine Cascades

The ability of the fetus to provide endocrine signals that initiate parturition has been demonstrated in several species. However, evidence suggests that it is not regulated in the same manner in humans. That said, the human fetal hypothalamic-pituitary-adrenal-placental axis is considered a critical component of normal parturition. Moreover, premature activation of this axis is considered to prompt many cases of preterm labor. As in the sheep, steroid products of the human fetal adrenal gland are believed to have effects on the placenta and membranes that eventually transform the myometrium from a quiescent to a contractile state. A key component in the human may be the unique ability of the placenta to produce large amounts of CRH (Fig. 10).

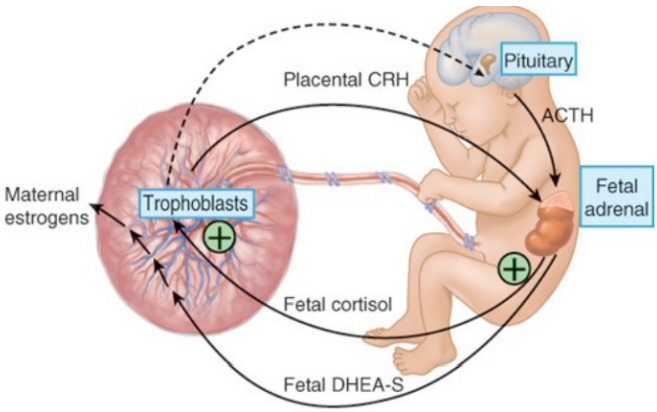


Figure 10: The placental–fetal adrenal endocrine cascade.

In late gestation, placental corticotropin-releasing hormone (CRH) stimulates fetal adrenal production of dehydroepiandrosterone sulfate (DHEA-S) and cortisol. The latter stimulates production of placental CRH, which leads to a feed-forward cascade that enhances adrenal steroid hormone production. ACTH = adrenocorticotropic hormone.

A CRH hormone that is identical to maternal and fetal hypothalamic CRH is synthesized by the placenta in relatively large amounts. However, unlike hypothalamic CRH, which is under glucocorticoid negative feedback, cortisol instead *stimulates* placental CRH production. This ability makes it possible to create a feed-forward endocrine cascade that does not end until delivery. Maternal plasma CRH levels are low in the first trimester and rise from midgestation to term. In the last 12 weeks, CRH plasma levels rise exponentially, peak during labor, and then fall precipitously after delivery. Amnionic fluid CRH concentrations similarly increase in late gestation. CRH is the only trophic hormone-releasing factor to have a specific serum binding protein. During most of pregnancy, CRH-binding protein (CRH-BP) binds most maternal circulating CRH, and this inactivates it. During later pregnancy, however, CRH-BP levels in both maternal plasma and amnionic fluid decline, leading to markedly greater levels of bioavailable CRH.

In pregnancies in which the fetus can be considered "stressed" from various complications, concentrations of CRH in fetal plasma, amnionic fluid, and maternal plasma are greater than those seen in normal gestation. The placenta is the likely source of this elevated CRH concentration. For example, placental CRH content is fourfold higher in placentas from women with preeclampsia than in those from normal pregnancies.

Placental CRH is thought to play several roles in parturition regulation. It may enhance fetal cortisol production to provide positive feedback so that the placenta produces more CRH. Late in pregnancy—phase 2 or 3 of parturition—modification in the CRH receptor favors a switch from cAMP formation to increased myometrial cell calcium levels via protein kinase C activation. Oxytocin acts to attenuate CRH-stimulated accumulation of cAMP in myometrial tissue. CRH acts to augment myometrial contractile force in response to $PGF_{2\alpha}$. Finally, CRH stimulates fetal adrenal C_{19}-steroid synthesis, thereby increasing

substrate for placental aromatization. Some have proposed that the rising CRH level at the end of gestation reflects a *fetal-placental clock* . CRH concentrations vary greatly among women, and the rate of rise in maternal CRH levels is a more accurate predictor of pregnancy outcome than is a single measurement. In this regard, the placenta and fetus, through endocrinological events, influence the timing of parturition at the end of normal gestation.

Fetal Lung Surfactant and Platelet-Activating Factor

Surfactant protein A (SP-A) produced by the fetal lung is required for lung maturation. SP-A is expressed by the human amnion and decidua, is present in the amnionic fluid, and prompts signaling pathways in human myometrial cells. The exact mechanisms by which SP-A activates myometrial contractility in women, however, remain to be clarified. One mode may be its effects on prostaglandins. Namely, SP-A selectively inhibits prostaglandin $F_{2\alpha}$ in the term decidua, but SP-A levels drop in the amnionic fluid at term. In addition to SP-A, the fetal lung makes the uterotonic agent platelet-activating factor. This factor and SP-A play a role in fetal–maternal signaling for parturition.

Fetal-Membrane Senescence

Toward the end of pregnancy, fetal membranes undergo physiological aging termed cellular senescence. In human fetal membranes and animal models, stretch and oxidative stress induce senescent fetal membrane to manifest a form of sterile inflammation termed senescent-associated secretory phenotype (SASP). This in turn propagates inflammatory signals that further weaken the fetal membrane and activate signals in the decidua and myometrium to initiate parturition. Thus, as the functional necessity of fetal membranes declines at term, they are able to promote signals that contribute to parturition initiation.

Fetal Anomalies and Delayed Parturition

Some evidence shows that pregnancies with markedly diminished estrogen production may be associated with prolonged gestation. These “natural experiments” include women with inherited placental sulfatase deficiency and fetal anencephaly with adrenal

hypoplasia. The broad range of gestational length seen with these disorders, however, calls into question the exact role of estrogen in human parturition initiation.

Other fetal abnormalities that prevent or severely reduce the entry of fetal urine or lung secretions into amnionic fluid do not prolong human pregnancy. Examples are renal agenesis and pulmonary hypoplasia, respectively. Thus, a fetal signal through the paracrine arm of the fetal–maternal communication system does not appear to be mandated for parturition initiation.

Some brain anomalies of the fetal calf, fetal lamb, and sometimes the human fetus delay the normal timing of parturition. More than a century ago, Rea (1898) observed an association between fetal anencephaly and prolonged human gestation.

Malpas (1933) extended these observations and described a pregnancy with an anencephalic fetus that was prolonged to 374 days—53 weeks. He concluded that the association between anencephaly and prolonged gestation was attributable to anomalous fetal brain-pituitary-adrenal function.

Indeed, the adrenal glands of the anencephalic fetus are very small and, at term, may be only 5 to 10 percent as large as those of a normal fetus. This is caused by developmental failure of the fetal zone that normally accounts for most of fetal adrenal mass and production of C_{19}-steroid hormones. Such pregnancies are associated with delayed labor and suggest that the fetal adrenal glands are important for the timely onset of parturition.

4.1.6 Phase 3: Labor

The process of labor and delivery is divided into three stages. The first stage of labor begins when you start having contractions, and ends when your cervix is fully dilated (open). The second stage of labor begins when you're fully dilated and ends with the birth of your baby. The third stage of labor starts right after the birth of your baby and ends with the delivery of the placenta.



There are three stages of labor. Here's what they include:

Stage 1: Early labor contractions, active labor, and full dilation of the cervix

Stage 2: Pushing and delivering the baby

Stage 3: Delivering the placenta

The first stage of labor is the longest. A lot happens in this stage – so much that it's divided into three phases:

- **Early labor:** Your cervix gradually thins out and opens to about 6 centimeters (cm) by the end of this phase.
- **Active labor:** Your cervix begins to dilate more rapidly and opens up further to 10 cm. Contractions are longer, stronger, and closer together.
- **Transition:** During the last part of active labor, contractions are even longer, stronger, and closer together. This can be the most difficult part of your entire labor.

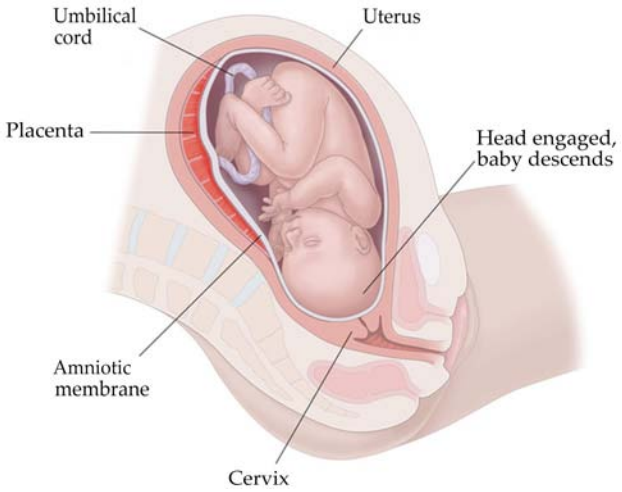
Every pregnancy is different, and there's wide variation in the length of labor. For first-time moms, labor often takes between 12 and 18 hours. For women who've already had a vaginal birth, labor may last 8 to 10 hours. These are just estimates: For some women labor lasts much longer, while for others it's over much sooner.

First Stage of labor

The first stage of labor is the longest stage, especially if you're giving birth for the first time. Early labor usually takes the longest amount of time and transition the shortest.

Early labor

You may have had signs of early labor – such as more frequent Braxton Hicks contractions, loss of your mucus plug, bloody show, and even some cervical dilation and effacement – for days or even weeks now. Or maybe not! Either way, once you start having regular, persistent contractions, you›re in labor.



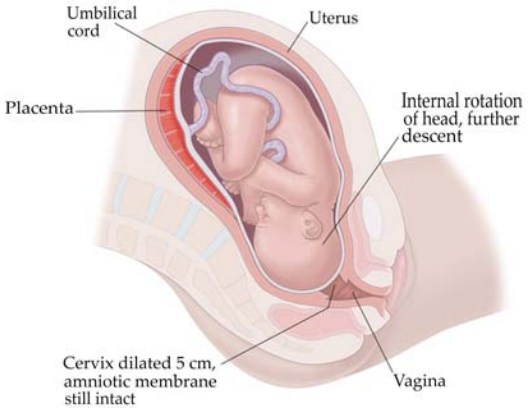
What to expect:

- Contractions start. You›ll start having contractions at relatively regular intervals. Early labor contractions are sometimes hard to distinguish from "false labor" (that is, irregular Braxton Hicks contractions). True labor contractions get closer together as time goes on and are more regular than Braxton Hicks contractions. If you aren't sure whether you're in true labor, see whether you can hold a complete conversation. If you have to stop, especially mid-sentence, to breathe through contractions, you're probably moving into early labor.
- Contractions get longer, stronger, and closer together. Eventually they›ll be coming every four to five minutes and lasting 40 to 60 seconds each. (Some women have much more frequent contractions during this phase, but the contractions will still tend to be relatively mild and last no more than a minute.) Early labor ends when your cervix is about 6 cm dilated and your progress starts to accelerate.

- You may feel some pain. If your labor is typical, your early contractions will be mild enough for you to talk through them and putter around the house, or even doze off between them. But as your labor progresses, your contractions will become painful.
- You may feel pelvic pressure or back pain as your baby moves down. If you have lower back pain with your contractions, you may be having back labor.
- You may see a mucousy vaginal discharge. This may be tinged with blood – the so-called bloody show. This is perfectly normal, but if you see more than a tinge of blood, be sure to call your doctor or midwife.
- Your water may break. Call your provider if your water breaks. It may feel like a slow trickle of liquid or a strong gush.

What to do:

- Time contractions periodically. Don›t become a slave to the stopwatch just yet – it›s stressful and exhausting to record every contraction over the many long hours of labor, and it isn't necessary. Instead, you may want to time your contractions periodically to get a sense of what›s going on. In most cases, your contractions will let you know in no uncertain terms when it›s time to take them more seriously.
- Rest. It›s important to do your best to stay rested, since you may have a long day (or night) ahead of you. If you›re tired, try to doze off between contractions.
- Relax. If you›re feeling anxious, you may want to try some relaxation exercises, take a warm bath, or do something to distract yourself a bit – like watching a movie.
- Drink plenty of fluids to keep well hydrated. And don›t forget to urinate often, even if you don›t feel the urge. A full bladder may make it more difficult for your uterus to contract efficiently, and an empty bladder leaves more room for your baby to descend.



Active labor

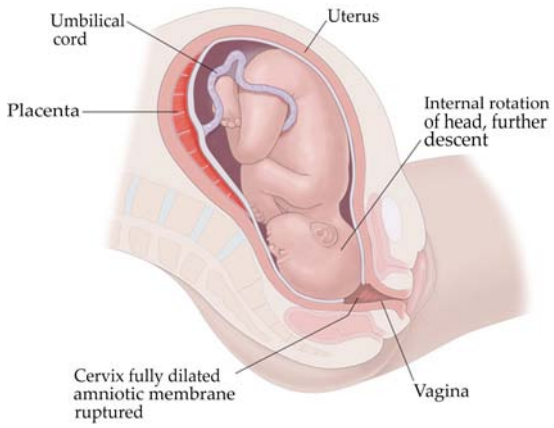
There's no doubt now that your baby is on the way. Your doctor or midwife may have given you instructions about when to go to the hospital or birth center, but usually once you have regular, painful contractions (lasting about 60 seconds each) every four to five minutes for an hour or more, it's time to grab your hospital bag and head out.

What to expect:

- Contractions become intense. Active labor is when things *really* get rolling. Your contractions become increasingly intense – more regular, longer, and stronger – and you›ll no longer be able to talk through them.
- Contractions get more frequent. In most cases, contractions eventually happen every 2 1/2 to 3 minutes, although some women never have them more often than every 5 minutes, even during transition.
- Cervix opens wider. Your cervix dilates more quickly. (The last part of active labor, when the cervix dilates fully from 8 to 10 cm, is called transition, which is described in the next section.)
- Your baby may begin to descend toward the end of active labor, although they might have started to descend earlier, or might not start until the next stage.
- Nausea and vomiting. This is fairly common now, sometimes from epidural anesthesia causing the blood pressure to drop, and sometimes from stimulation of nerves that cause vomiting.

What to do:

- Get pain relief if you need it. Most women opt for pain medication, such as an epidural, at some point during the active labor phase.
- Try relaxation techniques. Many pain-management and relaxation techniques used in natural childbirth – such as breathing exercises and visualization – can help you during labor, whether or not you're planning to receive medication.
- Lean on your support person. Your partner, a friend or family member, or a hired doula can be a huge help now. You›ll probably appreciate lots of gentle encouragement.
- Move. It may feel good to walk, but you›ll probably want to stop and lean against something (or someone) during each contraction. You should be able to move around the room freely after your caregiver evaluates you, as long as there are no complications.
- Sit or lie down on your side. If you›re tired, try sitting in a rocking chair or lying in bed on your left side.
- Get a massage. This might be a good time to ask your birth partner or doula for a massage to help ease labor pain.
- Take a warm shower or bath if you have access to a tub and your water hasn›t broken. Even if your water has broken, a shower is probably okay, as the risk of infection is low. (Don't take a bath if your water has broken.)



Transition

The last part of active labor is called the transition period because it marks the shift to the second stage of labor. Your contractions are at their strongest, and your cervix completely opens up so that your baby can pass through.

What to expect:

- A fully dilated cervix. Your cervix dilates from 8 cm to a full 10 cm.
- Very strong contractions. This is the most intense part of labor. Contractions are usually very strong, coming every 2 1/2 to 3 minutes or so and lasting a minute or more. You may start shaking and shivering.
- Pressure on your rectum. By the time your cervix is fully dilated and transition is over, your baby has usually descended somewhat into your pelvis. This is when you might begin to feel rectal pressure, as if you have to move your bowels.
- Discharge. There›s often a lot of bloody discharge.
- Nausea. You may feel nauseated or even vomit.
- An urge to push. Some babies descend earlier and the mom feels the urge to push before she›s fully dilated. Other babies descend later and the mom reaches full dilation without feeling pressure. If you›ve had an epidural, the pressure you'll feel will depend on the type and amount of medication you're getting and how low your baby is in your pelvis.

Remember

Some people have their baby by a planned or unplanned cesarean birth (c-section). Instead of pushing your baby out through your vagina, a healthcare provider makes a cut in your belly and uterus to remove your baby.

Second stage of labor

Once your cervix is fully dilated, the second stage of labor begins: pushing and the final descent and birth of your baby.

The entire second stage can last anywhere from a few minutes to several hours.

What to expect:

- More spaced-out contractions. At the beginning of the second stage, your contractions may be a little further

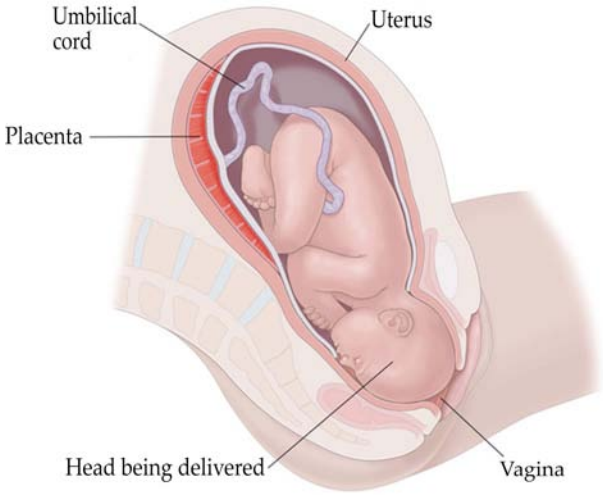
apart, giving you the chance for a much-needed rest between them.

- Less intensity as pushing begins. Many women find their contractions in the second stage easier to handle than the contractions in active labor because bearing down offers some relief. Others don't like the sensation of pushing.
- The urge to push. As your uterus contracts, it exerts pressure on your baby, moving them down the birth canal. If your baby is very low in your pelvis, you may feel an urge to push early in the second stage (and sometimes even before). But if your baby's still relatively high, you probably won't have this sensation right away.
- You might want to take it slow. If everything›s going well, you might want to take it slowly and let your uterus do the work until you feel the urge to push. Waiting a while may leave you less exhausted in the end.
- You may be instructed to push. In many hospitals it›s routine to coach women to push with each contraction in an effort to speed up the baby›s descent. Let your caregiver know if you›d prefer to wait until you feel a spontaneous urge to bear down. This practice, known as laboring down, has been shown to be as effective as coached pushing, although delivery may take a little longer.
- Epidurals can reduce the urge to push**.** If you have an **epidural**, the loss of sensation can blunt the urge to push, so you may not feel it until your baby's head has descended quite a bit. You may need explicit directions to help you push effectively.

An **epidural** is an injection in your back to stop you feeling pain in part of your body.

With each contraction, the force of your uterus – combined with the force of your abdominal muscles if you're actively pushing – exerts pressure on your baby to continue to move down the birth canal. The descent may be rapid. Or, especially if this is your first baby, the descent may be gradual.

When a contraction is over and your uterus is relaxed, your baby's head will recede slightly in a "two steps forward, one step back" kind of progression.

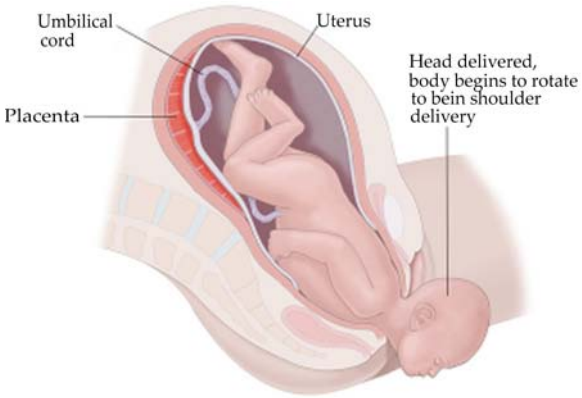


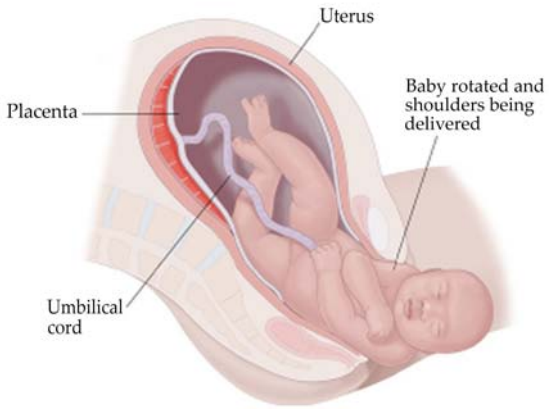
Crowning

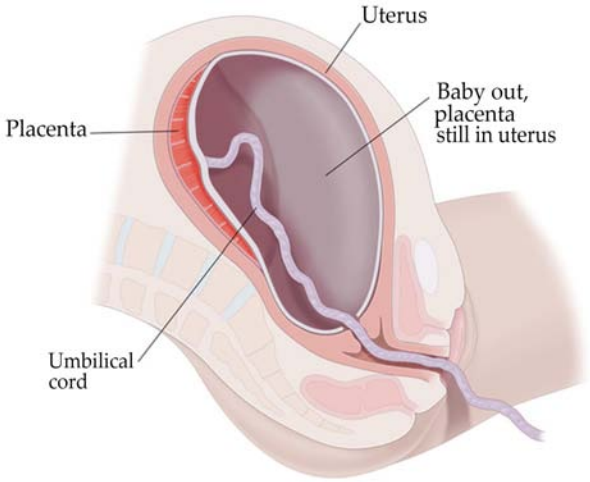
What to expect:

- Your baby's scalp will appear. After a time, your perineum (the tissue between your vagina and anus) will begin to bulge with each push, and before long your baby›s scalp will become visible – a very exciting moment and a sign that the end is in sight. You can ask for a mirror to get that first glimpse of your baby, or you may want to reach down and touch the top of their head.
- A powerful pushing urge. Now the urge to push becomes even stronger. With each contraction, more and more of your baby›s head becomes visible. The pressure of their head on your perineum feels very intense, and you may notice a strong burning or stinging sensation as your tissue begins to stretch. This is called «the ring of fire," and it lasts just a few minutes.
- Instructions to slow down or pant. At some point, your caregiver may ask you to push more gently or to stop pushing altogether so your baby›s head has a chance to gradually stretch out your vaginal opening and perineum. A slow, controlled delivery can help prevent perineal tearing. By now, the urge to push may be so overwhelming that you'll be coached to blow or pant during contractions to help counter it. Sometimes, gently coughing instead of pushing can result in a slower, easier descent of your baby's head.

- The whole head appears. Your baby's head continues to advance with each push until it crowns – that's when the widest part of their head is finally visible. The excitement in the room will grow as your baby's face begins to appear: their forehead, their nose, their mouth, and, finally, their chin.
- Provider removes any blockages. After your baby's head emerges, your doctor or midwife may suction their mouth and nose and will feel around their neck for the umbilical cord. If the cord is around your baby›s neck, your caregiver will either slip it over their head or, if need be, clamp and cut it.
- The body emerges. Your baby›s head then turns to the side as their shoulders rotate inside your pelvis to get into position for their exit. With the next contraction, you'll be coached to push as their shoulders emerge, one at a time, followed by their body.







Third stage of labor

Minutes after giving birth, your uterus begins to contract again. The first few contractions usually separate the placenta from your uterine wall.

When your caregiver sees signs of separation, they may ask you to gently push to help expel the placenta. This is usually one short push that's not at all difficult or painful. On average, the third stage of labor lasts just five or six minutes, with 90 percent of placentas delivered by 15 minutes from the birth of your baby.

If the placenta is still attached 30 minutes after birth (or sooner if there's heavy bleeding), your provider might need to take action to assist in its delivery. This might mean giving you a drug to help your uterus contract, massaging the top of the uterus to encourage placental separation, or gently tugging on the umbilical cord.

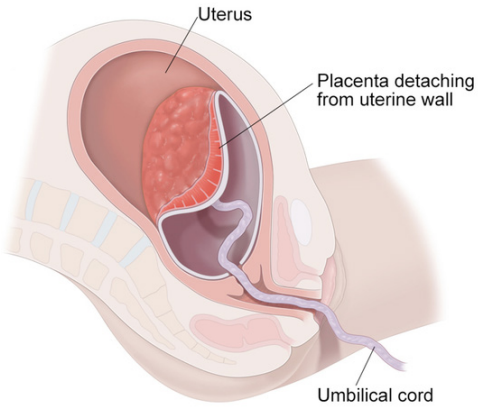
In the meantime, nurses and doctors will be caring for your baby:

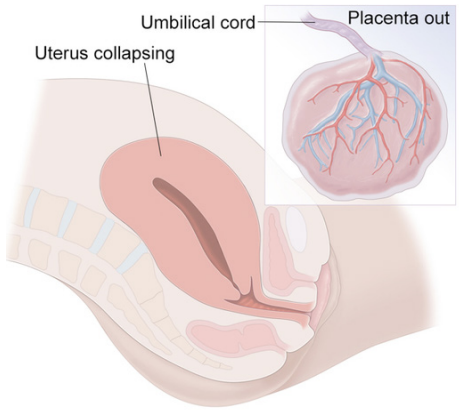
- They need to be dried off with a towel and kept warm.
- Your doctor or midwife may quickly suction your baby's mouth and nasal passages if they seem to have a lot of mucus.
- If there are no complications, they'll be lifted onto your bare belly so you can touch, kiss, and simply marvel at

them. Skin-to-skin contact will keep your baby nice and toasty, and they›ll be covered with a warm blanket – and perhaps given their first hat – to prevent heat loss.

- Your caregiver will clamp the umbilical cord in two places and then cut between the two clamps – or your partner can do the honors.

You may feel a wide range of emotions now: euphoria, awe, pride, disbelief, excitement (to name a few), and, of course, intense relief that it's almost over. Exhausted as you may be, you'll also probably feel a burst of energy.





What happens after you give birth

- Your uterus contracts. After you deliver the placenta, your uterus should contract and get very firm. You›ll be able to feel the top of it in your belly, around the level of your navel. Your caregiver, and later your nurse,

will periodically check to see that your uterus remains firm, and massage it if it isn›t. This is important because the contraction of the uterus helps cut off and collapse the open blood vessels at the site where the placenta was attached. If your uterus doesn›t contract properly, you may suffer from a postpartum hemorrhage as you continue to bleed profusely from those vessels.

- You can try breastfeeding. If you›re planning to breastfeed, start now if you can. Not all babies are eager to nurse in the minutes after birth, but try holding your baby's lips close to your breast for a little while. Most babies will eventually begin to nurse in the first hour or so after birth if given the chance. Early nursing is good for your baby. What's more, nursing triggers the release of oxytocin, the same hormone that causes contractions, which helps your uterus stay firm and contracted.
- You may receive oxytocin or other treatments. You may be given oxytocin to help your uterus contract. (Many providers routinely give it to all women at this point). If you›re bleeding excessively, you›ll be treated for that as well.
- Contractions will subside. Your contractions at this point are relatively mild. If this is your first baby, you may feel only a few contractions after you›ve delivered the placenta. If you›ve had a baby before, you may continue to feel occasional contractions for the next day or two. These so-called afterbirth pains can feel like strong menstrual cramps. If they bother you, ask for pain medication such as ibuprofen, which is very effective against this crampy pain and safe for you to take, even if you're breastfeeding.
- You may also have the chills or feel very shaky. Postpartum chills are perfectly normal and won›t last long. Don›t hesitate to ask for a warm blanket if you need one.
- Your caregiver will examine the placenta to make sure it›s all there. Then they›ll check you thoroughly to spot any tears in your perineum that need to be stitched.
- If you tore or had an episiotomy, you›ll get an injection of a local anesthetic before being sutured.

- If you had an epidural, an anesthesiologist or nurse anesthetist will come by and remove the catheter from your back. This takes just a second and doesn't hurt.

Unless your baby needs special care, you'll spend some quiet time together. You and your partner or other loved ones can share this special time as you get acquainted with your new little miracle.

Remember

All people experience the three stages of labor differently. Knowing what to expect during each phase can help you stay calm.

4.2 MANAGEMENT OF LABOUR

Active management of normal labour aims to achieve delivery of a normal healthy child with minimal physical and psychological maternal effects.

Early anticipation, recognition and management of any abnormalities during labour course.

4.2.1 First Stage of Labour

- History:
  - Complete obstetric history.
  - History of present pregnancy:
    - Duration of pregnancy.
    - Medical disorders during this pregnancy.
    - Complications during this pregnancy as antepartum haemorrhage.
  - History of present labour:
    - Labour pains: onset, frequency and duration.
    - Passage of "show", fluid or blood per vaginum.
    - Sensation of foetal movement.
- Examination:
  - General examination:
    - Height and built.
    - Maternal vital signs: pulse, temperature and blood pressure.

- Chest and heart examination.
- Lower limbs for oedema.

- Abdominal examination:
  - Fundal level.
  - Fundal grip.
  - Umbilical grip.
  - Pelvic grips.
  - FHS.
  - Scar of previous operations (e.g. C.S, myomectomy or hysterotomy).
- Pelvic examination:
  - Cervix:
    - Dilatation: the diameter of the external os is measured by the finger (s) during P/V examination and expressed in cm, one finger = 2 cm, 2 fingers = 4 cm and the distance resulted from their separation is added to the 4 cm in more dilatation.
    - Effacement.
    - Position (posterior, midway, central).
  - Membranes: ruptured or intact. If ruptured exclude cord prolapse and meconium stained liquor.
  - Presenting part and its position.
  - Station: of the presenting part.
  - Pelvic capacity.
- Investigations: If not done before or if indicated:
  - Blood group-Rh typing.

- Urine for albumin and sugar.
- Hb%.
- Ultrasonography.

- Active procedures:
  - Evacuation of the rectum by enema to;
    - avoid uterine inertia,
    - help the descent of the presenting part,
    - avoid contamination by faeces during delivery.
  - Evacuation of the bladder:
    - ask the patient to micturate every 2-3 hours, if she cannot use a catheter.
    - It prevents uterine inertia and helps descent of the presenting part.
  - Preparation of the vulva:
    - Shave the vulva, clean it with soap and warm water from above downwards, swab it with antiseptic lotion and apply a sterile pad.
  - Nutrition:
    - When labour is established no oral feeding is allowed, but sips of water.
    - 15 ml magnesium trisilicate is given every 2 hours as an oral antacid to guard against bronchospasm occurs if the acid vomitus is inhaled during general anaesthesia "Mendelson's syndrome". Antacid injections may be used instead.
    - If labour is delayed more than 8 hours, IV drip of glucose 5% or saline-glucose solution is given.
  - Posture:
    - Patient is allowed to walk during the early first stage particularly with intact membranes.

- If rest is needed the patient lies on her left lateral position to prevent inferior vena cava compression and hence placental insufficiency and foetal distress.

- Analgesia:
  - Pethidine 100 mg IM,
  - trilene inhalation, or
  - epidural anaesthesia are the most common use.
  - N.B. Patient should not bear down during the first stage as this is useless, exhausts the patient and predisposes to genital prolapse.

- The partogram:
  - It is the graphic recording of the course of labour including the following observations:
    - The mother:
      - Pulse every 30 minutes,
      - blood pressure every 2 hours,
      - temperature every 4 hours,
      - uterine contractions: frequency, strength and duration every 30 minutes by manual palpation or better by tocography if available,
      - cervical dilatation,
      - fluid input and output,
      - drugs including oxytocins.
    - The foetus
      - FHR every 15 minutes by Pinard's stethoscope or better by doptone,

- descent of the presenting part,
- degree of moulding.

- Cardiotocography if available is more valuable for continuous monitoring of both uterine contractions and FHR particularly in high risk pregnancy.
- The advantages of the partogram:
  - Allows right intervention in the proper time e.g. oxytocin usage, instrumental delivery or C.S.
  - Allows different staff shifts to manage the case successively.
  - A document for labour events.

4.2.2 Second Stage of Labour

Its beginning is identified by:

- The patient feels the desire to defecate.
- The contractions become more prolonged and painful.
- Reflex desire to bear down during the contractions.
- The expulsive effort is accompanied by sustained expiratory grunt.
- Rupture of membranes, although this is not specific as it may occur earlier even before start of labour " prelabour rupture of membranes" or later even to the degree that the foetus is delivered in an intact sac.
- Full dilatation of the cervix (10 cm) in between uterine contractions is the most sure sign.

Delivery room

- The patient is transferred on a wheel or trolley to the delivery room.
- Put her in the lithotomy position.

- The lower abdomen, upper parts of the thighs, vulva and perineum are swabbed with antiseptic lotion.
- Sterile legs and towels are applied.

Bearing down

Ask the patient to bear down during contractions and relax in between.

Delivery of the head

The main aim during delivery of the head is to prevent perineal lacerations through the following instructions:

- i) Support of the perineum:
  - When the labia start to separate by the head, a sterile pad is placed over the perineum and press on it with the right hand during uterine contractions. This is continued until crowning occurs to maintain flexion of the head.
- Crowning:
  - is the permanent distension of the vulval ring by the foetal head like a crown on the head. The head does not recede back in between uterine contractions.
  - This means that the biparietal diameter is just passed the vulval ring and the occipital prominence escapes under the symphysis pubis.
  - After crowning, allow slow extension of the head so the vulva is distended by the suboccipito frontal diameter 10 cm.
  - If the head is allowed to extend before crowning the vulva will be distended by the occipito-frontal 11.5 cm increasing the incidence of perineal lacerations.
  - Ritgen manoeuvre: upward pressure on the perineum by the right hand and downward pressure on the occiput by the left hand to control the extension of the head.
- Episiotomy:
  - It is done at crowning when the perineum is stretched to the degree that it is about to tear.

- Swab and aspirate:
  - the mouth and nose once the head is delivered before respiration is initiated and the liquor, meconium or blood is inhaled.
- Coils of the umbilical cord:
  - if present around the neck are slipped over the head but if tight or multiple they are cut between 2 clamps.

Delivery of the shoulders

Gentle downward traction is applied to the head till the anterior shoulder slips under the symphysis pubis. The head is lifted upwards to deliver the posterior shoulder first then downwards to deliver the anterior shoulder.

Delivery of the remainder of the body

Usually slips without difficulty otherwise gentle traction is applied to complete delivery.

Clamping the cord

The baby is held by its ankles with the head downwards at a lower level than its mother for few seconds. This is contraindicated in:

- Preterm babies.
- Erythroblastosis foetalis.
- Suspicion of intracranial haemorrhage.

This may be enhanced by milking the cord towards the baby, to add about 100 ml of blood to its circulation. The cord is divided between 2 clamps to avoid bleeding from a possible 2nd uniovular twin.

4.2.3 Third Stage of Labour

Delivery of the placenta

Conservative method:

- Put the ulnar border of the left hand just above the fundus at the level of the umbilicus to detect any bleeding

inside the uterus known by rising level of the atonic uterus.

- Wait for signs of placental separation and descent but do not massage the uterus.
- As soon as they are detected massage the uterus to induce its contraction, ask the patient to bear down and push the uterus downwards to deliver the placenta.
- Hold the placenta between the two hands and roll it to make the membranes like a rope in order not to miss a part of it.
- Give ergometrine 0.5 mg or oxytocin 5 units IM after delivery of the placenta to help uterine contraction and minimise blood loss. These may be given before delivery of the placenta.

Signs of placental separation and descent:

- The body of the uterus becomes smaller, harder and globular.
- The fundal level rises as the upper segment overrides the lower uterine segment which is now distended with the placenta.
- Suprapubic bulge due to presence of the placenta in the lower uterine segment.
- Elongation of the cord particularly on pressing on the uterine fundus and it does not recede back into the vagina on relieving the pressure.
- Gush of blood from the vagina.

The active method (Brandt- Andrews method):

- With delivery of the anterior shoulder, 0.5 mg ergometrine or syntometrine (0.5 mg ergometrine + 5 units oxytocin) is given IM.
- When the uterus contracts, put the left hand suprapubic and push the uterus upwards while gentle downward and backward traction is applied on the cord by the right hand when the placenta is delivered it is rolled as in the conservative method.
- Advantage: reduction of the blood loss.
- Disadvantages:

- Constriction ring may occur with retention of the placenta.
- Avulsion of the cord if undue pressure is applied.
- Inversion of the uterus if fundus is pressed while the uterus is lax.

Routine examinations

- Examination of the placenta and membranes:
  - by exploring it on a plain surface to be sure that it is complete. If there is missed part, exploration of the uterus is done under general anaesthesia.
- Explore the genital tract:
  - For any lacerations that should be immediately repaired.

Repair of episiotomy

4.2.4 Fourth Stage of Labour

Observation for the patient particularly atony of the uterus and vaginal bleeding.

4.2.5 Care of the Newborn

Clearance of the air passages

Remember

Monitoring of fetal heart rate should be a routine practice to ensure fetal well being during the process of labor.

- The newborn is placed in supine position with the head lower down. A metal, rubber or better disposable plastic catheter is used to aspirate the mucus from the pharynx and mouth directly by the physician's mouth or by attach it to an electric suction pump.
- Crying of the baby is usually occurs within seconds, if delayed slapping its soles, flexion and extension of the legs and rubbing the back usually stimulate breathing.

Apgar score

Is calculated at 1 and 5 minutes and further steps of resuscitation are arranged according to it (see later).

The umbilical cord

- A disposable plastic umbilical clamp is applied about 5 cm from the umbilicus to avoid the possibility of tying an umbilical hernia then cut about 1.5 cm distal to the clamp. Inspect for bleeding and paint it with alcohol.
- If the plastic umbilical clamp is not available, 2 ligatures of silk are applied instead of it.
- The umbilical stump is painted daily with an antiseptic till its fall within 10 days.

Congenital anomalies

The newborn is examined for injuries or congenital anomalies as imperforate anus, hypospadias (not to be circumcised as the cut skin will be used in the repair later on), cyanotic heart diseases.... etc.

Weight: the newborn and record it.

Dressing

Dressing as well as all previous procedures should be done in a warm place better under radiant warmer to prevent heat loss which occurs rapidly after delivery increasing the metabolism and acidosis.

Care of the eyes

An antibiotic eye drops as chloramphenicol are instilled into the eyes as a prophylaxis against ophthalmia neonatorum.

Identification

Identification of the baby by a plastic bracelet on which its mother's name is written.

Did You Know?

Approximately 90% of the stress and anxiety women experience during pregnancy is related to the process of childbirth and its risks.

CASE STUDY

CHALTU'S STORY



Chaltu came to the maternal health risk assessment clinic at Ganji when she was 34 weeks pregnant. Her last pregnancy had ended in a stillbirth at home and, even though it was a two hour walk from her village, she was intending to come to the health clinic for this delivery. Chaltu was surprised to be told that she was in fact expecting twins. In rural Ethiopia childbirth can be hazardous and even more so when twins are expected. Without the support of a skilled midwife or doctor at time of delivery, babies can die as a result of long and obstructed labour and the mother's life can also be at risk.

Using a portable ultrasound machine, the professional volunteer from Maternity Worldwide was able to show Chaltu that one of the babies was in a transverse position (that is lying across the uterus) while the other was breech (lying feet down). This meant that Chaltu would almost certainly require a caesarean section and she was advised to come to the hospital in 3 weeks time. When she arrived at the hospital the babies were found to still be in the same positions. A caesarean was carried out and Chaltu safely delivered two healthy babies, a boy of 1.9 kg and a girl of 1.7kg. Four days later Chaltu, her husband and the twins were able to return to their village.

In rural Ethiopia women are often discharged quite early after their caesarean sections. Many families live in small and remote villages considerable distances from the nearest health post or clinic making it difficult for mothers to get post natal care and information about both maternal and child health. Two weeks after they had returned home from the hospital, Chaltu's husband made the long journey to the health centre to get advice as he was concerned about his wife's condition. Chaltu had been experiencing considerable pain around her caesarean scar and was struggling to produce enough milk for the two babies. Having assessed all the information, the Maternity Worldwide volunteer advised Chaltu's husband to ensure his wife got plenty of rest, food and fluids.

Two days later Chaltu's husband returned to the clinic as he was still concerned about his wife. At the end of the ante natal care clinic she was running, the Maternity Worldwide volunteer drove over to the family's home with him. Chaltu was clearly tired and anxious. She was in some pain around her operation scar but this was healing well despite a minor infection. Chaltu was given some antibiotics for the infection, iron and vitamin tablets to increase her energy levels and some pain killers. The twins were doing well and Chaltu was producing enough milk for them.

Due to Maternity Worldwide's programme of running a cycle of maternal health clinics in rural communities, Chaltu and her family were able to get the reassurance, support and medicines that they needed for both the mother and her babies to thrive.

SUMMARY

- Labor is the last few hours of human pregnancy. It is characterized by forceful and painful uterine contractions that effect cervical dilation and cause the fetus to descend through the birth canal. Extensive preparations take place in both the uterus and cervix long before this.
- The physiological processes that regulate *parturition*—the bringing forth of young—and the onset of labor continue to be defined. Three general contemporaneous theories describe labor initiation.
- In many species, the role of sex steroid hormones is clear— estrogen promotes and progesterone inhibits the events leading to parturition.
- The balance between myometrial relaxation and contraction is controlled by steroid- and peptide-hormone transcriptional regulation of key genes and their protein products.
- To prepare for labor, the myometrial tranquility of phase 1 of parturition must be suspended—so-called *uterine awakening* or *activation.*
- In some nonhuman species, the cascades of events that allow cervical ripening are induced by dropping serum progesterone concentrations. And in humans, administration of progesterone antagonists causes cervical ripening.
- The process of labor and delivery is divided into three stages. The first stage of labor begins when you start having contractions, and ends when your cervix is fully dilated (open).
- Once your cervix is fully dilated, the second stage of labor begins: pushing and the final descent and birth of your baby.
- Active management of normal labour aims to achieve delivery of a normal healthy child with minimal physical and psychological maternal effects.

MULTIPLE CHOICE QUESTIONS

1. Stage 1 of labor includes which phases in the correct order?*

a. Transition, Latent, Active

b. Active, Latent, Transition

c. Active, Transition, Latent

d. Latent, Active, Transition

2. True or False: Stage 2 of labor begins with the delivery of the baby and ends with the delivery of the placenta.*

a. True

b. False

3. **You're performing a routine assessment on a mother post-delivery. The uterus is soft and displaced to the left of the umbilicus. What is your next nursing action?***
   a. Perform fundal massage and assist the patient to the bathroom.
   b. Continue to monitor the mother. This is a normal finding post-delivery.
   c. Notify the physician.
   d. Administer PRN dose of Pitocin as ordered by the physician.
4. **In stage 1 of labor, during the active phase, the cervix dilates?***
   a. 1-3 cm
   b. 7-10 cm
   c. 4-7 cm
   d. 8-10 cm
5. **What statement is FALSE about the transition phase of stage 1?***
   a. The mother may experience intense pain, irritation, nausea, and deep concentration.
   b. The transition phase is the longest phase of stage 1 and contractions are very intense and long in duration.
   c. The cervix will dilate from 8 to 10 cm.
   d. The transition phase ends and progresses to stage 2 of labor when the cervix has dilated to 10 cm.
6. **Your laboring patient has transitioned to stage 2 of labor. What changes in the perineum indicate the birth of the baby is imminent?***
   a. Increase in meconium-stained fluid and retracting perineum
   b. Retracting perineum and anus with an increase of bloody show
   c. Rapid and intense contractions
   d. Bulging perineum and rectum with an increase in bloody show
7. **True or False: Stage 4 of labor starts with the full delivery of the baby and ends with the full delivery of the placenta.***
   a. True
   b. False
8. **The mother has delivered the placenta. You note that the shiny surface of the placenta was delivered first. What delivery mechanism is this known as AND is this the maternal or baby's surface of the placenta?***
   a. Duncan mechanism, maternal
   b. Schultze mechanism, maternal
   c. Schultze mechanism, baby

d. Duncan mechanism, baby

9. After birth, where do you expect to assess fundal height?*

a. At the xiphoid process

b. 5 cm below the umbilicus

c. 2 cm above the pubic symphysis

d. At or near the umbilicus

10. During stage 3 of labor, you note a gush of blood and that the uterus changes shape from an oval shape to globular shape. This indicates?*

a. Postpartum hemorrhage

b. Imminent delivery of the baby

c. Signs of placental separation

d. Answers B and C

REVIEW QUESTIONS

1. What are the labour stages and its physiology?
2. What is the first stage of labor?
3. Differentiate between early labor and active labor.
4. How is each stage of labor managed?
5. What are the steps of management of labour?

Answers

1. (d)	2. (b)	3. (a)	4. (c)	5. (b)
6. (d)	7. (b)	8. (c)	9. (d)	10. (c)

REFERENCES

1. Aasheim V, et al: Perineal techniques during the second stage of labour for reducing perineal trauma. Cochrane Database Syst Rev 6:CD006672, 2017. doi: 10.1002/14651858.CD006672.pub3
2. Jones L, Othman M, Dowswell T, Alfirevic Z, Gates S, Newburn M, Jordan S, Lavender T, Neilson JP. Pain management for women in labour: an overview of systematic reviews. Cochrane database of systematic reviews. 2012(3).
3. Gupta JK, Sood A, Hofmeyr GJ, et al: Position in the second stage of labour for women without epidural anaesthesia. Cochrane Database Syst Rev 5:CD002006, 2017. doi: 10.1002/14651858.CD002006.pub4

4. Lawrence A, Lewis L, Hofmeyr GJ, Styles C: Maternal positions and mobility during first stage labour. Cochrane Database Syst Rev (8):CD003934, 2013. doi: 10.1002/14651858.CD003934.pub3
5. Lemos A, Amorim MM, Dornelas de Andrade A, et al: Pushing/bearing down methods for the second stage of labour. Cochrane Database Syst Rev. 3:CD009124, 2017. doi: 10.1002/14651858.CD009124.pub3



CHAPTER 5

Assessment and Management of Women during Post Natal Period

"The natural state of motherhood is unselfishness. When you become a mother, you are no longer the center of your own universe. You relinquish that position to your children."

—*Jessica Lange*

LEARNING OBJECTIVES

After studying this chapter, you will be able to:

1. Examine the physical assessment of women during postnatal period
2. Learn about the management of pain during postnatal period
3. Find the breastfeeding support and management during postnatal period
4. Access the nutritional assessment and support during postnatal period

INTRODUCTION

The postnatal period refers to the time after childbirth during which the mother and baby recover from the birth process and adapt to their new roles. This period can be divided into three phases: the first 24 hours after birth, the first week after birth, and the first six weeks after birth. During this period, it is important to assess and manage women to ensure that they are recovering well and to identify any potential complications.

Assessment:

1. Vital signs: The woman's blood pressure, heart rate, respiratory rate, and temperature should be monitored regularly to detect any signs of infection or other complications.
2. Lochia: The amount and type of vaginal discharge should be assessed to ensure that the woman is healing properly.
3. Breastfeeding: The woman's breastfeeding technique and milk production should be assessed to ensure that the baby is getting enough milk and that the mother is not experiencing any discomfort.
4. Pain: The woman's pain level should be assessed regularly, and pain relief measures should be provided as needed.
5. Emotional well-being: The woman's emotional well-being should be assessed, and support should be provided as needed.

Management:

1. Pain relief: Appropriate pain relief measures, such as non-steroidal anti-inflammatory drugs (NSAIDs) or opioids, should be provided as needed.
2. Wound care: The perineal area and any incisions should be kept clean and dry to prevent infection.
3. Breastfeeding support: Women should be encouraged to breastfeed and provided with support and education to ensure successful breastfeeding.
4. Nutrition: Women should be encouraged to eat a healthy diet and stay hydrated to support healing and recovery.
5. Postpartum exercise: Women should be encouraged to gradually resume exercise as recommended by their healthcare provider to promote physical and emotional well-being.

In addition, women should be educated about warning signs of potential complications, such as fever, heavy bleeding, severe pain, or signs of depression, and encouraged to seek medical attention if these symptoms occur. With proper assessment and management, women can have a safe and healthy postnatal period.

5.1 PHYSICAL ASSESSMENT OF WOMEN DURING POSTNATAL PERIOD

Physical assessment of women during the postnatal period is crucial to ensure their well-being and identify any potential complications. The physical assessment should include a comprehensive examination of the woman's body, including vital signs, cardiovascular and respiratory systems, breast and abdominal examination, perineal and genital examination, musculoskeletal system, and emotional well-being.

One of the primary goals of the physical assessment during the postnatal period is to monitor the woman's vital signs, including her blood pressure, pulse rate, respiratory rate, and temperature. This assessment helps identify any early signs of infection, such as fever or an elevated pulse rate, which can occur following childbirth. It is recommended to take vital signs every 4 hours during the first 24 hours postpartum, and then every 8 hours for the next 48 hours.

Another important aspect of the physical assessment during the postnatal period is a cardiovascular and respiratory examination. This assessment helps identify any potential cardiac or respiratory complications that may have occurred during childbirth or postpartum. The assessment should include auscultation of the heart and lungs, checking for edema, and observing the woman's breathing patterns.

The breast examination should be conducted to assess the woman's milk production, any signs of engorgement, and any discomfort or pain. The nipples should also be assessed for any signs of cracking or bleeding. Education on proper breastfeeding techniques, position, and latch should be provided, and any concerns or difficulties should be addressed.

The abdominal examination is essential to assess the size and consistency of the uterus, check for any signs of distention, and assess for any tenderness or pain. The uterus should be firm and descending gradually, and the fundus should be at the level of the umbilicus. Any excessive bleeding or clots should be noted and reported.



The perineal and genital examination should be conducted to assess any lacerations or tears that may have occurred during childbirth, and to monitor any episiotomy repair or wound healing. The examination should also assess any signs of hemorrhoids or thrombosis, vaginal or perineal swelling or bruising, and the presence of lochia (vaginal discharge).

The musculoskeletal assessment is essential to identify any potential postnatal musculoskeletal complications such as low back pain, sacroiliac joint dysfunction, or pubic symphysis pain. The woman's posture and gait should be assessed, and recommendations for postnatal exercises and physical therapy should be provided as needed.

The emotional well-being of the woman should also be assessed during the physical examination. The woman may be experiencing feelings of anxiety, depression, or exhaustion, which can affect her ability to care for herself and her newborn. Screening tools such as the Edinburgh Postnatal Depression Scale can be used to identify postnatal depression symptoms.

In summary, the physical assessment of women during the postnatal period should include a comprehensive examination of the woman's body, including vital signs, cardiovascular and respiratory systems, breast and abdominal examination, perineal and genital

examination, musculoskeletal system, and emotional well-being. This assessment helps identify any potential complications and allows for early intervention to promote the woman's physical and emotional recovery.

5.1.1 Vital Sign Monitoring

Vital sign monitoring is an essential component of the physical assessment of women during the postnatal period. Vital signs are objective measures of a woman's physiological status, which can help identify potential complications or changes in health status. The vital signs that are commonly monitored during the postnatal period include blood pressure, pulse rate, respiratory rate, and temperature.

Blood pressure is an essential vital sign to monitor during the postnatal period, as it can help identify potential complications such as preeclampsia or postpartum hemorrhage. Blood pressure should be measured at regular intervals, usually every 4 hours during the first 24 hours after delivery and then every 8 hours for the next 48 hours, or as per the facility protocols. If the woman has a history of hypertension or other cardiovascular diseases, the frequency of blood pressure monitoring may be increased.

Pulse rate is another vital sign that is monitored during the postnatal period. An elevated pulse rate can indicate pain, fever, or infection, which are common postpartum complications. Normal pulse rate ranges from 60 to 100 beats per minute in adults, and any significant deviation from this range should be monitored and reported to the healthcare provider.

Respiratory rate is also monitored during the postnatal period. An elevated respiratory rate can indicate respiratory distress or infection. Normal respiratory rate ranges from 12 to 20 breaths per minute in adults. Any significant deviation from this range should be reported to the healthcare provider.

Temperature monitoring is an important aspect of vital sign monitoring during the postnatal period. An elevated temperature can indicate infection, which is common in the postnatal period. The normal body temperature for adults ranges from 36.5°C to 37.5°C (97.7°F to 99.5°F). Temperature should be measured at regular intervals, usually every 4 hours during the first 24 hours

after delivery and then every 8 hours for the next 48 hours or as per the facility protocols.

In summary, vital sign monitoring is an essential component of the physical assessment of women during the postnatal period. Monitoring of blood pressure, pulse rate, respiratory rate, and temperature at regular intervals can help identify potential complications or changes in health status and allows for early intervention to promote the woman's physical and **emotional recovery**.

Emotional recovery is an important aspect of the postnatal period, as women may experience a range of emotions after giving birth.

5.1.2 Cardiovascular and Respiratory Assessment of Women

Cardiovascular and respiratory assessments are essential components of the physical assessment of women during the postnatal period. The cardiovascular and respiratory systems are closely linked, and changes in one system can affect the other. A thorough assessment of these systems can help identify potential complications or changes in health status and allows for early intervention to promote the woman's physical and emotional recovery.

Cardiovascular Assessment: The cardiovascular system undergoes significant changes during pregnancy and the postnatal period. The volume of blood in the woman's body increases during pregnancy, and the heart has to work harder to circulate blood to the growing fetus. After delivery, the woman's body undergoes several physiological changes, including a decrease in blood volume and a decrease in hormone levels. These changes can affect the cardiovascular system and increase the risk of complications such as postpartum hemorrhage, deep vein thrombosis, and preeclampsia.

During the postnatal assessment, the healthcare provider should assess the woman's heart rate, rhythm, and blood pressure. They should also monitor for signs of complications such as bleeding, shortness of breath, chest pain, or swelling in the extremities. The healthcare provider may also order additional tests, such as an electrocardiogram or echocardiogram, to assess the woman's cardiovascular status.

Respiratory Assessment: The respiratory system also undergoes changes during pregnancy and the postnatal period. The growing fetus can put pressure on the woman's diaphragm, making it difficult for her to breathe. After delivery, the woman's body undergoes several physiological changes, including a decrease in hormone levels and an increase in lung capacity. These changes can affect the respiratory system and increase the risk of complications such as pulmonary embolism, pneumonia, or respiratory distress.

During the postnatal assessment, the healthcare provider should assess the woman's respiratory rate, rhythm, and lung sounds. They should also monitor for signs of complications such as shortness of breath, chest pain, or coughing. The healthcare provider may also order additional tests, such as a chest x-ray or pulmonary function tests, to assess the woman's respiratory status.

Cardiovascular and respiratory assessments are essential components of the physical assessment of women during the postnatal period. These assessments can help identify potential complications or changes in health status and allows for early intervention to promote the woman's physical and emotional recovery.

5.1.3 Breast Examination and Management

Breast examination and management are essential components of the physical assessment of women during the postnatal period. The postnatal period is a critical time for breastfeeding, and the healthcare provider should assess the woman's breast health and provide support and guidance to promote successful breastfeeding.

Breast Examination: During the postnatal assessment, the healthcare provider should assess the woman's breast health, including breast engorgement, nipple tenderness, and signs of infection. The healthcare provider should also evaluate the woman's milk supply and provide guidance on proper breastfeeding techniques.

Breast engorgement is a common postnatal complication, and it occurs when the woman's breasts become overly full with milk.

This can cause discomfort, pain, and difficulty breastfeeding. The healthcare provider should assess the woman's breasts for engorgement and provide guidance on proper breastfeeding techniques, such as frequent feeding, proper latching, and the use of warm compresses. Nipple tenderness is another common postnatal complication, and it occurs when the woman's nipples become sore or painful due to breastfeeding. The healthcare provider should assess the woman's nipples for tenderness and provide guidance on proper breastfeeding techniques, such as proper latching and the use of nipple shields or lanolin cream.

Signs of infection, such as redness, warmth, or discharge from the breast, should also be assessed. These can indicate mastitis, a breast infection that can cause flu-like symptoms, and requires prompt medical attention.

Breast Management: Proper breast management is essential to promote successful breastfeeding and prevent complications. The healthcare provider should provide guidance on proper breastfeeding techniques, such as proper latching, frequent feeding, and breast massage to promote milk flow.

The healthcare provider should also provide guidance on breast care, such as proper breast hygiene, the use of breast pads to prevent leaking, and the use of breast pumps to relieve engorgement or increase milk supply.

If the woman experiences complications such as engorgement or mastitis, the healthcare provider may recommend the use of warm compresses, breast massage, or the use of medication to alleviate symptoms.

In summary, breast examination and management are essential components of the physical assessment of women during the postnatal period. Proper breast care and management can promote successful breastfeeding and prevent complications, while prompt identification and management of complications can ensure the woman's physical and emotional recovery.

5.1.4 Abdominal Examination and Management

Abdominal examination and management are important components of the physical assessment of women during the postnatal period. The postnatal period is a critical time for the

woman's abdominal health, as the uterus undergoes significant changes after delivery. The healthcare provider should assess the woman's abdominal health and provide support and guidance to promote her physical and emotional recovery.

Abdominal Examination: During the postnatal assessment, the healthcare provider should assess the woman's abdominal health, including uterine involution, abdominal incision healing, and signs of infection. The healthcare provider should also evaluate the woman's bladder and bowel function.

Uterine involution is the process by which the uterus returns to its pre-pregnancy size and shape. The healthcare provider should assess the woman's uterus for size and position, as well as for signs of abnormal bleeding, such as excessive bleeding or clots.

If the woman has had a cesarean delivery, the healthcare provider should assess the incision site for healing and signs of infection, such as redness, swelling, or discharge.

The healthcare provider should also evaluate the woman's bladder and bowel function, as these can be affected by delivery and can cause discomfort or complications if not properly managed.

Abdominal Management: Proper abdominal management is essential to promote the woman's physical and emotional recovery. The healthcare provider should provide guidance on proper self-care techniques, such as proper hygiene, rest, and nutrition.

The healthcare provider should also provide guidance on proper pain management, such as the use of pain medication or non-pharmacological interventions, such as heat or ice packs.

If the woman has had a cesarean delivery, the healthcare provider should provide guidance on proper incision care, such as keeping the incision clean and dry and avoiding strenuous activity.

The healthcare provider should also provide guidance on proper bladder and bowel management, such as maintaining regular bowel movements, drinking plenty of fluids, and avoiding constipation.

Abdominal examination and management are important components of the physical assessment of women during the postnatal period. Proper abdominal care and management can promote the woman's physical and emotional recovery, while prompt identification and management of complications can ensure optimal health outcomes.

5.1.5 Musculoskeletal Assessment and Management

Musculoskeletal assessment and management are important components of the physical assessment of women during the postnatal period. The postnatal period is a critical time for musculoskeletal health, as the woman's body undergoes significant changes during pregnancy and delivery. The healthcare provider should assess the woman's musculoskeletal health and provide support and guidance to promote her physical and emotional recovery.

Musculoskeletal Assessment: During the postnatal assessment, the healthcare provider should assess the woman's musculoskeletal health, including muscle strength, range of motion, and signs of injury. The healthcare provider should also evaluate the woman's pelvic floor muscles, as these can be affected by delivery and can cause discomfort or complications if not properly managed.

Muscle strength and range of motion can be affected by pregnancy and delivery, and the healthcare provider should assess the woman's ability to perform activities of daily living, such as walking, standing, and lifting.

The healthcare provider should also evaluate the woman's pelvic floor muscles for signs of weakness or injury, such as incontinence or pelvic organ prolapse. Musculoskeletal Management: Proper musculoskeletal management is essential to promote the woman's physical and emotional recovery. The healthcare provider should provide guidance on proper self-care techniques, such as rest, exercise, and nutrition.

The healthcare provider should also provide guidance on proper **pain management**, such as the use of pain medication or non-pharmacological interventions, such as heat or ice packs.



Pain management is an important aspect of postnatal care. Many women experience pain and discomfort in the days and weeks following childbirth, and effective pain management can help to improve their comfort and overall well-being.

If the woman experiences musculoskeletal complications, such as pelvic floor dysfunction, the healthcare provider may recommend the use of pelvic floor exercises or physical therapy to alleviate symptoms.

musculoskeletal assessment and management are important components of the physical assessment of women during the postnatal period. Proper musculoskeletal care and management can promote the woman's physical and emotional recovery, while prompt identification and management of complications can ensure optimal health outcomes.

5.1.6 Emotional well-being Assessment and Management during the postnatal period

Emotional well-being assessment and management are critical components of postnatal care for women. The postnatal period can be a challenging time for women, as they adjust to the physical, emotional, and social changes that occur after childbirth. Emotional well-being assessment and management can help women cope with these changes and prevent the development of postpartum mood disorders.

Emotional Well-being Assessment: During the postnatal assessment, the healthcare provider should assess the woman's emotional well-being and screen for postpartum mood disorders, such as postpartum depression or anxiety. The healthcare provider

should also evaluate the woman's social support network and identify any potential sources of stress or difficulty.

The healthcare provider should ask the woman about her mood, energy level, and sleep quality, as well as any feelings of sadness, anxiety, or irritability. The healthcare provider should also inquire about the woman's relationship with her partner and family, as well as her support network.

Emotional Well-being Management: Proper emotional well-being management is essential to promote the woman's physical and emotional recovery. The healthcare provider should provide guidance on self-care techniques, such as rest, exercise, and nutrition.

The healthcare provider should also provide guidance on coping strategies, such as stress management techniques, relaxation exercises, and mindfulness practices. In cases where the woman is experiencing postpartum mood disorders, the healthcare provider may recommend psychotherapy or medications.

The healthcare provider should also encourage the woman to seek support from her partner, family, or a support group. Social support can be critical in promoting emotional well-being and preventing the development of postpartum mood disorders.

Emotional well-being assessment and management are critical components of postnatal care for women. Proper emotional well-being care and management can promote the woman's physical and emotional recovery, while prompt identification and management of postpartum mood disorders can ensure optimal health outcomes. The healthcare provider should prioritize emotional well-being assessment and management as part of their postnatal care for women.

5.1.7 Timing and Frequency of Physical Assessments during the Postnatal Period

Physical assessments during the postnatal period are essential to ensure that women receive appropriate care and support during this critical time. The timing and frequency of physical assessments may vary depending on the woman's individual needs and circumstances. However, there are some general

guidelines that healthcare providers can follow to ensure that women receive timely and appropriate care.

Timing of Physical Assessments: The timing of physical assessments during the postnatal period may vary depending on the woman's delivery and recovery. Generally, the first physical assessment is conducted within the first 24 hours after delivery to evaluate the woman's vital signs and check for any immediate complications.

The next physical assessment is usually conducted within the first 48 to 72 hours after delivery to evaluate the woman's overall recovery and identify any potential complications, such as postpartum hemorrhage, infection, or thrombosis.

Subsequent physical assessments are conducted at regular intervals during the postnatal period to monitor the woman's recovery and identify any new or ongoing issues. The timing of these assessments may depend on the woman's individual needs and circumstances, but they are typically conducted at 1-2 weeks, 4-6 weeks, and 6-12 weeks after delivery.

Frequency of Physical Assessments: The frequency of physical assessments during the postnatal period may vary depending on the woman's individual needs and circumstances. For example, women with a history of complications during pregnancy or delivery may require more frequent assessments.

The healthcare provider should also consider the woman's physical and emotional well-being when determining the frequency of physical assessments. Women who are experiencing complications or who are at risk of postpartum mood disorders may require more frequent assessments to ensure that they receive appropriate care and support.

In general, women should receive physical assessments at regular intervals during the postnatal period to monitor their recovery and ensure that any complications or issues are identified and managed promptly.

Physical assessments are an essential component of postnatal care for women. The timing and frequency of physical assessments may vary depending on the woman's individual needs and circumstances, but they should be conducted at regular intervals to ensure that women receive appropriate care and support during

the postnatal period. Healthcare providers should prioritize physical assessments as part of their postnatal care for women.

5.2 MANAGEMENT OF PAIN DURING POST-NATAL PERIOD

Pain is a common experience during the postnatal period, and it can occur for various reasons, including childbirth, episiotomy or tears, and after-pains. Managing pain during the postnatal period is crucial to promote the woman's comfort and well-being, facilitate early mobilization, and prevent the development of chronic pain.

Pain Management Strategies: Several pain management strategies can be used to manage pain during the postnatal period, including:

1. Non-pharmacological interventions: Non-pharmacological interventions include relaxation techniques, breathing exercises, massage, heat or cold therapy, and acupuncture. These techniques can help reduce pain and promote relaxation.
2. Pharmacological interventions: Pharmacological interventions may include non-opioid analgesics, such as acetaminophen or non-steroidal anti-inflammatory drugs (NSAIDs), or opioids. The use of opioids is usually reserved for severe pain, and they are typically prescribed for a limited period to avoid the risk of addiction.
3. Local anesthetics: Local anesthetics can be used to manage pain related to episiotomy or perineal tears. They can be administered topically or through injection.
4. Regional anesthesia: Regional anesthesia, such as epidural anesthesia, can be used during childbirth to manage pain. It provides effective pain relief while allowing the woman to remain alert and participate in the birth process.
5. Complementary therapies: Complementary therapies, such as aromatherapy, hypnosis, or music therapy, can also be used to manage pain during the postnatal period.

Pain Management Guidelines: When managing pain during the postnatal period, healthcare providers should consider the

woman's individual needs and circumstances. Pain management guidelines may vary depending on the woman's medical history, the type and severity of pain, and the woman's preferences.

Healthcare providers should also provide education and support to the woman and her family on pain management strategies and the potential side effects and risks associated with different pain management options.

In cases where the woman is experiencing chronic pain, healthcare providers should consider referring the woman to a pain specialist to develop a comprehensive pain management plan.

Pain management guidelines should be tailored to the woman's individual needs and circumstances, and healthcare providers should provide education and support to the woman and her family on pain management strategies.

5.2.1 Non-Pharmacological Interventions for Pain Management

Non-pharmacological interventions are a safe and effective way to manage pain during the postnatal period. These interventions can help reduce pain, promote relaxation, and enhance the overall experience of childbirth and the postnatal period. Here are some examples of non-pharmacological interventions for pain management during the postnatal period:

1. Relaxation techniques: Deep breathing, guided imagery, and progressive muscle relaxation are effective techniques for reducing pain and promoting relaxation during the postnatal period. Women can practice these techniques on their own or with the support of a healthcare provider or a trained doula.
2. Massage: Massage can help reduce muscle tension, promote relaxation, and relieve pain during the postnatal period. Women can receive massages from a trained therapist or partner, or they can use self-massage techniques to reduce pain and discomfort.
3. Heat or cold therapy: Applying heat or cold to the affected area can help reduce pain during the postnatal

Remember

Pain is a common experience during the postnatal period, and managing pain is crucial to promote the woman's comfort and well-being. Healthcare providers should consider a range of pain management strategies, including non-pharmacological and pharmacological interventions, local or regional anesthesia, and complementary therapies.

period. Heat therapy can help relieve muscle tension and promote relaxation, while cold therapy can help reduce inflammation and swelling.

4. Acupuncture: Acupuncture is a traditional Chinese medicine practice that involves the insertion of thin needles into specific points on the body to relieve pain and promote healing. Acupuncture can be an effective way to manage pain during the postnatal period.
5. Hydrotherapy: Hydrotherapy involves the use of water for pain relief and relaxation. Taking a warm bath or using a birthing pool can help reduce pain during childbirth and the postnatal period.
6. Music therapy: Listening to calming music or using music therapy techniques can help reduce pain and promote relaxation during the postnatal period.
7. Aromatherapy: Using essential oils or aromatherapy techniques can help reduce pain and promote relaxation during the postnatal period. Lavender and peppermint are popular essential oils used for pain management during the postnatal period.



Non-pharmacological interventions are a safe and effective way to manage pain during the postnatal period. These interventions can help reduce pain, promote relaxation, and enhance the overall experience of childbirth and the postnatal

period. Women can use a variety of non-pharmacological techniques, including relaxation techniques, massage, heat or cold therapy, acupuncture, hydrotherapy, music therapy, and aromatherapy to manage pain during the postnatal period.

5.2.2 Pharmacological Interventions for Pain Management

Pharmacological interventions can be used to manage pain during the postnatal period. These interventions can include over-the-counter (OTC) medications, prescription medications, and anesthesia. Here are some examples of pharmacological interventions for pain management during the postnatal period:

1. OTC medications: Acetaminophen and non-steroidal anti-inflammatory drugs (NSAIDs) such as ibuprofen and naproxen can be used to manage mild to moderate pain during the postnatal period. These medications can help reduce pain, inflammation, and fever.
2. Prescription medications: Stronger pain medications such as opioids may be prescribed to manage severe pain during the postnatal period. These medications should be used with caution and under the guidance of a healthcare provider, as they can cause side effects such as drowsiness, constipation, and nausea.
3. Local anesthetics: Local anesthetics such as lidocaine can be used to numb the perineal area after childbirth, providing pain relief after episiotomy or perineal tears.
4. Regional anesthesia: Epidural and spinal anesthesia can be used to provide pain relief during childbirth and the postnatal period. These techniques involve the injection of an anesthetic into the epidural or spinal space to numb the lower half of the body.
5. Intravenous patient-controlled analgesia (PCA): PCA is a technique that allows the patient to self-administer small doses of pain medication through an intravenous line. This technique can be used to manage severe pain during the postnatal period.
6. Combination therapies: A combination of pharmacological and non-pharmacological interventions may be used to

manage pain during the postnatal period. For example, a woman may receive a combination of acetaminophen, ibuprofen, and local anesthetics for pain management after childbirth.

It is important for **healthcare providers** to carefully assess the risks and benefits of pharmacological interventions for pain management during the postnatal period. They should consider the individual needs and preferences of the woman and provide appropriate education and support regarding the use of these interventions. Women should also be encouraged to report any side effects or concerns regarding their pain management plan.

Health care provider is an individual health professional or a health facility organization licensed to provide health care diagnosis and treatment services including medication, surgery and medical devices.

5.2.3 Regional Anesthesia for Pain Management during childbirth

Regional anesthesia is a type of anesthesia that numbs a specific area of the body, and it is commonly used for pain management during childbirth. There are two types of regional anesthesia commonly used during childbirth: epidural anesthesia and spinal anesthesia.

Epidural anesthesia involves the injection of anesthetic medication into the epidural space, which is located just outside the membrane that surrounds the spinal cord. This numbs the nerves that carry pain signals from the uterus and cervix, providing pain relief during labor and delivery. The procedure involves the insertion of a small catheter into the epidural space, which allows the anesthetic medication to be administered continuously throughout the labor and delivery process.

Spinal anesthesia, also known as a spinal block, involves the injection of anesthetic medication into the cerebrospinal fluid that surrounds the spinal cord. This provides a more intense and rapid pain relief compared to epidural anesthesia. However, it is typically used only during a cesarean delivery, as it may be more difficult to control the level of anesthesia during a vaginal delivery.

Both types of regional anesthesia have benefits and potential risks. Benefits include effective pain relief, improved maternal satisfaction, and decreased need for other pain medications. Risks include potential side effects such as low blood pressure,

headache, and backache, and more serious complications such as nerve damage or infection.

It is important for women to discuss the benefits and risks of regional anesthesia with their healthcare provider, and to inform their provider of any medical conditions or medications that could affect the procedure or their response to the medication. Women should also be aware of the potential side effects and complications associated with regional anesthesia, and report any symptoms or concerns to their healthcare provider.

5.2.4 Complementary Therapies for Pain Management during the postnatal period

Complementary therapies can be used alongside pharmacological and non-pharmacological interventions for pain management during the postnatal period. These therapies can provide additional pain relief and help promote relaxation and emotional well-being. Here are some examples of complementary therapies for pain management during the postnatal period:

1. Massage therapy: Massage can help relieve muscle tension and promote relaxation, which can be beneficial for managing pain and stress during the postnatal period. Massage can be performed by a licensed massage therapist or by a partner or family member.
2. Acupuncture: Acupuncture involves the insertion of fine needles into specific points on the body to help relieve pain and promote relaxation. Acupuncture may be helpful for managing back pain, pelvic pain, and other types of pain during the postnatal period.
3. Chiropractic care: Chiropractic care involves the manipulation of the spine and other joints to help relieve pain and improve mobility. Chiropractic care may be helpful for managing back pain and other types of musculoskeletal pain during the postnatal period.
4. Relaxation techniques: Relaxation techniques such as deep breathing, meditation, and visualization can help promote relaxation and reduce stress and anxiety, which can be beneficial for managing pain during the postnatal period.

5. Hydrotherapy: Hydrotherapy involves the use of water for therapeutic purposes, such as soaking in a warm bath or using a hydrotherapy pool. Hydrotherapy can help promote relaxation and reduce pain and muscle tension.
6. Aromatherapy: Aromatherapy involves the use of essential oils to promote relaxation and reduce pain and stress. Essential oils can be used in a diffuser, added to a warm bath, or applied topically with a carrier oil.

It is important for women to discuss the use of complementary therapies with their healthcare provider, as some therapies may not be safe or appropriate for all women. Women should also be aware of the potential risks and limitations of these therapies, and should only use them under the guidance of a qualified practitioner.

5.2.5 Pain Management Guidelines for Healthcare Providers

Here are some general pain management guidelines for healthcare providers to follow during the postnatal period:

1. Assess pain regularly: Healthcare providers should assess a woman's pain regularly during the postnatal period using a validated pain assessment tool. This will help determine the severity of the pain and the effectiveness of any pain management interventions.
2. Provide education and support: Healthcare providers should provide education and support to women about pain management options during the postnatal period, including pharmacological and non-pharmacological interventions. This can include information about the benefits and risks of different interventions, as well as instructions on how to use them effectively.
3. Use a multimodal approach: Healthcare providers should use a multimodal approach to pain management during the postnatal period, combining different interventions to provide optimal pain relief with minimal side effects. This may include pharmacological interventions such as non-steroidal anti-inflammatory drugs (NSAIDs) or opioids, as well as non-pharmacological interventions such as massage, relaxation techniques, or hydrotherapy.

4. Consider individualized treatment: Healthcare providers should consider the individual needs and preferences of each woman when developing a pain management plan during the postnatal period. This may include adjusting medication dosages or timing, providing additional support or counseling, or incorporating complementary therapies.
5. Monitor for side effects: Healthcare providers should monitor women for potential side effects of pain management interventions, such as nausea, vomiting, drowsiness, or constipation. Women should be encouraged to report any symptoms or concerns to their healthcare provider promptly.
6. Provide appropriate follow-up: Healthcare providers should provide appropriate follow-up care to women after delivery, including monitoring for signs of infection or other complications, and ensuring appropriate pain management during the recovery period.

By following these pain management guidelines, healthcare providers can help women manage pain effectively during the postnatal period, promote recovery, and improve overall maternal and infant outcomes.

5.2.6 Chronic Pain Management

Chronic pain management during the postnatal period can be challenging, as it requires ongoing assessment and individualized treatment plans. Here are some general guidelines for healthcare providers to follow:

1. Evaluate the source of pain: Healthcare providers should evaluate the source of chronic pain in women during the postnatal period to determine the most appropriate treatment approach. This may involve a combination of medical history, physical examination, imaging studies, and laboratory tests.
2. Consider non-pharmacological interventions: Healthcare providers should consider non-pharmacological interventions as a first-line treatment for chronic pain during the postnatal period. This may include physical therapy, occupational therapy, acupuncture, massage, or cognitive-behavioral therapy.

3. Use pharmacological interventions with caution: Healthcare providers should use pharmacological interventions for chronic pain management during the postnatal period with caution, as many medications can pass into breast milk and potentially harm the infant. Any medication prescribed should be based on the woman's medical history, current medications, and the potential risks and benefits.
4. Monitor for side effects: Healthcare providers should closely monitor women for any side effects of chronic pain management interventions, including medication, and adjust treatment plans as necessary to minimize these effects.
5. Collaborate with a multidisciplinary team: Healthcare providers should work with a multidisciplinary team of healthcare professionals, including obstetricians, pediatricians, pain specialists, and lactation consultants, to develop and implement an individualized chronic pain management plan for women during the postnatal period.
6. Provide ongoing support and follow-up: Chronic pain management during the postnatal period requires ongoing support and follow-up from healthcare providers. Women should be encouraged to report any changes in pain levels, medication side effects, or concerns about their recovery to their healthcare provider promptly.

By following these chronic pain management guidelines during the postnatal period, healthcare providers can help women effectively manage pain, promote recovery, and improve overall maternal and infant outcomes.

5.2.7 Multidisciplinary Pain Management Approaches for Postnatal Pain

Multidisciplinary pain management approaches for postnatal pain involve the coordinated efforts of healthcare professionals from various specialties to provide comprehensive and holistic care to women experiencing pain during the postnatal period. Here are some key components of a multidisciplinary pain management approach:

1. Assessment: The first step in a multidisciplinary approach is to conduct a thorough assessment of the woman's pain and its impact on her daily life. This may involve evaluating physical, emotional, social, and psychological factors contributing to pain.
2. Treatment planning: Based on the assessment, a treatment plan is developed that includes a range of interventions tailored to the individual needs of the woman. This may include pharmacological and non-pharmacological interventions, such as physical therapy, acupuncture, and psychological counseling.
3. Collaborative care: A multidisciplinary approach involves collaboration between healthcare providers from different specialties, such as obstetricians, pain specialists, physical therapists, and psychologists, to ensure that the woman receives comprehensive care.
4. Patient education: Patient education is a crucial component of a multidisciplinary approach to pain management. Women are provided with information about their condition, treatment options, and self-management strategies to help them manage their pain effectively.
5. Ongoing assessment and follow-up: Ongoing assessment and follow-up are important to ensure that the treatment plan is effective and to make any necessary adjustments to the plan.
6. Support for breastfeeding: For women who choose to breastfeed, multidisciplinary pain management approaches should take into account the impact of medications and other interventions on lactation and provide support for breastfeeding.

Multidisciplinary pain management approaches have been shown to be effective in reducing pain and improving function in women during the postnatal period. By working together and providing comprehensive care, healthcare providers can help women manage their pain and improve their overall quality of life.

5.3 BREASTFEEDING SUPPORT AND MANAGEMENT DURING POSTNATAL PERIOD

Breastfeeding is an important aspect of postnatal care and provides numerous benefits for both the mother and the newborn. However, breastfeeding can also be a challenging experience for some women. Therefore, it is crucial for healthcare providers to provide breastfeeding support and management during the postnatal period. Here are some key components of breastfeeding support and management:

1. Education: Healthcare providers should educate mothers about the benefits of breastfeeding, proper breastfeeding techniques, and how to recognize and manage common breastfeeding problems.
2. Breastfeeding assessment: During postnatal checkups, healthcare providers should assess the mother's breastfeeding technique, milk supply, and the infant's weight gain to ensure that breastfeeding is going well.
3. Addressing breastfeeding problems: Healthcare providers should address any breastfeeding problems that arise, such as sore nipples, engorgement, or low milk supply, and provide the mother with practical solutions to address these issues.
4. Support for mothers: Healthcare providers should offer emotional support and encouragement to mothers who are struggling with breastfeeding. They should provide reassurance and offer guidance on how to overcome challenges.
5. Referral to lactation consultant: If breastfeeding problems persist, healthcare providers should refer mothers to a lactation consultant or other qualified breastfeeding specialist who can provide more in-depth support.
6. Support for working mothers: Healthcare providers should also offer support to mothers who need to return to work while breastfeeding, including guidance on pumping and storing breast milk, and advice on how to maintain a milk supply while away from the baby.

Breastfeeding support and management is an important component of postnatal care. By providing education, assessment, addressing problems, emotional support, and referral to a

lactation consultant when needed, healthcare providers can help mothers overcome challenges and succeed in their **breastfeeding** journey, leading to improved health outcomes for both the mother and the baby.

Breastfeeding is the act of feeding a baby with breast milk produced by the mother's mammary glands.

5.3.1 The Benefits of Breastfeeding for both Mother and Baby

Breastfeeding is the recommended way to feed a newborn and provides numerous benefits for both the mother and the baby. Here are some of the benefits of breastfeeding:

Benefits for the baby:

1. Provides complete nutrition: Breast milk is uniquely designed to meet the nutritional needs of a growing baby and contains all the nutrients and vitamins necessary for healthy growth and development.
2. Boosts the immune system: Breast milk contains antibodies and other immune-boosting substances that can help protect the baby from illnesses and infections.
3. Reduces the risk of Sudden Infant Death Syndrome (SIDS): Breastfeeding has been shown to reduce the risk of SIDS, a condition where a seemingly healthy infant dies suddenly and unexpectedly.
4. Promotes cognitive development: Breast milk contains substances that have been shown to promote brain development and cognitive function in infants.
5. Reduces the risk of chronic diseases: Breastfeeding has been linked to a reduced risk of developing chronic diseases such as obesity, diabetes, and certain types of cancer later in life.

Benefits for the mother:

1. Promotes bonding: Breastfeeding can help promote bonding between the mother and the baby and can lead to a stronger emotional connection.
2. Reduces the risk of postpartum bleeding: Breastfeeding causes the release of hormones that help the uterus contract and can reduce the risk of excessive bleeding after childbirth.

3. Helps with postpartum weight loss: Breastfeeding can help women lose weight gained during pregnancy and return to their pre-pregnancy weight more quickly.
4. Reduces the risk of certain cancers: Breastfeeding has been shown to reduce the risk of developing breast and ovarian cancers later in life.
5. Enhances emotional well-being: Breastfeeding can help mothers feel more confident in their parenting abilities and may reduce the risk of postpartum depression.

Overall, breastfeeding has numerous benefits for both the mother and the baby and should be encouraged as the preferred method of feeding a newborn.

5.3.2 Common Breastfeeding Problems and their Management

Breastfeeding is a natural process, but it can be challenging for some mothers, especially in the early days. Here are some common breastfeeding problems and their management:

1. Sore nipples: Sore nipples are a common problem that many breastfeeding mothers experience. The best way to prevent sore nipples is to ensure that the baby is latching on correctly. To manage sore nipples, mothers can try different breastfeeding positions, use a nipple shield, or apply lanolin cream or expressed breast milk to the nipples.
2. Engorgement: Engorgement occurs when the breasts become overly full of milk. This can make it difficult for the baby to latch on and can be uncomfortable for the mother. To manage engorgement, mothers can apply heat or cold compresses to the breasts, express a small amount of milk before breastfeeding, and feed the baby frequently.
3. Plugged ducts: Plugged ducts occur when milk ducts become blocked, usually due to a build-up of milk. This can be painful and can lead to mastitis if left untreated. To manage plugged ducts, mothers can apply heat or cold compresses to the affected area, massage the breast, and feed the baby frequently.

4. Mastitis: Mastitis is an infection of the breast tissue that can cause flu-like symptoms, including fever, chills, and body aches. To manage mastitis, mothers should rest, drink plenty of fluids, and continue breastfeeding to help clear the infection. Antibiotics may also be prescribed if the infection is severe.
5. Low milk supply: Low milk supply can be caused by a variety of factors, including stress, dehydration, and certain medications. To manage low milk supply, mothers should breastfeed frequently, drink plenty of fluids, and try to reduce stress. In some cases, a lactation consultant may be able to help the mother increase her milk supply.
6. Overactive letdown: Overactive letdown occurs when the milk flows too quickly, making it difficult for the baby to keep up. To manage overactive letdown, mothers can try feeding the baby in a more upright position, allowing the baby to take breaks during feeding, and pumping a small amount of milk before breastfeeding.
7. Breastfeeding strikes: Breastfeeding strikes occur when the baby suddenly refuses to breastfeed. This can be caused by a variety of factors, including illness or changes in the baby's routine. To manage breastfeeding strikes, mothers should offer the breast frequently, try different breastfeeding positions, and offer expressed milk or formula if necessary.

If a mother is experiencing persistent breastfeeding problems, it is recommended that she seek the advice of a lactation consultant or other healthcare professional who can provide further guidance and support.

5.3.3 Proper Breastfeeding Techniques and Positions

Proper breastfeeding techniques and positions can make breastfeeding more comfortable for both the mother and baby, and can help ensure that the baby is getting enough milk. Here are some techniques and positions to consider:

1. Get comfortable: Find a comfortable chair or sofa with good back support. Use pillows or cushions to support

your back, arms, and the baby. Make sure your feet are flat on the floor or a footrest.

2. Support the baby: Use a nursing pillow or a rolled-up blanket to support the baby's head, neck, and back. The baby's mouth should be level with your nipple.
3. Latch on correctly: Bring the baby to your breast and aim the nipple toward the baby's nose. Wait for the baby to open their mouth wide and then bring them onto the breast with the nipple and areola in the baby's mouth.
4. Check the latch: Make sure the baby's mouth is covering most of the areola, and the lips are flanged out. If the latch feels painful or uncomfortable, gently break the suction by inserting your finger between the baby's mouth and your breast, and try again.
5. Use different positions: There are many different breastfeeding positions to try, such as the cradle hold, football hold, side-lying position, or reclining position. Experiment to find what works best for you and your baby.
6. Switch sides: Offer the other breast after the baby has finished feeding on one side. This helps ensure that both breasts are stimulated and produces enough milk.
7. Burp the baby: Gently pat or rub the baby's back to help release any trapped air.
8. Keep the baby awake: If the baby falls asleep during feeding, gently stroke their cheek, tickle their feet, or switch to the other breast.

Remember

Breastfeeding is a learned skill, and it may take some time and practice to get the hang of it. Don't hesitate to ask for help from a lactation consultant or healthcare provider if you are having difficulty. With the right support and techniques, breastfeeding can be a rewarding and enjoyable experience for both mother and baby.

5.3.4 Breastfeeding and Medication Use

Breastfeeding mothers may need to take medication for various reasons, such as pain relief, treatment of infections, or management of chronic conditions. It is important to be aware of the potential effects of medication on the baby and to consult with a healthcare provider before taking any medication while breastfeeding.

Here are some general guidelines for medication use during breastfeeding:

1. Check with your healthcare provider: Before taking any medication, consult with your healthcare provider

or a lactation consultant to ensure that it is safe for breastfeeding mothers and their babies.

2. Consider timing: Try to take medication right after breastfeeding to minimize the amount of medication in the breast milk.
3. Choose medication carefully: Some medications are known to be safe for breastfeeding mothers, while others are not. Choose medications that are compatible with breastfeeding whenever possible.
4. Watch for side effects: Monitor your baby for any unusual symptoms or side effects, such as drowsiness, diarrhea, or changes in appetite, and contact your healthcare provider if you have any concerns.
5. Consider alternatives: In some cases, alternative treatments or medications may be available that are safer for breastfeeding mothers and their babies.

It is important to note that breastfeeding has many benefits for both mother and baby, including improved immunity, bonding, and overall health. Most medications can be taken safely while breastfeeding, but it is important to consult with a healthcare provider to ensure that the medication is safe and appropriate for both mother and baby.

5.3.5 Returning to Work while Breastfeeding

Returning to work while breastfeeding can be a challenging experience for many new mothers. However, with proper planning and support, it is possible to continue breastfeeding while working outside of the home. Here are some tips for returning to work while breastfeeding:

1. Start preparing early: Begin planning for your return to work at least a few weeks before you need to go back. This will give you time to figure out your schedule, set up a breastfeeding and pumping routine, and make arrangements with your employer.
2. Invest in a good breast pump: A quality breast pump can make all the difference when it comes to maintaining your milk supply while working. Consider purchasing

a double electric pump, which can save time and help stimulate milk production.

3. Create a pumping schedule: Develop a pumping schedule that works for you and your employer. Consider pumping at work during breaks or lunchtime, and make sure to communicate your needs with your employer.
4. Communicate with your employer: Let your employer know that you plan to continue breastfeeding and ask if there are any accommodations that can be made to support your breastfeeding goals.
5. Store your milk safely: Store your breast milk in a clean, sealed container in the refrigerator or freezer. Label the milk with the date and time it was expressed, and make sure to follow proper hygiene practices.
6. Seek support: Join a support group for breastfeeding mothers or connect with a lactation consultant to get advice and guidance on breastfeeding and pumping while working.

Overall, returning to work while breastfeeding requires planning, organization, and support. With the right resources and preparation, it is possible to continue providing your baby with the many benefits of breastfeeding, even while working outside of the home.

5.3.6 Support for Mothers with Breastfeeding Difficulties

Breastfeeding is a natural process, but it can also be challenging for some mothers. There are a variety of breastfeeding difficulties that new mothers may encounter, including issues with milk production, latch problems, nipple pain, and more. Fortunately, there are many resources available to support mothers who are struggling with breastfeeding. Here are some options for seeking help:

1. Lactation Consultants: Lactation consultants are trained professionals who specialize in helping mothers with breastfeeding. They can offer guidance on proper latch and positioning, help with milk production issues, and provide solutions for common breastfeeding problems.

2. Support Groups: Many hospitals and community organizations offer support groups for breastfeeding mothers. These groups can be a great source of encouragement, advice, and practical tips from other mothers who are going through similar experiences.
3. Breastfeeding Helplines: There are several breastfeeding helplines that offer free support and advice for mothers who are struggling with breastfeeding. These helplines are staffed by trained professionals who can offer guidance on a variety of breastfeeding issues.
4. Online Resources: There are many online resources available for mothers who are struggling with breastfeeding, including forums, blogs, and educational websites. These resources can be especially helpful for mothers who live in remote areas or who have difficulty accessing in-person support.
5. Healthcare Providers: Mothers can also seek help from their healthcare providers, such as their obstetrician/gynecologist, pediatrician, or family physician. These professionals can offer guidance on breastfeeding and refer mothers to other resources if needed.

Remember, it is important for mothers to seek help if they are experiencing difficulties with breastfeeding. With the right support and resources, most mothers can overcome these challenges and continue providing their babies with the many benefits of breast milk.

5.3.7 Breastfeeding and Infant Growth and Development

Breastfeeding is not only beneficial for the mother but also for the infant's growth and development. Breast milk is considered the ideal food for infants, as it contains all the necessary nutrients and antibodies that babies need to grow and develop. Here are some of the ways that breastfeeding can impact infant growth and development:

1. Nutritional Benefits: Breast milk is rich in nutrients such as protein, carbohydrates, and fat, which are essential for the infant's growth and development. Breast milk also contains antibodies that can help protect the baby against infections.

2. Brain Development: Breast milk is also rich in DHA, an omega-3 fatty acid that is essential for the development of the baby's brain and nervous system.
3. Digestive Health: Breast milk contains beneficial bacteria that help promote the growth of a healthy gut microbiome in infants. This can help prevent gastrointestinal problems such as diarrhea and colic.
4. Reduced Risk of Illness: Breastfed babies have a lower risk of developing illnesses such as ear infections, respiratory infections, and gastrointestinal infections.
5. Proper Weight Gain: Breastfeeding has been shown to promote healthy weight gain in infants, which is important for their overall growth and development.
6. Cognitive Development: Breastfeeding has been associated with improved cognitive development and higher IQ scores in children.
7. Emotional Bonding: Breastfeeding can also help promote emotional bonding between mother and infant, which is important for the baby's emotional development.

Breastfeeding provides many benefits for infant growth and development. It is recommended that infants be exclusively breastfed for the first six months of life, and continue to breastfeed while introducing **complementary foods** until at least 12 months of age.

Complementary foods are any foods or liquids other than breast milk or infant formula that are introduced to an infant's diet as they begin to transition to solid foods.

5.3.8 Breastfeeding in Special Circumstances

Breastfeeding in special circumstances can present unique challenges, but with the right support and guidance, many mothers are able to successfully breastfeed their infants. Here are some considerations for breastfeeding in special circumstances:

1. Premature Infants: Premature infants may not be able to breastfeed right away, but it is still important to begin pumping breast milk as soon as possible after delivery to establish milk supply. Many premature infants will need to be fed through a feeding tube at first, but as they grow stronger, they may be able to transition to breastfeeding directly.

2. Multiples: Mothers of multiples may need to feed their babies at different times or use a combination of breastfeeding and bottle feeding to ensure that all babies are getting enough milk. It can be helpful to have a support person or lactation consultant to assist with positioning and latching multiple babies.
3. Medical Conditions: Mothers with certain medical conditions may need to take medication that could impact their ability to breastfeed. It is important to consult with a healthcare provider to discuss the risks and benefits of breastfeeding in these situations.
4. Adoptive Nursing: Adoptive mothers may be able to induce lactation or use a combination of breastfeeding and formula feeding to provide their infants with breast milk. This process typically involves the use of a breast pump and hormone therapy.
5. Surrogacy: In cases of surrogacy, the intended mother may be able to breastfeed her infant with the use of a breast pump and hormone therapy. It is important to discuss this option with a healthcare provider and lactation consultant.

In all of these special circumstances, it is important for mothers to receive support and guidance from healthcare providers and lactation consultants to ensure the best possible outcomes for both mother and infant.

5.3.9 The Role of the Partner and Family in Breastfeeding Support

The partner and family members can play a crucial role in supporting a mother's decision to breastfeed. Here are some ways that partners and family members can support breastfeeding:

1. Provide emotional support: Breastfeeding can be challenging, especially in the early days. Partners and family members can provide emotional support by being present, offering words of encouragement, and helping to alleviate any stress or anxiety the mother may be feeling.
2. Assist with household tasks: Breastfeeding mothers may be tired or sore, making it difficult to perform household

tasks. Partners and family members can assist with tasks such as cooking, cleaning, and grocery shopping to allow the mother to rest and focus on breastfeeding.

3. Attend breastfeeding education classes: Partners and family members can attend breastfeeding education classes with the mother to learn about the benefits of breastfeeding, proper techniques, and ways to support the mother during the breastfeeding journey.
4. Learn about breastfeeding challenges: Partners and family members can educate themselves about common breastfeeding challenges such as low milk supply, nipple pain, and engorgement. This can help them to identify when the mother may need additional support or guidance from a healthcare provider or lactation consultant.
5. Assist with feedings: Partners and family members can assist with feedings by burping the baby, changing diapers, or providing a glass of water to the mother during breastfeeding sessions.

By providing support and encouragement, partners and family members can help to create a positive breastfeeding experience for both the mother and the baby.

5.4 NUTRITIONAL ASSESSMENT AND SUPPORT DURING POSTNATAL PERIOD

Nutritional assessment and support during the postnatal period are crucial for both the mother and the infant. Proper nutrition can support the mother's recovery after childbirth, promote lactation, and ensure that the infant receives adequate nutrients for growth and development.

Nutritional Assessment: The nutritional assessment of a postnatal mother involves evaluating her nutritional status, dietary habits, and possible nutritional deficiencies. This assessment helps to identify any nutritional issues and helps to create a nutritional plan that is tailored to meet the mother's and infant's nutritional needs.

Evaluation of Nutritional Status: The evaluation of a postnatal mother's nutritional status includes assessing her height, weight,

body mass index (BMI), and weight gain during pregnancy. These factors are important because they indicate whether the mother has gained sufficient weight during pregnancy and whether she is at risk for malnutrition. Other factors that are evaluated include the mother's blood pressure, hemoglobin, and blood glucose levels. These factors provide information on the mother's overall health status.

Dietary Habits: The evaluation of the mother's dietary habits involves assessing her intake of macronutrients (carbohydrates, proteins, and fats) and micronutrients (vitamins and minerals). A diet history can help to identify the mother's dietary habits, preferences, and any special dietary needs. It is also important to assess the mother's fluid intake, as hydration is crucial for lactation.

Nutritional Deficiencies: The evaluation of nutritional deficiencies involves assessing the mother's intake of key nutrients such as iron, calcium, and vitamin D. Nutritional deficiencies can affect the mother's recovery after childbirth and can also impact the quality and quantity of breast milk. It is important to identify any deficiencies and provide the necessary nutritional supplements or dietary recommendations.

Nutritional Support: Nutritional support during the postnatal period involves providing the mother with a balanced and nutrient-dense diet. It is essential to ensure that the mother's dietary needs are met to support her recovery and promote lactation. Here are some nutritional recommendations for the postnatal period:

1. **Adequate Caloric Intake:** The mother's caloric intake should be sufficient to support her recovery and lactation. A postnatal mother needs an additional 500 calories per day for lactation. A balanced diet that includes whole grains, lean proteins, fruits, and vegetables can provide the necessary calories and nutrients.
2. **Hydration:** Hydration is crucial for lactation. The mother should drink enough fluids to prevent dehydration. Water, milk, and other low-sugar beverages are good options.
3. **Macronutrient Intake:** The mother's diet should include a balance of macronutrients. Carbohydrates provide

energy, while proteins are essential for tissue repair and growth. Healthy fats are important for hormone regulation and the absorption of fat-soluble vitamins.

4. **Micronutrient Intake:** The mother's diet should include a variety of fruits, vegetables, and whole grains to provide essential micronutrients. Key micronutrients for lactation include calcium, vitamin D, iron, and folic acid. A prenatal vitamin or multivitamin can help to meet the mother's nutritional needs.
5. **Avoidance of Alcohol and Caffeine:** Alcohol and caffeine can affect the quality and quantity of breast milk. Mothers should limit their intake of these substances or avoid them altogether.
6. **Special Dietary Needs:** Mothers with special dietary needs, such as those with food allergies or intolerances, should receive appropriate dietary guidance to ensure that their nutritional needs are met.

Nutritional assessment and support during the postnatal period are essential for both the mother and infant. Adequate nutrition can promote lactation, support the mother's recovery after childbirth, and ensure that the infant receives adequate

5.4.1 Importance of Proper Nutrition during the Postnatal Period

Proper nutrition during the postnatal period is essential for the health and well-being of both the mother and the infant. After childbirth, the mother's body undergoes significant changes as it recovers from the stress of pregnancy and birth, and adjusts to the demands of lactation. Adequate nutrient intake is necessary to support this process and prevent complications.

Proper nutrition during the postnatal period can help the mother to recover faster and reduce the risk of complications such as anemia, infections, and postpartum depression. Adequate nutrient intake can also support milk production and ensure that the infant receives the necessary nutrients for growth and development.

For the infant, breastmilk is the ideal source of nutrition during the first six months of life. Breastmilk provides all the

nutrients that the infant needs for growth and development, and also helps to protect against infections and other health problems. Maternal nutrition plays a critical role in ensuring the quality and quantity of breastmilk.

Proper nutrition during the postnatal period is essential for the health and well-being of both the mother and the infant, and can have long-term effects on the health of both. It is important for healthcare providers to provide adequate nutrition support and education to mothers during this period.

5.4.2 Macronutrient and Micronutrient Requirements for Postpartum Women

Postpartum women have increased nutrient requirements to support their own recovery and to provide adequate nutrition for their infants if breastfeeding. These requirements can vary based on factors such as age, weight, height, physical activity, and lactation status. In general, postpartum women require additional macronutrients and micronutrients to support their increased energy needs and to support the growth and development of their infants.

Macronutrients:

1. Protein: Protein is essential for tissue repair and growth, and to support lactation. Postpartum women should consume at least 1.1 grams of protein per kilogram of body weight per day. This can be achieved through consumption of lean meats, fish, poultry, beans, legumes, nuts, and dairy products.
2. Carbohydrates: Carbohydrates are the primary source of energy for the body. Postpartum women should consume complex carbohydrates such as whole grains, fruits, and vegetables to provide sustained energy throughout the day.
3. Fats: Fats are important for hormone regulation, brain function, and energy production. Postpartum women should consume healthy fats such as avocados, nuts, seeds, olive oil, and fatty fish.

Micronutrients:

1. Iron: Iron is important for the production of red blood cells and to prevent anemia. Postpartum women may experience iron deficiency due to blood loss during childbirth. Women should consume iron-rich foods such as red meat, poultry, fish, beans, and leafy green vegetables. Iron supplements may also be necessary.
2. Calcium: Calcium is important for bone health and to support lactation. Postpartum women should consume at least 1000 milligrams of calcium per day. This can be achieved through consumption of dairy products, fortified foods, and calcium supplements.
3. Vitamin D: Vitamin D is important for calcium absorption and bone health. Postpartum women may have low vitamin D levels due to limited sun exposure and inadequate dietary intake. Women should consume foods rich in vitamin D such as fatty fish, egg yolks, and fortified foods. Vitamin D supplements may also be necessary.
4. B Vitamins: B vitamins are important for energy production and nervous system function. Postpartum women should consume foods rich in B vitamins such as whole grains, leafy green vegetables, and fortified cereals.

Postpartum women require a balanced diet that is rich in a variety of nutrient-dense foods to support their recovery and lactation. Healthcare providers should provide nutrition education and support to help women meet their nutrient needs during this period.

5.4.3 Dietary Recommendations for Breastfeeding Mothers

Many breastfeeding mothers wonder if the foods they eat will affect their breast milk.

Perhaps you've wondered if it is necessary to avoid certain foods to prevent digestive problems or allergies in your baby. Or maybe you wonder if you need to eat special foods to make the right amount of milk or the best quality milk for your baby.

The good news is that your milk will probably be just right for your baby regardless of what you eat. Your body knows exactly what nutrition your baby needs at every stage of development.

Use the following tips to help plan your diet.

What to eat

- Include protein foods 2-3 times per day such as meat, poultry, fish, eggs, dairy, beans, nuts and seeds.
- Eat three servings of vegetables, including dark green and yellow vegetables per day.
- Eat two servings of fruit per day.
- Include whole grains such as whole wheat breads, pasta, cereal and oatmeal in your daily diet.
- Drink water to satisfy your thirst. Many women find they are thirsty while breastfeeding; however, forcing yourself to drink fluids does not increase your supply.
- Dietary restrictions from pregnancy do not apply to breastfeeding moms.
- Vegetarian diets can be compatible with breastfeeding. If you avoid meat, make sure you eat other sources of iron and zinc such as dried beans, dried fruit, nuts, seeds and dairy. If you avoid all animal products (vegan diet) you will need to take a B12 supplement to make sure your baby does not develop a B12 deficiency.

How much to eat

- Breastfeeding requires extra calories. If you still have baby weight from your pregnancy, these extra calories will naturally be used for your milk. If you have lost all your baby weight, you may need to eat an extra 500-600 calories per day. After your baby starts eating other foods at 6 months, you will be making less milk and you can cut back on your calorie intake.

Alcohol and caffeine

- If you wish to drink alcohol, wait 2-3 hours after each serving (12 oz. beer, 6 oz. wine, 1.5 oz. liquor) before breastfeeding/pumping. Alcohol does not stay in your milk. It is removed as your blood alcohol levels go down. When you are sober, the alcohol is gone from your milk.

If you are feeling the effects of alcohol and your breasts are full, you may need to "pump and dump."

- Caffeine is passed into your milk but most babies are not bothered by it. If your baby isn't sleeping well or is irritable, you may want to limit or avoid caffeine. Newborns may be more sensitive to caffeine than older babies.

Sharing with baby through milk

- DocasaHexanenoic Acid (DHA) is an important omega 3 fatty acid needed by babies for brain development. You can boost the DHA in your milk by eating fish 2-3 times per week. The best sources of DHA are: salmon, bluefish, bass, trout, flounder and tuna. Do not eat tile fish, swordfish, shark and king mackerel. They contain high levels of mercury.
- The colors of the foods you eat, including naturally occurring pigments in vegetables and herbal supplements or food dyes added to foods, may change the color of your milk.
- The varied flavors in your diet will appear in your milk. Your baby will even enjoy milk flavored with garlic!
- Spicy and gas-producing foods are normally tolerated by most babies. If you find your baby is often gassy or colicky and has increased diarrhea after you eat a particular food, try avoiding that food for several weeks and see if the symptoms go away. Then try the food again to see if you still need to avoid it.

Allergies in baby

- In rare cases a breastfeeding baby may develop a food allergy to foods the mother is eating. The most common symptoms are green, mucus-like and blood-specked stools. Colic and reflux are not usually caused by food allergies.
- The most common foods that cause allergies are dairy products, soy products, wheat and eggs. Less common foods that cause allergies include fish, nuts, peanuts or corn. A baby could develop an allergy to any food you eat.

- Keeping a food diary of symptoms along with what you eat might help you know which foods are causing the problem. As long as your baby is gaining weight and not anemic, the allergy is not going to cause any long-term problems. You do not need to stop breastfeeding.
- Removing the suspected foods from your diet by carefully reading all food labels should solve the problem but it may take 4-6 weeks for the infant's symptoms to resolve. A visit with a registered dietitian experienced with food allergies may help you plan your diet.

5.4.4 Managing Special Diets during the Postnatal Period

Managing special diets during the postnatal period is crucial for mothers who follow certain dietary restrictions due to personal, cultural, or religious reasons. Vegetarianism and veganism are becoming increasingly common, and it is essential to understand how to manage these special diets during the postnatal period to ensure optimal health for both the mother and baby.

Vegetarian and vegan diets exclude meat, fish, and poultry. Vegetarian diets may still include dairy and eggs, while vegan diets exclude all animal products. These diets can be healthy and well-balanced, but it is important to pay close attention to the types and amounts of nutrients consumed to avoid deficiencies.

During the postnatal period, a vegetarian or vegan mother should ensure she is consuming enough protein, iron, calcium, and vitamin B12. Protein is essential for tissue repair and growth, while iron is necessary for red blood cell production and preventing anemia. Calcium is essential for bone health, and vitamin B12 is necessary for the production of red blood cells and proper **nervous system** function.

Nervous system is the complex network of nerve cells and fibers that transmit signals between different parts of the body

Good sources of protein for vegetarians and vegans include legumes, tofu, tempeh, and nuts. Iron-rich foods include beans, dark green leafy vegetables, and fortified cereals. Calcium can be found in fortified non-dairy milk, calcium-set tofu, and dark green leafy vegetables. Vitamin B12 is only naturally present in animal products, so vegans must consume fortified foods or supplements to meet their needs.

It is important for vegetarian and vegan mothers to work with a healthcare provider or registered dietitian to ensure their dietary needs are being met. They may need to take supplements or adjust their diet to ensure they are getting enough of the necessary nutrients.

In addition to vegetarian and vegan diets, other special diets may need to be managed during the postnatal period. For example, women who are lactose intolerant or have a milk protein allergy may need to avoid dairy products. In this case, they should consume other sources of calcium, such as fortified non-dairy milk or calcium supplements.

Women with celiac disease or gluten sensitivity should avoid gluten-containing foods, such as wheat, barley, and rye. They should choose gluten-free grains, such as quinoa, rice, and corn, and ensure they are getting enough fiber and B vitamins.

In general, it is important for postpartum women to consume a variety of nutrient-dense foods to ensure they are meeting their nutritional needs. A balanced diet should include a variety of fruits, vegetables, whole grains, lean protein, and healthy fats. It is also essential to stay hydrated by drinking plenty of water and other fluids, such as milk, non-dairy milk, and herbal tea.

In conclusion, managing special diets during the postnatal period is important to ensure optimal health for both the mother and baby. Vegetarian and vegan diets, as well as other special diets, can be healthy and well-balanced if managed properly. It is important to work with a healthcare provider or registered dietitian to ensure dietary needs are being met and to consume a variety of nutrient-dense foods to ensure optimal nutrition.

5.4.5 Nutrition-related Complications during the Postnatal Period and their Management

The postnatal period is a time of great nutritional demand for women, as they recover from childbirth and nourish their newborns. Proper nutrition is essential for optimal physical and mental health during this period. However, some women may experience nutrition-related complications during the postnatal period, which can have significant negative effects on their health and well-being. In this regard, some of the common

nutrition-related complications during the postnatal period and their management are discussed below.

1. Anemia: Anemia is a common complication during the postnatal period, and it can be caused by iron deficiency. Symptoms of anemia may include fatigue, weakness, dizziness, and shortness of breath. To manage anemia, postnatal women should consume iron-rich foods such as red meat, poultry, fish, beans, and fortified cereals. Additionally, iron supplements may be prescribed by a healthcare provider if necessary.
2. Constipation: Constipation is another common complication during the postnatal period, and it can be caused by a lack of dietary fiber, dehydration, and hormonal changes. To manage constipation, postnatal women should consume plenty of fluids and increase their intake of dietary fiber by eating fruits, vegetables, whole grains, and legumes. Additionally, regular physical activity can help stimulate bowel movements.
3. Lactose intolerance: Some women may experience lactose intolerance during the postnatal period, which can make it difficult to consume enough calcium and vitamin D. To manage lactose intolerance, postnatal women should consume lactose-free or low-lactose dairy products or use calcium and vitamin D supplements.
4. Vitamin D deficiency: Vitamin D deficiency is common during the postnatal period, and it can lead to a variety of health problems. To manage vitamin D deficiency, postnatal women should consume vitamin D-rich foods such as fatty fish, egg yolks, and fortified cereals. Additionally, vitamin D supplements may be prescribed by a healthcare provider if necessary.
5. Excessive weight gain: Some postnatal women may experience excessive weight gain, which can increase the risk of health problems such as diabetes, high blood pressure, and heart disease. To manage excessive weight gain, postnatal women should consume a healthy and balanced diet that is low in calories and high in nutrients. Additionally, regular physical activity can help to maintain a healthy weight.

6. Insufficient milk production: Insufficient milk production is a common concern for postnatal women, and it can be caused by a lack of nutrients, dehydration, or hormonal changes. To manage insufficient milk production, postnatal women should consume a balanced diet that is rich in nutrients and fluids. Additionally, lactation consultants may be able to provide guidance on techniques for increasing milk production, such as frequent breastfeeding or pumping.

Proper nutrition is essential during the postnatal period, and nutrition-related complications can have significant negative effects on women's health and well-being. Therefore, postnatal women should be encouraged to consume a healthy and balanced diet that is rich in nutrients and fluids, and healthcare providers should be aware of the common nutrition-related complications during the postnatal period and their management.

5.4.6 The Role of Healthcare Providers in Providing Nutrition Support

Healthcare providers play an essential role in providing nutrition support during the postnatal period. They can provide guidance and support to help postpartum women meet their nutritional needs and manage any nutrition-related complications. Here are some specific ways healthcare providers can support postnatal nutrition:

1. Assessment: Healthcare providers can assess a postpartum woman's nutritional status, including weight, dietary habits, and any nutrition-related complications. They can also assess the woman's breastfeeding status and provide guidance on appropriate calorie intake to support lactation.
2. Education: Healthcare providers can provide education on the importance of proper nutrition during the postnatal period and provide guidance on macronutrient and micronutrient requirements. They can also provide education on managing special diets, such as vegetarian or vegan diets, during this period.
3. Counseling: Healthcare providers can provide counseling to postpartum women who may be experiencing nutrition-related complications, such as anemia or constipation.

They can provide guidance on dietary modifications and recommend appropriate supplementation, if necessary.

4. Referral: Healthcare providers can refer postpartum women to a registered dietitian for further nutrition support if needed. This can be especially important for women with complicated medical histories or who require specialized nutrition care.
5. Collaboration: Healthcare providers can collaborate with other members of the healthcare team, such as lactation consultants or social workers, to provide comprehensive support to postpartum women. This can help ensure that the woman's nutritional needs are being met and any barriers to good nutrition are being addressed.

Overall, healthcare providers play a critical role in providing nutrition support during the postnatal period. By providing assessment, education, counseling, referral, and collaboration, they can help postpartum women achieve optimal nutrition and promote overall health and well-being.

5.4.7 Breastfeeding and Maternal Nutrition: Impact on Infant Health and Development

The postnatal period is a critical time for both the mother and the infant as they adjust to a new phase of life. Maternal nutrition during this period plays a crucial role in the health and development of the infant. Breastfeeding, which is the recommended mode of infant feeding during the first six months of life, is influenced by maternal nutrition. The quality and quantity of breast milk produced by the mother are determined by her nutritional status, and therefore, optimal maternal nutrition is essential for the health and growth of the infant.

The benefits of breastfeeding for infant health and development are well-established. Breast milk provides all the necessary nutrients, growth factors, and hormones needed for optimal infant growth and development. Breastfeeding also enhances the infant's immune system, protecting against infectious diseases, and reducing the risk of chronic diseases later in life. Furthermore, breastfeeding promotes bonding between the mother and the infant, leading to better mental health outcomes for both the mother and the child.

Maternal nutrition affects the quality and quantity of breast milk produced. Adequate maternal nutrition is essential for optimal breastfeeding outcomes. Malnourished mothers produce less breast milk, which affects the infant's growth and development negatively. Inadequate maternal nutrition can also affect the quality of breast milk, leading to a deficiency in essential nutrients required for infant growth and development.

Iron-deficiency anemia is a common nutrition-related complication during the postnatal period. It is prevalent among women who experience blood loss during childbirth, and those with poor iron stores before delivery. Anemia affects the mother's health and can lead to fatigue, weakness, and poor concentration. Maternal anemia can also affect the infant's growth and development as it can lead to reduced milk production and quality.

Constipation is another common nutrition-related complication during the postnatal period. It is caused by inadequate fluid and fiber intake, leading to difficulty in bowel movements. Postpartum mothers may experience constipation due to changes in hormonal levels and decreased physical activity. Constipation can be managed by increasing fluid and fiber intake, engaging in physical activity, and taking laxatives if necessary.

Healthcare providers play a critical role in providing nutrition support during the postnatal period. They should assess the nutritional status of postpartum women, identify nutrition-related complications, and provide appropriate interventions. Healthcare providers should also provide information and support on the benefits of breastfeeding and optimal nutrition during this critical period. Nutrition education should be tailored to individual needs, taking into account cultural, dietary, and lifestyle factors.

Proper maternal nutrition during the postnatal period is essential for optimal infant growth and development. Breastfeeding is the recommended mode of infant feeding during the first six months of life and is influenced by maternal nutrition. Adequate maternal nutrition is essential for optimal breastfeeding outcomes and can prevent nutrition-related complications during the postnatal period. Healthcare providers play a critical role in providing nutrition support and education to postpartum women, promoting optimal maternal and infant health outcomes.

Did You Know?

Throughout the 20th century, the care of new mothers continued to evolve. The introduction of antibiotics and improvements in surgical techniques made childbirth safer, and postnatal care became more standardized. In many countries, maternity leave was introduced, giving women time to recover and bond with their new babies.

CASE STUDY

ASSESSING AND MANAGING WOMEN DURING THE POSTNATAL PERIOD

The postnatal period is a critical time for women, as they recover from childbirth and adjust to the demands of caring for a newborn. This period is characterized by significant physical, emotional, and social changes, and requires comprehensive assessment and management to ensure optimal health and well-being for both the mother and baby. This dissertation report aims to explore the assessment and management of women during the postnatal period, using a case study to illustrate key points.

Mary is a 28-year-old first-time mother who gave birth to a healthy baby girl two days ago. She had an uncomplicated vaginal delivery and is eager to take her baby home. Mary has no significant medical history and has been receiving regular prenatal care throughout her pregnancy. She is currently breastfeeding and reports some mild discomfort in her breasts.

Assessment

The assessment of Mary during the postnatal period should be comprehensive and cover a range of physical, emotional, and social factors. This includes:

1. Physical assessment: Mary should be assessed for any signs of physical complications following childbirth, including excessive bleeding, pain, and infection. Her breasts should be examined for engorgement or signs of mastitis.
2. Emotional assessment: Mary should be assessed for any signs of postpartum depression or anxiety, which can have a significant impact on her well-being and the care of her baby.
3. Social assessment: Mary's social support network should be assessed, including the availability of family or friends to help with childcare and other responsibilities.

Management

The management of Mary during the postnatal period should be individualized to her specific needs and circumstances. This includes:

1. Pain management: Mary's pain should be managed effectively, using a combination of non-pharmacologic measures such as relaxation techniques and pharmacologic measures such as acetaminophen or ibuprofen.
2. Breastfeeding support: Mary should be provided with support and education to optimize breastfeeding, including techniques to manage breast discomfort and ensure adequate milk supply.

3. Emotional support: Mary should be screened for postpartum depression and provided with appropriate referrals and support if needed.
4. Social support: Mary should be encouraged to develop a strong social support network, including family and friends who can help with childcare and other responsibilities.

Conclusion

The assessment and management of women during the postnatal period is critical to ensure optimal health and well-being for both the mother and baby. This requires a comprehensive and individualized approach, taking into account physical, emotional, and social factors. The case study of Mary highlights the importance of effective assessment and management during this critical time, and the need for ongoing support to promote a healthy transition to motherhood.

SUMMARY

- The postnatal period refers to the time after childbirth during which the mother and baby recover from the birth process and adapt to their new roles.
- Physical assessment of women during the postnatal period is crucial to ensure their well-being and identify any potential complications.
- The musculoskeletal assessment is essential to identify any potential postnatal musculoskeletal complications such as low back pain, sacroiliac joint dysfunction, or pubic symphysis pain.
- Cardiovascular and respiratory assessments are essential components of the physical assessment of women during the postnatal period.
- Abdominal examination and management are important components of the physical assessment of women during the postnatal period. The postnatal period is a critical time for the woman's abdominal health, as the uterus undergoes significant changes after delivery.
- Musculoskeletal assessment and management are important components of the physical assessment of women during the postnatal period. The postnatal period is a critical time for musculoskeletal health, as the woman's body undergoes significant changes during pregnancy and delivery.
- Emotional well-being assessment and management are critical components of postnatal care for women. The postnatal period can be a challenging time for women, as they adjust to the physical, emotional, and social changes that occur after childbirth.
- Physical assessments during the postnatal period are essential to ensure that women receive appropriate care and support during this critical time. The timing and frequency of physical assessments may vary depending on the woman's individual needs and circumstances.
- Regional anesthesia is a type of anesthesia that numbs a specific area of the body, and it is commonly used for pain management during childbirth. There are two types of regional anesthesia commonly used during childbirth: epidural anesthesia and spinal anesthesia.
- Multidisciplinary pain management approaches for postnatal pain involve the coordinated efforts of healthcare professionals from various specialties to provide comprehensive and holistic care to women experiencing pain during the postnatal period.
- Breastfeeding is an important aspect of postnatal care and provides numerous benefits for both the mother and the newborn. However, breastfeeding can also be a challenging experience for some women.
- Proper breastfeeding techniques and positions can make breastfeeding more comfortable for both the mother and baby, and can help ensure that the baby is getting enough milk.

MULTIPLE CHOICE QUESTIONS

1. **What is the primary goal of physical assessment during the postnatal period?**
   a. To identify any medical complications
   b. To provide emotional support
   c. To promote breastfeeding
   d. To assess the mother's level of fatigue
2. **What is the recommended frequency for monitoring vital signs during the first 24 hours after delivery?**
   a. Every hour
   b. Every 2 hours
   c. Every 4 hours
   d. Every 6 hours
3. **What is the most common complication of breastfeeding?**
   a. Mastitis
   b. Nipple soreness
   c. Insufficient milk supply
   d. Breast engorgement
4. **What is the recommended duration of exclusive breastfeeding?**
   a. 3 months
   b. 6 months
   c. 9 months
   d. 12 months
5. **What is the recommended frequency of breastfeeding during the first month postpartum?**
   a. Every 2-3 hours
   b. Every 4-5 hours
   c. Every 6-7 hours
   d. Every 8-9 hours
6. **Which of the following is a non-pharmacological intervention for pain management during the postnatal period?**
   a. Epidural anesthesia
   b. Acetaminophen
   c. Relaxation techniques
   d. Ibuprofen

7. **What is the recommended position for breastfeeding?**
   a. Supine position
   b. Side-lying position
   c. Sitting position
   d. Prone position
8. **Which of the following is a recommended macronutrient requirement for postpartum women?**
   a. High protein diet
   b. Low carbohydrate diet
   c. High fat diet
   d. High fiber diet
9. **Which of the following is a nutrition-related complication during the postnatal period?**
   a. Muscle cramps
   b. Hypertension
   c. Insomnia
   d. Anemia
10. **What is the recommended duration for exclusive breastfeeding for premature infants?**
    a. 2 months
    b. 4 months
    c. 6 months
    d. 8 months

REVIEW QUESTIONS

1. What is the importance of breast examination and management during the postnatal period?
2. How can healthcare providers assess and manage emotional well-being during the postnatal period?
3. What is the recommended timing and frequency of physical assessments during the postnatal period?
4. What are some non-pharmacological interventions for pain management during the postnatal period?
5. How can regional anesthesia be used for pain management during childbirth?

Answers

1. (a)	2. (a)	3. (b)	4. (b)	5. (a)
6. (c)	7. (c)	8. (a)	9. (d)	10. (c)

REFERENCES

1. American College of Obstetricians and Gynecologists. (2018). ACOG Committee Opinion No. 736: Optimizing Postpartum Care. Obstetrics and Gynecology, 131(5), e140-e150.
2. Brown, A., & Jordan, S. (2013). Impact of birth complications on breastfeeding duration: an internet survey. Journal of Advanced Nursing, 69(4), 828-839.
3. Centers for Disease Control and Prevention. (2020). Pregnancy and Postpartum Care. Retrieved from https://www.cdc.gov/reproductivehealth/maternalinfanthealth/pregnancy-postpartum.htm
4. Douma, R., Buist, A., & Fraser, W. D. (2003). Feasibility of early postpartum discharge with home follow-up: a randomized controlled trial. Canadian Medical Association Journal, 168(3), 290-295.
5. Kozhimannil, K. B., Jou, J., Attanasio, L. B., Joarnt, L. K., & Johnson, P. J. (2014). Patient-reported quality measures for prenatal care. Obstetrics and Gynecology, 124(4), 757-764.
6. Lee, Y. L., Spence, D., & Lee, D. T. (2013). Challenges of caring for women in the postpartum period: a review of the literature. Midwifery, 29(4), 401-411.
7. Lumbiganon, P., Laopaiboon, M., Intarut, N., Vogel, J. P., Souza, J. P., Gülmezoglu, A. M., & Mori, R. (2016). Indirect causes of severe adverse maternal outcomes: a secondary analysis of the WHO Multicountry Survey on Maternal and Newborn Health. BJOG: An International Journal of Obstetrics and Gynaecology, 123(5), 749-757.
8. Mathews, T. J., & MacDorman, M. F. (2013). Infant mortality statistics from the 2010 period linked birth/infant death data set. National Vital Statistics Reports, 62(8), 1-26.
9. Melese, T., Gebrehiwot, Y., Bisetegne, D., & Habte, D. (2016). Assessment of postpartum maternal health care service utilization and associated factors in eastern Ethiopia. BMC Pregnancy and Childbirth, 16(1), 1-10.
10. National Institute for Health and Care Excellence. (2014). Postnatal care up to 8 weeks after birth. Retrieved from https://www.nice.org.uk/guidance/cg37/chapter/Recommendations#routine-postnatal-care-for-all-women-and-babies
11. Osterman, M. J. K., & Martin, J. A. (2014). Trends in low-risk cesarean delivery in the United States, 1990-2013. National Vital Statistics Reports, 63(6), 1-16.

12. Rallis, S., Skouteris, H., McCabe, M., Milgrom, J., & Wertheim, E. H. (2014). A prospective examination of depression, anxiety and stress throughout pregnancy. Women and Birth, 27(4), e36-e42.



CHAPTER 6

Assessment and Management of Normal Neonates

"A new baby is like the beginning of all things - wonder, hope, a dream of possibilities."

—Eda J. Le Shan.

LEARNING OBJECTIVES

After studying this chapter, you will be able to:

1. Elaborate the Apgar score and its significance in assessing neonatal health
2. Determine the importance of gestational age assessment in neonatal management
3. Find out the breastfeeding and its benefits for neonatal health and development
4. Discuss on neonatal jaundice and its management

INTRODUCTION

Neonates are newborn babies who are less than 28 days old. In the first few days of life, neonates undergo significant physiological changes as they adapt to the extra-uterine environment. This period is crucial in establishing good health and preventing potential complications. Therefore, assessment and management of normal neonates are important for their overall health and wellbeing.

The initial assessment of a neonate should be done promptly after birth. The assessment should include the following:

- Apgar score: The Apgar score is a quick and simple way to assess the overall health of a newborn baby. It is usually done at one and five minutes after birth. The score is based on five criteria: heart rate, respiratory effort, muscle tone, reflex irritability, and color. A score of 7-10 is considered normal.
- Vital signs: Vital signs such as heart rate, respiratory rate, and temperature should be assessed and recorded. Normal heart rate for neonates is between 120-160 beats per minute, respiratory rate is between 30-60 breaths per minute, and temperature should be between 36.5-37.5°C.
- Physical examination: A thorough physical examination should be done to assess for any abnormalities, congenital defects, or signs of distress. The examination should include inspection, palpation, percussion, and auscultation of the baby's head, neck, chest, abdomen, and extremities.
- Gestational age assessment: The gestational age of the neonate should be assessed as it is an important factor in determining the neonate's risk for complications and management.
- Newborn screening: Neonatal screening is done to detect any genetic or metabolic disorders that may not be apparent at birth. These tests are usually done within the first few days of life.

Management of Neonates

- Feeding: Breast milk is the preferred choice of feeding for neonates. It provides the necessary nutrients for growth and development and has protective factors that help prevent infections. If breastfeeding is not possible, formula milk may be given. Feeding should be done on demand and the baby should be observed for signs of hunger and satiety.
- Hygiene: Good hygiene practices are important to prevent infections. The umbilical cord stump should be kept clean and dry until it falls off, usually within

10-14 days. The baby should be bathed regularly and diaper changes should be done promptly.

- Immunizations: Neonates should receive their first immunizations within the first few weeks of life. The first immunization is usually given at 6 weeks of age and includes the vaccine for hepatitis B.
- Follow-up: Neonates should have regular follow-up appointments with their healthcare provider to monitor their growth and development, and to detect any abnormalities or signs of illness.

Assessment and management of normal neonates are crucial in promoting their overall health and wellbeing. A thorough physical examination, gestational age assessment, and newborn screening should be done to detect any abnormalities or risk factors. Good feeding practices, hygiene, and immunizations are important in preventing infections and ensuring optimal growth and development. Regular follow-up appointments with a healthcare provider should be done to monitor the neonate's progress and detect any signs of illness.

6.1 THE APGAR SCORE AND ITS SIGNIFICANCE IN ASSESSING NEONATAL HEALTH

The Apgar score is a simple and quick assessment tool used to evaluate the health of newborn babies immediately after birth. It was developed by an American anesthesiologist, Virginia Apgar, in 1952. The Apgar score is a combination of five components: heart rate, respiratory effort, muscle tone, reflex irritability, and color. The score is obtained at one minute and five minutes after birth, and sometimes at 10 minutes if the initial scores are low.

Each of the five components is scored from 0 to 2, with a total score of 10 being the highest possible score. A score of 7 or more is considered normal, while a score of less than 7 may indicate the need for further medical attention. A low Apgar score may also indicate a neonate's risk for long-term developmental delays, cerebral palsy, or mortality.

The Apgar score is important in assessing the neonate's initial response to extrauterine life and identifying any problems that

may require immediate intervention. For example, a low heart rate or respiratory effort may require immediate resuscitation, while a low muscle tone or reflex irritability may indicate a need for monitoring and follow-up.

The Apgar score is a useful tool for healthcare providers to quickly evaluate neonatal health, and it can also provide reassurance to parents about their newborn's health. However, it should be noted that the Apgar score is not a comprehensive assessment of neonatal health and should be used in conjunction with a thorough physical examination and other diagnostic tests as needed.

The Apgar score is a valuable tool in assessing neonatal health and identifying any potential problems that may require intervention.

6.1.1 The History and Development of the Apgar score

The Apgar score is named after Virginia Apgar, an American anesthesiologist who developed the scoring system in 1952. Dr. Apgar was concerned about the high rate of infant mortality and morbidity in the immediate postnatal period. She recognized the need for a standardized method of assessing the health of newborns and identifying those who required immediate medical attention.

The Apgar score was first presented at a meeting of the American Society of Anesthesiologists in 1952. At the time, the score only included four components: heart rate, respiratory effort, muscle tone, and reflex irritability. The fifth component, color, was added later.

The initial version of the Apgar score was designed to be a quick and simple assessment tool that could be used by healthcare providers immediately after birth. The score was intended to be used as a screening tool to identify newborns who required further medical attention.

The Apgar score quickly gained widespread acceptance and became a standard part of neonatal care. It has since been used in countless clinical trials and epidemiological studies to

evaluate the health of neonates.

Over the years, the Apgar score has been modified and adapted to meet the changing needs of neonatal care. For example, the score is now often calculated at 1 minute and 5 minutes after birth, and sometimes at 10 minutes if the initial scores are low. In addition, the score has been adapted for use in preterm and low birth weight infants.

Today, the Apgar score remains a widely used and important tool in neonatal care. While it is not a comprehensive assessment of neonatal health, it provides a valuable initial assessment of the newborn's condition and helps identify infants who require immediate attention.

6.1.2 The Timing and Frequency of Apgar score Assessments in Neonates

The Apgar score is typically assessed at two time points after birth: 1 minute and 5 minutes. In some cases, a third assessment may be done at 10 minutes if the initial scores are low. The score is obtained by observing the newborn's heart rate, respiratory effort, muscle tone, reflex irritability, and color.

The 1-minute Apgar score provides a quick assessment of the newborn's initial response to extrauterine life. A low score at 1 minute may indicate the need for immediate medical intervention or further monitoring.

The 5-minute Apgar score provides a more comprehensive assessment of the newborn's health and can be used to assess the effectiveness of any interventions that were initiated after the 1-minute score.

The decision to perform a 10-minute Apgar score assessment is based on the infant's condition at 5 minutes. If the 5-minute score is less than 7, or if the infant required resuscitation, a 10-minute score may be performed to determine if the infant is continuing to improve.



In addition to the standard timing of Apgar score assessments, some healthcare providers may perform additional assessments at different time points, depending on the infant's condition. For example, if a newborn requires resuscitation, an Apgar score assessment may be done every minute until the score improves.

Medical attention for neonates is critical to ensure their health and wellbeing, especially in the first few days and weeks of life.

It is important to note that while the Apgar score provides a valuable initial assessment of neonatal health, it should be used in conjunction with a thorough physical examination and other diagnostic tests as needed. The score is not a comprehensive assessment of neonatal health and should not be used as the sole determinant of medical management.

The timing and frequency of Apgar score assessments in neonates depends on the infant's condition and any interventions that may have been initiated. Regular assessments provide important information to healthcare providers and help identify infants who require immediate **medical attention**.

6.1.3 Interpreting Apgar Scores and their Implications for Neonatal Health

The Apgar score is a useful tool for assessing the health of newborns immediately after birth. The score is calculated based on five parameters: heart rate, respiratory effort, muscle tone, reflex irritability, and color, and is assessed at 1 minute and 5

minutes after birth. The maximum score is 10, and a score of 7 or above is considered normal.

Interpreting Apgar scores requires an understanding of the significance of each parameter and their implications for neonatal health. The following is a brief overview of how to interpret Apgar scores and their implications for neonatal health:

- Heart rate: The heart rate is a critical parameter in the immediate postnatal period. A heart rate of 0 is scored as 0, while a heart rate above 100 is scored as 2. A low heart rate may indicate that the infant is in distress and requires immediate intervention.
- Respiratory effort: Respiratory effort is essential for adequate oxygenation and ventilation of the newborn. A score of 0 is given if the infant is not breathing, while a score of 2 is given if the infant is crying and breathing well. A low score may indicate the need for ventilation or other interventions.
- Muscle tone: Muscle tone reflects the infant's neurological status and overall health. A score of 0 is given if the infant is completely flaccid, while a score of 2 is given if the infant has good muscle tone. Low muscle tone may indicate the need for further evaluation and intervention.
- Reflex irritability: The reflex irritability score is based on the infant's response to stimulation. A score of 0 is given if there is no response to stimulation, while a score of 2 is given if the infant has a vigorous response. A low score may indicate neurological dysfunction or depression.
- Color: The color of the skin is a reflection of the infant's oxygenation status. A score of 0 is given if the infant is pale or blue, while a score of 2 is given if the infant is pink. A low score may indicate hypoxia or other underlying medical conditions.

Interpreting Apgar scores requires a holistic assessment of the infant's overall health and any medical interventions that may have been initiated. Low Apgar scores at 1 and 5 minutes may indicate the need for further evaluation and intervention, such as resuscitation, monitoring, or transfer to a higher level of care. Apgar scores should be used in conjunction with other clinical

assessments and diagnostic tests to provide a comprehensive assessment of neonatal health.

6.1.4 Limitations and Criticisms of the Apgar score as a tool for Neonatal Assessment

While the Apgar score is a useful tool for assessing neonatal health, it has limitations and criticisms that should be considered. These include:

- Limited predictive value: The Apgar score provides a snapshot of the infant's health at a particular point in time, but it does not necessarily predict long-term outcomes. A low Apgar score does not necessarily mean that the infant will have long-term health problems, and a high Apgar score does not guarantee good health.
- Subjectivity: The Apgar score is based on subjective assessments of the infant's appearance and behavior, which can be influenced by various factors such as the healthcare provider's experience, lighting conditions, and the infant's gestational age.
- Lack of consideration for gestational age: The Apgar score does not take into account the infant's gestational age or other factors that may affect their health, such as the presence of congenital anomalies or perinatal asphyxia.
- Limited focus: The Apgar score is focused on the five parameters it assesses and does not provide a comprehensive assessment of neonatal health. It does not, for example, assess the infant's neurological status or evaluate for metabolic abnormalities.
- Poor inter-rater reliability: There may be inconsistencies between different healthcare providers in scoring the Apgar score, leading to poor inter-rater reliability.
- Overemphasis on intervention: In some cases, the Apgar score may lead to overemphasis on intervention and treatment, particularly in cases where the score is low. This can lead to unnecessary medical interventions and increased healthcare costs.

Despite these limitations, the Apgar score remains a useful tool for assessing neonatal health and has helped to improve the management and outcomes of newborns. It is important, however, to recognize its limitations and to use it in conjunction with other clinical assessments and diagnostic tests to provide a comprehensive evaluation of neonatal health.

6.1.5 Comparison of the Apgar score with other Neonatal Assessment Tools

While the Apgar score is a widely used tool for assessing neonatal health, it is not the only tool available. There are several other assessment tools that may be used in conjunction with, or as an alternative to, the Apgar score. Some of these tools include:

- New Ballard Score: The New Ballard Score is a tool used to assess gestational age by evaluating physical and neuromuscular maturity. It is often used in conjunction with the Apgar score to provide a comprehensive assessment of neonatal health.
- Clinical Risk Index for Babies (CRIB): The CRIB score is a tool used to predict mortality risk in premature infants. It assesses various clinical factors such as birth weight, gestational age, and oxygenation status to provide a numerical score that can help guide clinical decision-making.
- Neonatal Behavioral Assessment Scale (NBAS): The NBAS is a tool used to assess neurological and behavioral functioning in newborns. It evaluates various aspects of the infant's behavior, such as their ability to regulate their state, their response to stimuli, and their motor coordination.
- Neonatal Neurological Examination (NNE): The NNE is a tool used to assess neurological functioning in newborns. It evaluates various aspects of the infant's neurological status, such as muscle tone, reflexes, and cranial nerve function.
- SNAP (Score for Neonatal Acute Physiology): The SNAP score is a tool used to assess illness severity in premature infants. It evaluates various clinical factors such as birth weight, gestational age, and vital signs to provide a

numerical score that can help guide clinical decision-making.



While each of these assessment tools has its own strengths and limitations, they can be used in conjunction with one another to provide a comprehensive evaluation of neonatal health. The choice of which tool or tools to use will depend on the clinical context and the specific needs of the infant.

6.1.6 The Relationship between Apgar scores and Long-term Outcomes in Neonates

The Apgar score is a tool used to assess the health of newborn infants immediately after birth. While it provides valuable information about the infant's health status at a particular point in time, it is not a reliable predictor of long-term outcomes.

Numerous studies have investigated the relationship between Apgar scores and long-term outcomes in neonates. Some studies have found that infants with low Apgar scores (less than 7) are more likely to experience adverse outcomes such as cerebral palsy, developmental delays, and learning disabilities. However, other studies have found that Apgar scores are not predictive of long-term outcomes and that other factors, such as gestational age and birth weight, are more important predictors of neonatal

health.

One study published in the Journal of the American Medical Association (JAMA) in 2015 found that while low Apgar scores were associated with increased risk of cerebral palsy and other neurodevelopmental disorders, they were not strong predictors of long-term outcomes. The study also found that gestational age and birth weight were more important predictors of neurodevelopmental outcomes in premature infants.

Another study published in the American Journal of Obstetrics and Gynecology in 2018 found that while low Apgar scores were associated with increased risk of neonatal mortality and morbidity, they were not reliable predictors of long-term outcomes. The study concluded that other factors, such as birth weight and gestational age, were more important predictors of neonatal health.

While Apgar scores are not reliable predictors of long-term outcomes in neonates, they remain an important tool for assessing the infant's health status immediately after birth. A low Apgar score may indicate that the infant requires immediate medical attention and intervention, which can improve their chances of survival and long-term health.

6.1.7 The Role of the Apgar score in Guiding Neonatal Resuscitation

The Apgar score plays a crucial role in guiding neonatal resuscitation. It is a quick and reliable tool that provides important information about the newborn's health status immediately after birth, and can help determine the need for resuscitative measures.

The Apgar score is typically assessed at one and five minutes after birth, and can be repeated at 10-minute intervals if necessary. A score of 7 or above is considered normal, while a score of 4-6 indicates moderate distress, and a score of 0-3 indicates severe distress and the need for immediate resuscitation.

If an infant has a low Apgar score, resuscitative measures may be necessary to support the infant's breathing and circulation. These measures may include stimulation, bag-mask ventilation, chest compressions, and administration of medications.

In addition to guiding immediate resuscitative measures, the Apgar score can also help determine the need for ongoing monitoring and intervention. Infants with low Apgar scores may require closer monitoring and more intensive interventions, such as mechanical ventilation or admission to a neonatal intensive care unit.

It is important to note, however, that the Apgar score should not be used in isolation to guide resuscitative measures. Clinical judgment and assessment of other factors, such as the infant's gestational age and the presence of risk factors for neonatal distress, should also be considered when determining the need for resuscitation.

The Apgar score plays a critical role in guiding neonatal resuscitation. It provides important information about the newborn's health status immediately after birth and can help determine the need for resuscitative measures and ongoing monitoring and intervention.

6.1.8 Apgar Scores and their association with Preterm Birth and Low Birth Weight

Preterm birth and low birth weight are two important risk factors that can impact an infant's health status at birth and can be associated with lower Apgar scores.

Preterm birth is defined as delivery before 37 weeks of gestation, and is associated with an increased risk of neonatal morbidity and mortality. Preterm infants may have underdeveloped organs and immature physiological systems, which can lead to complications such as respiratory distress syndrome, apnea, and sepsis. Preterm infants are also at increased risk of neurodevelopmental disabilities, including cerebral palsy, intellectual disability, and learning disorders.

Low birth weight (LBW) is defined as a birth weight of less than 2500 grams, regardless of gestational age. LBW infants may be born prematurely or may be small for gestational age. LBW infants are at increased risk of complications such as hypoglycemia, hypothermia, respiratory distress, and sepsis. Both preterm birth and low birth weight are associated with lower Apgar scores. Infants who are born preterm or with LBW are

more likely to have lower Apgar scores at 1 and 5 minutes after birth compared to full-term infants with normal birth weights. However, it is important to note that not all preterm or LBW infants will have low Apgar scores, and not all infants with low Apgar scores will have preterm birth or LBW.



The association between preterm birth or low birth weight and lower Apgar scores underscores the importance of close monitoring and early intervention for these high-risk infants. Neonatal intensive care, specialized equipment, and skilled healthcare professionals may be required to provide the necessary support and care for preterm or LBW infants with low Apgar scores.

Preterm birth and low birth weight are important risk factors that can impact an infant's health status at birth and are associated with lower Apgar scores. Close monitoring and early intervention are essential for high-risk infants with low Apgar scores, and may require specialized care and equipment.

6.1.9 The use of the Apgar score in predicting Neonatal Mortality and Morbidity

The Apgar score is a useful tool in predicting neonatal mortality and morbidity, as it provides a quick assessment of the newborn's health status immediately after birth. Several studies have shown that low Apgar scores at 5 minutes are associated with increased neonatal mortality and morbidity.

A study published in the New England Journal of Medicine found that infants with an Apgar score of 0-3 at 5 minutes had a significantly increased risk of neonatal mortality compared to infants with a score of 7-10 (odds ratio of 947.2). Another study published in the Journal of Perinatology found that infants with a 5-minute Apgar score of 0-3 had a significantly increased risk of death or severe morbidity compared to infants with a score of 4-7 or 8-10.

In addition to predicting mortality, the Apgar score can also be used to predict other neonatal outcomes, such as the need for neonatal resuscitation, admission to a neonatal intensive care unit (NICU), and the development of neonatal complications such as hypoxic-ischemic encephalopathy.

However, it is important to note that the Apgar score is not a perfect predictor of neonatal outcomes, and other factors such as gestational age, birth weight, and the presence of risk factors for neonatal morbidity and mortality should also be considered when assessing neonatal outcomes.

The Apgar score is a useful tool in predicting neonatal mortality and morbidity. Low Apgar scores at 5 minutes are associated with increased neonatal mortality and morbidity, and can help guide the need for neonatal resuscitation, admission to a NICU, and ongoing monitoring and intervention. However, other factors should also be considered when assessing neonatal outcomes, and the Apgar score should not be used in isolation to predict neonatal outcomes.

Did You Know?

Developed in 1952 by Dr. Virginia Apgar, then a professor of anesthesiology at Columbia University College of Physicians and Surgeons, and director of obstetric anesthesia at Presbyterian Hospital, the Apgar score is used around the world for assessing newborns' health as they take their first breaths.

6.2 THE IMPORTANCE OF GESTATIONAL AGE ASSESSMENT IN NEONATAL MANAGEMENT

Gestational age assessment is a critical aspect of neonatal management, as it provides important information about the timing of fetal development and can help guide appropriate care and management of newborns. Gestational age refers to the duration of pregnancy, measured in weeks from the first day of the mother's last menstrual period or estimated by ultrasound measurements.

Accurate assessment of gestational age is essential for several reasons. Firstly, it is important for identifying preterm

and post-term infants, who may require specialized care and management. Preterm infants, defined as those born before 37 weeks of gestation, are at increased risk of complications such as respiratory distress syndrome, sepsis, and neurological deficits. Post-term infants, defined as those born after 42 weeks of gestation, may be at increased risk of complications such as meconium aspiration syndrome, macrosomia, and stillbirth.

Secondly, gestational age assessment is important for predicting fetal and neonatal growth and development, and for identifying infants who may be small for gestational age (SGA) or large for gestational age (LGA). Infants who are SGA or LGA may be at increased risk of complications such as hypoglycemia, hypothermia, and respiratory distress.

Thirdly, gestational age assessment is important for determining the timing of interventions such as corticosteroids for fetal lung maturation, and for identifying infants who may require ongoing monitoring and intervention in the neonatal period.

Several methods are used for gestational age assessment, including menstrual dating, ultrasound dating, and clinical assessment based on physical examination. Menstrual dating is based on the first day of the mother's last menstrual period, and is commonly used when the date of conception is unknown. Ultrasound dating is based on measurements of fetal biometry, including crown-rump length, biparietal diameter, and femur length, and is considered the most accurate method for gestational age assessment. Clinical assessment based on physical examination includes assessment of physical features such as the presence of breast buds, the appearance of the external genitalia, and the degree of cartilage ossification.

In some cases, gestational age may be difficult to assess accurately, particularly in cases of uncertain menstrual dates, poor quality ultrasound images, or in cases of fetal growth restriction. In these cases, other markers of fetal maturity may be used, such as assessments of fetal lung maturity or placental grading.

Gestational age assessment is a critical aspect of neonatal management, as it provides important information about the timing of fetal development and can help guide appropriate care

and management of newborns. Accurate assessment of gestational age is essential for identifying preterm and post-term infants, predicting fetal and neonatal growth and development, and determining the timing of interventions and ongoing monitoring in the neonatal period. Several methods are used for gestational age assessment, including menstrual dating, ultrasound dating, and clinical assessment based on physical examination.

6.2.1 The Accuracy of Different Methods for Gestational Age Assessment in Neonates

Accurate assessment of gestational age is critical for appropriate neonatal management, as it can guide decisions about care and interventions for infants at increased risk of complications such as preterm birth or fetal growth restriction. However, there is no single gold standard for gestational age assessment, and different methods have varying degrees of accuracy and reliability.

The three main methods for gestational age assessment in neonates are menstrual dating, ultrasound dating, and clinical assessment based on physical examination. Menstrual dating relies on the mother's last menstrual period and assumes a regular menstrual cycle, which may not always be the case. As a result, menstrual dating may be inaccurate in cases where the mother has irregular menstrual cycles, has experienced vaginal bleeding during pregnancy, or has undergone hormonal contraception.

Ultrasound dating is considered the most accurate method for gestational age assessment and is based on measurements of fetal biometry, including crown-rump length, biparietal diameter, and femur length. However, ultrasound dating is subject to a range of factors that can affect its accuracy, including variability in fetal growth patterns, variations in fetal position, and differences in ultrasound equipment and operator skill.

Clinical assessment based on physical examination is a less commonly used method for gestational age assessment and relies on assessing physical features such as the presence of breast buds, the appearance of the external genitalia, and the degree of cartilage ossification. However, clinical assessment may be difficult to interpret in cases where infants are born prematurely, are small for gestational age, or have other physical anomalies.



In addition to these methods, other markers of fetal maturity may be used to estimate gestational age, such as assessments of fetal lung maturity or placental grading. However, these markers may be subject to variability and may not always accurately reflect gestational age.

Accurate gestational age assessment is critical for appropriate neonatal management, and multiple methods may be used to achieve this goal. While ultrasound dating is considered the most accurate method, it may still be subject to variability and may not always be feasible or available. Clinicians should be aware of the limitations and potential sources of error for different methods of gestational age assessment and should use a combination of methods where possible to increase accuracy and reliability.

6.2.2 The Impact of Gestational Age on Neonatal Outcomes and Long-Term Health

Gestational age at birth is a major determinant of neonatal outcomes and long-term health. Infants born preterm (before 37 weeks gestation) or post-term (after 42 weeks gestation) are at increased risk of a range of complications compared to infants born at term (between 37 and 42 weeks gestation).

Preterm birth is a leading cause of neonatal mortality and morbidity, and infants born preterm are at increased risk of respiratory distress syndrome, intraventricular hemorrhage, necrotizing enterocolitis, sepsis, and long-term neurodevelopmental disabilities such as cerebral palsy, cognitive

impairment, and behavioral problems. Preterm birth is also associated with an increased risk of chronic health conditions in adulthood, including cardiovascular disease, diabetes, and respiratory disorders.

On the other hand, infants born post-term are at increased risk of complications such as meconium aspiration syndrome, macrosomia (large birth weight), and hypoglycemia. Post-term infants are also at increased risk of stillbirth and neonatal mortality compared to infants born at term.

Infants born small for gestational age (SGA), which means their birth weight is below the 10th percentile for their gestational age, are also at increased risk of complications including hypothermia, hypoglycemia, and respiratory distress syndrome. SGA infants are also at increased risk of long-term health problems such as growth restriction, developmental delays, and chronic health conditions such as hypertension and metabolic disorders.

Conversely, infants born large for gestational age (LGA), which means their birth weight is above the 90th percentile for their gestational age, are at increased risk of complications such as birth injury, shoulder dystocia, and hypoglycemia. LGA infants are also at increased risk of long-term health problems such as obesity, cardiovascular disease, and metabolic disorders.

Preterm infants are those who are born before 37 weeks of gestation. These infants often require specialized medical attention due to their underdeveloped organs and systems.

In addition to these immediate and long-term health risks, gestational age can also impact healthcare resource utilization and healthcare costs. **Preterm infants** and infants with other gestational age-related complications often require longer hospital stays, more intensive care, and ongoing follow-up care, which can place a significant burden on healthcare resources and increase healthcare costs.

Gestational age is a critical determinant of neonatal outcomes and long-term health, and accurate gestational age assessment is essential for appropriate neonatal management and long-term health planning. Early identification of infants at increased risk of complications based on gestational age can help guide decisions about care and interventions to optimize neonatal outcomes and reduce the burden of long-term health problems.

6.2.3 Gestational Age Assessment in Predicting and Managing Preterm Birth

Gestational age assessment plays a crucial role in predicting and managing preterm birth, which is defined as birth before 37 weeks of gestation. Accurate determination of gestational age is important for identifying women at risk of preterm birth and for monitoring fetal growth and development to ensure appropriate management and interventions.

Several methods are used for gestational age assessment, including ultrasound, last menstrual period (LMP), and neonatal assessments such as the Ballard score. Ultrasound is the most accurate method of gestational age assessment and is routinely used in prenatal care to estimate gestational age based on fetal size and development. LMP is also commonly used, although it is less accurate than ultrasound, particularly in women with irregular menstrual cycles or limited knowledge of their last menstrual period.

Gestational age assessment can help identify women at high risk of preterm birth, allowing for early intervention and management. For example, women identified as at high risk of preterm birth may receive progesterone supplementation or cervical cerclage to reduce the risk of preterm delivery. In addition, close monitoring of fetal growth and development can help detect signs of preterm birth and allow for timely intervention.



In cases where preterm birth is imminent or has already occurred, gestational age assessment is important for determining appropriate management and interventions. For example, infants born at different gestational ages may require different levels of care in the neonatal intensive care unit (NICU) and may be at increased risk of complications such as respiratory distress syndrome or sepsis. Accurate gestational age assessment can help guide decisions about appropriate NICU care, including respiratory support, nutritional support, and monitoring for potential complications.

In addition, gestational age assessment can also help guide long-term follow-up care for preterm infants. Preterm infants are at increased risk of neurodevelopmental delays and other long-term health problems, and appropriate follow-up care is essential to ensure optimal outcomes. Accurate gestational age assessment can help identify infants at increased risk of these complications and guide decisions about appropriate follow-up care, such as developmental screening and early intervention services.

Remember

Gestational age assessment is critical for predicting and managing preterm birth, and accurate determination of gestational age is essential for appropriate prenatal and neonatal care. Early identification of women at risk of preterm birth and close monitoring of fetal growth and development can help reduce the risk of preterm delivery and optimize neonatal outcomes.

6.2.4 The Association between Gestational Age and Neonatal Sepsis

Neonatal sepsis is a serious and potentially life-threatening condition in which a newborn develops a bloodstream infection. Premature infants are at higher risk of neonatal sepsis compared to term infants. Gestational age plays a significant role in the incidence and severity of neonatal sepsis.

Infants born preterm, especially those born before 32 weeks of gestation, are at increased risk of developing sepsis. This is because the immature immune system of preterm infants is not fully developed, making them more susceptible to infection. In addition, preterm infants often require invasive medical procedures, such as intubation and intravenous catheterization, which can increase the risk of infection.

The risk of neonatal sepsis also increases with decreasing gestational age. A study published in the Journal of Perinatology found that the incidence of sepsis was highest among infants born before 28 weeks of gestation, and decreased with increasing gestational age. Infants born at 28-31 weeks of gestation were

also at increased risk of sepsis compared to those born at term. Preterm infants with sepsis are at increased risk of complications, including respiratory distress, hypotension, and neurologic impairment. They may require prolonged hospitalization and are at increased risk of long-term developmental delays and disabilities.

In addition to gestational age, other risk factors for neonatal sepsis include prolonged rupture of membranes, chorioamnionitis (infection of the placenta and fetal membranes), and low birth weight. Early recognition and treatment of neonatal sepsis is essential for improving outcomes. Treatment typically involves antibiotic therapy, and in some cases, supportive care such as respiratory support and fluid management.

The association between gestational age and neonatal sepsis highlights the importance of accurate gestational age assessment and appropriate management of preterm infants. Early identification and management of risk factors for sepsis, as well as prompt recognition and treatment of sepsis, can help reduce the incidence and severity of this potentially life-threatening condition.

6.2.5 Guiding Neonatal Nutrition and Feeding Strategies

Gestational age assessment is crucial in guiding neonatal nutrition and feeding strategies. Infants born preterm or with a low birth weight require different nutritional support than full-term infants to meet their growth and development needs. Gestational age assessment is used to determine when to initiate feeding and the type of feeding to provide.

Preterm infants require specialized nutritional support because they have not had the opportunity to fully develop in utero. They have lower nutrient stores, higher nutrient requirements, and immature digestive and metabolic systems. Feeding preterm infants requires careful monitoring and adjustment to ensure optimal growth and development.

The timing of initiation of enteral feeding, or feeding through the gastrointestinal tract, is an important consideration in the management of preterm infants. Early initiation of enteral feeding

has been associated with improved growth, lower incidence of feeding intolerance, and shorter hospital stays. However, it is important to balance the benefits of early feeding with the risk of feeding intolerance, which can lead to complications such as necrotizing enterocolitis (NEC), a serious inflammatory bowel disease.



Gestational age assessment is used to determine the type of enteral feeding to provide. Preterm infants have immature digestive systems and may require specialized formulas that are easier to digest or contain additional nutrients, such as protein and calories, to support growth and development. Breast milk is the preferred source of nutrition for preterm infants as it is rich in nutrients, growth factors, and protective factors that can help prevent infections.

Gestational age assessment is also important in guiding parenteral nutrition, or nutrition provided through intravenous infusion. Preterm infants may require parenteral nutrition if they are unable to tolerate enteral feeding or if their nutritional needs cannot be met through enteral feeding alone. Parenteral nutrition can provide the necessary nutrients to support growth and development, but also carries a risk of complications such as sepsis, liver dysfunction, and metabolic abnormalities.

In addition to gestational age, other factors such as birth weight, growth trajectory, and medical conditions may also impact nutritional requirements and feeding strategies. Close monitoring and individualized nutritional support are essential to optimize growth and development in preterm and low birth weight infants.

Gestational age assessment is a critical component in guiding neonatal nutrition and feeding strategies. Careful consideration of the infant's nutritional needs, growth trajectory, and medical conditions can help ensure optimal growth and development and reduce the risk of complications.

6.2.6 Identifying and Managing Neonatal Hypoglycemia

Gestational age assessment is important in identifying and managing neonatal hypoglycemia, which is a common problem in preterm and low birth weight infants. Hypoglycemia is defined as a blood glucose level below the normal range, which can cause brain damage and other long-term complications if not promptly recognized and treated.

Gestational age plays a crucial role in determining the normal range for blood glucose levels in neonates. Infants born preterm or with a low birth weight have lower glucose stores and a decreased ability to regulate glucose levels compared to full-term infants. As a result, they are at a higher risk of developing hypoglycemia.

Gestational age assessment is used to determine the appropriate screening and monitoring protocols for hypoglycemia. For example, preterm infants may require more frequent glucose monitoring and a lower threshold for initiating treatment compared to full-term infants. The American Academy of Pediatrics recommends that all neonates at risk of hypoglycemia be screened with a blood glucose level within the first hour of life and have glucose levels monitored regularly until they are able to maintain stable glucose levels on their own.

Gestational age assessment is also important in determining the appropriate treatment for neonatal hypoglycemia. In some cases, hypoglycemia can be managed through frequent feedings

Neonatal Intensive Care Unit (NICU) is a specialized unit within a hospital that provides specialized medical attention and care for critically ill or premature neonates.

or supplementation with glucose gel or formula. However, some infants may require intravenous glucose administration or transfer to a **neonatal intensive care unit (NICU)** for closer monitoring and management.

In addition to gestational age, other factors such as birth weight, feeding status, and medical conditions may also impact the risk and management of neonatal hypoglycemia. Close monitoring and individualized treatment plans are essential to prevent and manage hypoglycemia and reduce the risk of long-term complications.

Gestational age assessment plays a critical role in identifying and managing neonatal hypoglycemia. Screening and monitoring protocols should be tailored to the infant's gestational age and other risk factors, and treatment should be individualized to prevent and manage hypoglycemia and reduce the risk of long-term complications.

6.2.7 Identifying Infants who may require Ongoing Monitoring and Intervention in the Neonatal Period

Gestational age assessment is an essential tool in identifying infants who may require ongoing monitoring and intervention in the neonatal period. Preterm and low birth weight infants are at increased risk of complications, including respiratory distress syndrome, jaundice, hypoglycemia, and sepsis, among others.

Gestational age assessment is used to stratify infants into different risk categories and guide their management. For example, preterm infants may require specialized care in a neonatal intensive care unit (NICU) to ensure adequate respiratory support and monitoring for complications. Low birth weight infants may require additional monitoring for hypoglycemia and other metabolic disturbances.

Gestational age assessment is also important in identifying infants who may require long-term follow-up and intervention. Preterm infants are at increased risk of developmental delays, cognitive impairments, and other long-term complications. Close monitoring and early intervention may help improve outcomes for these infants.

In addition to gestational age, other factors such as birth weight, fetal growth restriction, and medical conditions may also impact the need for ongoing monitoring and intervention in the neonatal period. Close collaboration between obstetricians, neonatologists, and other healthcare providers is essential to ensure that infants receive appropriate care and monitoring.

Gestational age assessment is a critical tool in identifying infants who may require ongoing monitoring and intervention in the neonatal period. Preterm and low birth weight infants are at increased risk of complications and may require specialized care to ensure optimal outcomes. Close collaboration between healthcare providers is essential to ensure that infants receive appropriate care and monitoring.

6.3 BREASTFEEDING AND ITS BENEFITS FOR NEONATAL HEALTH AND DEVELOPMENT

Breastfeeding is one of the most effective and natural ways to promote optimal health and development for neonates. Breast milk contains a unique blend of nutrients, antibodies, and hormones that provide numerous benefits for both the infant and mother. Here are some of the key benefits of breastfeeding for neonatal health and development:

- Provides optimal nutrition: Breast milk is specifically designed to meet the nutritional needs of infants, providing them with the perfect balance of protein, fat, and carbohydrates. It also contains vitamins and minerals that support healthy growth and development.
- Boosts immune system: Breast milk contains antibodies that help protect infants from infections and illnesses. Breastfed infants have a lower risk of developing respiratory infections, ear infections, and gastrointestinal infections.
- Supports cognitive development: Breast milk contains essential fatty acids that support brain development and cognitive function. Studies have shown that breastfed infants have higher IQ scores and better academic performance in later life.

- Promotes healthy weight: Breastfeeding has been shown to reduce the risk of obesity in later life. Breastfed infants are better able to regulate their own food intake, which may help prevent overeating and weight gain.
- Builds bonding and emotional attachment: Breastfeeding promotes bonding and emotional attachment between mother and infant. It provides a sense of security and comfort for the infant, and promotes relaxation and stress reduction in the mother.
- Reduces the risk of chronic diseases: Breastfeeding has been shown to reduce the risk of chronic diseases such as diabetes, asthma, and certain cancers in both the infant and mother.

In addition to these benefits, breastfeeding is also convenient, cost-effective, and environmentally friendly. It requires no preparation, and breast milk is always the right temperature and readily available.



To promote breastfeeding, healthcare providers should provide education and support to mothers, including information on the benefits of breastfeeding, techniques for successful breastfeeding, and strategies for overcoming common challenges. Healthcare providers should also work to create a supportive

environment for breastfeeding, including promoting skin-to-skin contact immediately after birth, allowing mothers to breastfeed on demand, and providing resources and support for breastfeeding mothers.

Breastfeeding is one of the most effective ways to promote optimal health and development for neonates. It provides a range of benefits for both the infant and mother, including optimal nutrition, immune support, cognitive development, healthy weight, bonding and emotional attachment, and reduced risk of chronic diseases. Healthcare providers should work to promote and support breastfeeding to ensure the best outcomes for neonatal health and development.

6.3.1 The Nutritional Benefits of Breastfeeding for Neonatal Health and Development

Breastfeeding is the natural and ideal method of feeding infants. Human milk is unique and provides all the necessary nutrients required for optimal growth and development of a newborn. Breast milk contains all the essential nutrients, such as protein, fat, carbohydrates, vitamins, and minerals, in the right proportion, which are essential for the growth and development of an infant.

The nutritional benefits of breastfeeding for neonatal health and development are numerous. Firstly, breast milk provides optimal nutrition that is easily digestible, thereby reducing the risk of gastrointestinal infections in neonates. Breast milk contains proteins that are easily absorbed, making it easy for the infant's immature digestive system to break it down. Breast milk also contains carbohydrates in the form of lactose, which provides energy for growth and development.

Breast milk is also rich in fats, especially omega-3 fatty acids, which are essential for brain development in neonates. These fatty acids are crucial for the development of the nervous system and the formation of neural pathways that are essential for learning and cognitive development. In addition, breast milk contains cholesterol, which is also important for brain development.

Breast milk is rich in vitamins, including vitamins A, B, C, and D, which are essential for the overall health and development of neonates. Vitamin A is important for vision, while vitamin

D is essential for the development of strong bones and teeth. Breast milk also contains minerals such as calcium, iron, and zinc, which are important for the development of strong bones, teeth, and muscles.

Furthermore, breast milk contains antibodies and other immune-boosting factors that help protect neonates against infections and diseases. Breastfeeding is especially important in developing countries, where access to clean water and proper sanitation is limited, and neonates are at a higher risk of infection.

The nutritional benefits of breastfeeding are numerous, and breast milk provides the perfect balance of nutrients that are essential for neonatal growth and development. Breastfeeding is a natural and cost-effective way of providing optimal nutrition to infants, and it is recommended that neonates be exclusively breastfed for the first six months of life, followed by the introduction of complementary foods while continuing breastfeeding up to two years of age.

6.3.2 Breastfeeding and its impact on the Immune System of Neonates

Breastfeeding is not only beneficial for providing optimal nutrition to neonates, but it also has a significant impact on their immune system. Breast milk contains various components that help enhance the neonatal immune system, including antibodies, immune cells, and other factors that protect against infections and diseases.

Antibodies are proteins that are produced by the immune system to identify and neutralize harmful substances such as bacteria and viruses. During pregnancy, antibodies from the mother's bloodstream cross the placenta and enter the fetal circulation, providing passive immunity to the fetus. However, the level of maternal antibodies decreases rapidly after birth, leaving the neonate vulnerable to infections. Breast milk contains immunoglobulins, such as IgA, IgG, and IgM, which help provide passive immunity to the neonate and protect against infections.

Breast milk also contains immune cells such as leukocytes, which help fight infections and stimulate the neonatal immune system. These cells help protect the neonate against infections

and diseases by detecting and destroying harmful substances such as bacteria and viruses. Breast milk also contains various cytokines and growth factors that help regulate the neonatal immune system and promote the development of immune cells.

Furthermore, breastfeeding helps create a diverse microbiota in the neonatal gut, which plays a crucial role in the development and regulation of the immune system. Breast milk contains prebiotics, which promote the growth of beneficial bacteria in the gut, such as bifidobacteria and lactobacilli. These bacteria help protect against harmful pathogens and stimulate the development of the immune system.

Breastfeeding also helps protect against allergic and autoimmune diseases in neonates. Breast milk contains various factors that help regulate the **immune system** and prevent the development of allergies and autoimmune diseases. It is believed that the protective effect of breastfeeding against allergies is due to the transfer of immunoglobulins and other immune factors from the mother's milk to the neonate.

Immune system protects your body from harmful substances, germs and cell changes that could make you ill. It is made up of various organs, cells and proteins. As long as your immune system is running smoothly, you don't notice that it's there.

Breastfeeding has a significant impact on the neonatal immune system, providing passive immunity, immune cells, and other factors that help protect against infections and diseases. Breast milk helps create a diverse microbiota in the gut, promoting the development and regulation of the immune system. Breastfeeding also protects against allergic and autoimmune diseases in neonates. Therefore, breastfeeding is not only beneficial for neonatal nutrition but also for the development and regulation of their immune system.

6.3.3 Breastfeeding and Cognitive Development in Neonates

Breastfeeding has been associated with various benefits for neonatal health and development, including improved cognitive development. Several studies have examined the relationship between breastfeeding and cognitive outcomes in neonates, and the evidence suggests that breastfeeding has a positive impact on cognitive development.

One of the reasons why breastfeeding may have a positive impact on cognitive development is due to its nutritional content.

Breast milk is rich in nutrients, including proteins, carbohydrates, fats, and vitamins, which are essential for brain development in neonates. Breast milk also contains growth factors, hormones, and enzymes that promote neural development and myelination, which is the process of forming the myelin sheath around nerves that is important for neural transmission.



In addition to its nutritional content, breastfeeding has been shown to have other cognitive benefits for neonates. For example, breastfeeding has been associated with improved visual acuity and recognition memory in neonates. Breastfeeding may also have a positive impact on the development of executive function skills, such as attention, working memory, and inhibitory control, which are important for cognitive and academic success later in life.

There are several potential mechanisms by which breastfeeding may impact cognitive development. Breastfeeding involves close physical contact between the mother and the neonate, which may promote bonding and emotional attachment, leading to improved cognitive outcomes. Breastfeeding may also enhance neurodevelopmental processes through the transmission of hormones, growth factors, and other biologically active substances in breast milk.

It is important to note that the relationship between breastfeeding and cognitive development is complex and may

be influenced by various factors, including maternal education, socio-economic status, and birth weight. While breastfeeding is associated with improved cognitive outcomes, it is not a guarantee of optimal cognitive development. Additionally, other factors, such as parental engagement and access to educational resources, may also play a significant role in shaping cognitive development in neonates.

Breastfeeding has numerous benefits for neonatal health and development, including improved cognitive outcomes. Breast milk contains nutrients and growth factors that are essential for brain development in neonates, and breastfeeding promotes emotional attachment and bonding between the mother and neonate, which may enhance cognitive outcomes. Healthcare providers should encourage and support breastfeeding as a vital component of neonatal care.

6.3.4 Strategies for Promoting and Supporting Breastfeeding in Neonates

Breastfeeding is a natural and essential part of neonatal care that provides numerous benefits for both the infant and the mother. However, despite the proven benefits of breastfeeding, many mothers struggle to initiate and maintain breastfeeding for various reasons. Therefore, promoting and supporting breastfeeding is crucial to ensure that neonates receive optimal nutrition and other benefits.

One of the strategies for promoting and supporting breastfeeding in neonates is education. Parents and healthcare providers should be educated about the benefits of breastfeeding and the techniques for successful breastfeeding. Prenatal education is particularly important, as it can help mothers prepare for breastfeeding before delivery. Healthcare providers can also offer support and education on breastfeeding techniques and positions, and address any concerns or problems that may arise during the breastfeeding process.

Another strategy is to create a supportive environment for breastfeeding mothers. This includes providing access to breastfeeding-friendly spaces and resources, such as lactation rooms, breast pumps, and lactation consultants. Employers can also support breastfeeding by offering flexible work schedules

and breaks to allow mothers to breastfeed or pump milk during the workday.

Partner involvement is also crucial for promoting and supporting breastfeeding. Partners can provide emotional and practical support to breastfeeding mothers, such as helping with household chores, taking care of older children, and bringing the baby to the mother for breastfeeding. Partners can also attend breastfeeding classes and appointments with the mother to learn about breastfeeding and provide support.

Additionally, healthcare providers can offer ongoing support for breastfeeding mothers, including postpartum visits and follow-up appointments. They can monitor the infant's growth and development, provide guidance on breastfeeding practices, and address any concerns or problems that may arise during the breastfeeding process. Promoting and supporting breastfeeding in neonates requires a multi-faceted approach that involves education, creating a supportive environment, partner involvement, and ongoing healthcare provider support. By implementing these strategies, more mothers can successfully initiate and maintain breastfeeding, leading to improved neonatal health and development.

6.3.5 Breastfeeding and its Environmental Impact

Breastfeeding is a natural and sustainable way to provide optimal nutrition for newborns, and it has many benefits for both the infant and the mother. However, there is also an environmental impact associated with breastfeeding. Here are some factors to consider:

- Carbon footprint: While breastfeeding does not produce any direct carbon emissions, it can indirectly contribute to a mother's carbon footprint. This is because breastfeeding requires a mother to consume additional calories to produce milk, and the production and transportation of food can produce carbon emissions.
- Waste reduction: Breastfeeding can help reduce waste associated with formula feeding. Formula feeding produces plastic waste from bottles, nipples, and packaging, while breastfeeding does not require any of these items.

- Water usage: Breastfeeding does not require any additional water usage, while formula feeding requires water for mixing and cleaning bottles.
- Production and transportation: Formula production requires resources and energy for manufacturing, packaging, and transportation, while breast milk is produced and delivered without the need for any of these processes.

While there are some indirect environmental impacts associated with breastfeeding, it is still a more environmentally sustainable choice compared to formula feeding.

6.3.6 The impact of Breastfeeding on Neonatal Mortality and Morbidity

Breastfeeding has a significant impact on neonatal mortality and morbidity. Here are some of the ways in which breastfeeding can benefit the health of newborns:

- Reduced risk of infections: Breast milk contains antibodies that can help protect newborns from infections. Breastfeeding has been shown to reduce the risk of serious infections, such as pneumonia, meningitis, and sepsis, which can be life-threatening in newborns.
- Improved digestion: Breast milk is easily digested by newborns and provides all the nutrients they need for healthy growth and development. It has been shown to reduce the risk of gastrointestinal infections and diseases.
- Improved cognitive development: Breast milk contains essential fatty acids and other nutrients that support brain development in newborns. Studies have shown that breastfed infants have higher cognitive scores than formula-fed infants.
- Reduced risk of sudden infant death syndrome (SIDS): Breastfeeding has been associated with a reduced risk of SIDS, which is the sudden and unexpected death of a seemingly healthy infant.
- Reduced risk of allergies and asthma: Breastfeeding has been shown to reduce the risk of allergies and asthma in children, which are common chronic conditions that can

impact the quality of life and require ongoing medical care.

- Improved overall health: Breastfeeding has been associated with improved overall health in infants, including better growth, lower rates of hospitalization, and reduced healthcare costs.

Breastfeeding can have a significant impact on reducing neonatal mortality and morbidity, and it is recommended as the best form of nutrition for newborns.

6.3.7 Breastfeeding and its role in reducing Health Disparities in Neonatal Populations

Breastfeeding is not only beneficial for the individual health of the neonate, but it also plays a crucial role in reducing health disparities among different populations. Breastfeeding has been shown to reduce the incidence of many neonatal health problems, such as infections, diarrhea, and respiratory illnesses, which are more prevalent in low-income and developing countries.



Breastfeeding also helps to reduce health disparities in neonatal populations by providing essential nutrients that are not easily available in certain low-income or marginalized communities. Breast milk contains all the necessary nutrients and antibodies that a neonate requires to grow and develop,

which helps to reduce the incidence of malnutrition and related health problems in these populations.

Furthermore, breastfeeding can also improve the cognitive development of neonates, which can help reduce educational disparities and improve overall health outcomes. Studies have shown that breastfed infants have higher IQ scores and better academic achievement than those who were not breastfed.

However, certain populations may face challenges in promoting and supporting breastfeeding, such as low-income mothers who may have limited access to lactation support or work in environments that do not support breastfeeding. It is important to address these disparities by providing resources and support for these mothers, including access to lactation consultants, breast pumps, and workplace policies that support breastfeeding.

Breastfeeding plays an important role in reducing health disparities in neonatal populations. It provides essential nutrients and antibodies that reduce the incidence of many health problems, including malnutrition and infections, which are more prevalent in low-income and marginalized communities. Breastfeeding also improves cognitive development, which can help reduce educational disparities and improve overall health outcomes. It is important to address the challenges that some populations may face in promoting and supporting breastfeeding to ensure that all neonates have access to its benefits.

6.4 NEONATAL JAUNDICE AND ITS MANAGEMENT

Neonatal jaundice is a common condition that affects many newborns in the first few days of life. It is caused by an excess of bilirubin, a yellow pigment that is produced when red blood cells are broken down. In neonates, the liver may not be fully developed, and bilirubin may accumulate in the blood, causing yellowing of the skin and eyes.

Neonatal jaundice is typically harmless, but in severe cases, it can lead to brain damage, hearing loss, and even death. Therefore, prompt diagnosis and management are crucial to prevent complications.

Management of neonatal jaundice may involve the following strategies:

- Phototherapy: Phototherapy is the most common treatment for neonatal jaundice. It involves exposing the baby to blue light, which converts the bilirubin into a water-soluble form that can be excreted in the urine and feces. Phototherapy may be administered through a special light box or blanket, and the baby may need to be undressed to allow the light to reach the skin.
- Exchange transfusion: In severe cases of jaundice, exchange transfusion may be necessary. This involves replacing the baby's blood with fresh blood from a donor, which can lower the levels of bilirubin in the blood.
- Feeding: Frequent feeding may help to prevent jaundice by increasing the excretion of bilirubin in the stool. Breastfeeding is encouraged, as breast milk contains substances that help to promote bowel movements and excretion of bilirubin.
- Monitoring: Neonates with jaundice require close monitoring to ensure that their bilirubin levels do not reach dangerous levels. Blood tests may be performed to measure bilirubin levels, and the baby may need to be checked by a healthcare professional daily until the jaundice resolves.

In addition to these strategies, it is important to identify and manage any underlying causes of neonatal jaundice. In some cases, jaundice may be caused by an infection, blood group incompatibility, or other medical conditions that require specific treatments.

Remember

Neonatal jaundice is a common and usually harmless condition, but prompt diagnosis and management are crucial to prevent complications. Parents and caregivers should be aware of the signs and symptoms of jaundice, such as yellowing of the skin and eyes, and seek medical attention if they suspect that their baby may have jaundice.

6.4.1 Causes and Risk Factors for Neonatal Jaundice

Neonatal jaundice is a common condition in which a newborn's skin and eyes appear yellow due to elevated levels of bilirubin, a yellow pigment produced during the breakdown of red blood

cells. Some of the causes and risk factors for neonatal jaundice include:

- Physiological jaundice: This is the most common cause of neonatal jaundice and occurs when a baby's liver is still immature and cannot efficiently remove excess bilirubin from the bloodstream. This type of jaundice usually appears within 2-3 days of birth and resolves on its own within a few weeks.
- Breastfeeding: Breastfeeding jaundice occurs when a baby is not receiving enough breast milk and is unable to eliminate bilirubin from the bloodstream. This can lead to a buildup of bilirubin and the development of jaundice.
- Breast milk jaundice: This occurs due to a substance present in breast milk that can interfere with the elimination of bilirubin from the baby's bloodstream.
- Blood group incompatibility: If a baby's blood type is different from their mother's, their immune system may produce antibodies that can attack and destroy the baby's red blood cells, leading to an increased production of bilirubin.
- Hemolytic disease of the newborn: This is a condition in which a baby's red blood cells are destroyed at a faster rate than they can be replaced, leading to an increased production of bilirubin.
- Infections: Certain infections, such as sepsis or hepatitis, can cause neonatal jaundice.
- Prematurity: Premature babies are at a higher risk of developing jaundice due to their immature liver function.
- Other factors: Other factors that may increase the risk of neonatal jaundice include a family history of jaundice, male gender, and certain medications.

It is important to note that most cases of neonatal jaundice are not harmful and resolve on their own. However, in rare cases, severe jaundice can lead to complications such as brain damage or deafness. Therefore, it is important to monitor newborns for signs of jaundice and seek medical attention if necessary.

6.4.2 The Physiological Mechanisms of Neonatal Jaundice

Neonatal jaundice is a common condition that affects many newborns in the first few days of life. It is caused by the accumulation of bilirubin in the blood, which results in a yellowing of the skin and eyes. Bilirubin is a yellow pigment that is produced when red blood cells are broken down. In healthy individuals, bilirubin is processed by the liver and excreted in the bile. However, in newborns, the liver is not fully developed, and the processing of bilirubin is not as efficient. As a result, bilirubin can build up in the blood, leading to jaundice.

There are several factors that can increase the risk of neonatal jaundice. These include:

- Prematurity: Premature babies are more likely to develop jaundice because their livers are not fully developed.
- Blood type incompatibility: If a mother has a different blood type than her baby, it can lead to the destruction of the baby's red blood cells, which can cause jaundice.
- Breastfeeding: Breastfed babies are more likely to develop jaundice because they tend to consume less milk in the first few days of life, which can lead to dehydration and an increased risk of jaundice.
- Infection: Infections can cause inflammation and damage to the liver, which can impair its ability to process bilirubin.
- Genetic disorders: Some genetic disorders can cause the liver to function improperly, leading to an increased risk of jaundice.

It is important to identify the underlying cause of neonatal jaundice in order to determine the appropriate management and treatment.

6.4.3 Clinical Assessment and Diagnosis of Neonatal Jaundice

Neonatal jaundice is a common condition characterized by yellowish discoloration of the skin and mucous membranes due to elevated serum bilirubin levels in the neonate's blood.

Bilirubin is a yellow pigment that is formed when red blood cells break down. Normally, the liver metabolizes bilirubin and excretes it into the bile, which is then excreted from the body through the stool. However, in neonates, the liver is immature and may not be able to effectively process bilirubin, leading to elevated levels in the blood.

Clinical assessment of neonatal jaundice involves physical examination and laboratory tests. The physical examination involves assessing the color of the skin and mucous membranes, with particular attention to the degree and location of jaundice. The examiner may also evaluate the newborn's feeding patterns, urine and stool output, and signs of dehydration or lethargy.



Laboratory tests for neonatal jaundice include serum bilirubin measurements, complete blood count, blood typing and Coombs testing, and liver function tests. Serum bilirubin levels can be measured using either transcutaneous bilirubinometry or serum bilirubin assay. Transcutaneous bilirubinometry involves using a device that measures the amount of bilirubin in the skin. Serum bilirubin assay involves measuring the amount of bilirubin in the blood.

In addition to physical examination and laboratory tests, a risk assessment may also be performed to identify newborns who are at increased risk for developing severe hyperbilirubinemia

and require closer monitoring and management. The diagnosis of neonatal jaundice is based on **clinical assessment** and laboratory tests, and may involve a multidisciplinary approach that includes pediatricians, neonatologists, and other healthcare professionals.

Clinical assessment refers to collecting information and drawing conclusions through the use of observation, psychological tests, neurological tests, and interviews to determine what the person's problem is and what symptoms he/she is presenting with.

6.4.4 Non-pharmacological Management of Neonatal Jaundice

Neonatal jaundice is a common condition that affects approximately 60% of newborns in the first week of life. The management of neonatal jaundice may involve non-pharmacological interventions such as phototherapy and exchange transfusion.

Phototherapy is the most common non-pharmacological intervention used for the management of neonatal jaundice. It involves exposing the baby to a specific wavelength of light that helps to break down bilirubin in the skin. The light is absorbed by the skin and converted into a form of bilirubin that can be excreted in the urine and stool. Phototherapy is usually initiated when the serum bilirubin level exceeds the phototherapy threshold, which is determined based on the baby's age, gestational age, and other risk factors.

Phototherapy can be administered using various types of devices, including overhead fluorescent lamps, LED light beds, and fiber-optic blankets. The baby is typically placed in a bassinet or incubator and positioned so that the light source is directed at the skin. The duration of phototherapy treatment varies depending on the severity of the jaundice and the response to treatment. Blood tests are performed periodically to monitor the serum bilirubin level and assess the effectiveness of phototherapy.

Another non-pharmacological intervention used for the management of neonatal jaundice is exchange transfusion. Exchange transfusion involves the removal of a small amount of the baby's blood and replacement with fresh donor blood. This procedure is reserved for severe cases of jaundice that do not respond to phototherapy or when there is a risk of bilirubin-induced neurologic dysfunction.



Exchange transfusion is performed in a hospital setting under close monitoring of the baby's vital signs and laboratory values. The procedure is performed using a double-lumen catheter that is inserted into a large vein, such as the umbilical vein or a peripheral vein. The catheter is used to remove a small amount of blood and replace it with fresh donor blood. The procedure is repeated until the serum bilirubin level is reduced to a safe level.

In addition to phototherapy and exchange transfusion, other non-pharmacological interventions that may be used for the management of neonatal jaundice include frequent breastfeeding, hydration, and close monitoring of the baby's urine and stool output. It is important to identify and treat the underlying cause of neonatal jaundice, such as ABO or Rh incompatibility, as early as possible to prevent the development of severe jaundice and its complications.

Non-pharmacological management of neonatal jaundice involves various interventions such as phototherapy, exchange transfusion, frequent breastfeeding, hydration, and close monitoring of the baby's urine and stool output. These interventions are aimed at reducing the serum bilirubin level and preventing the development of severe jaundice and its complications. It is important to monitor the baby's response to treatment and adjust the intervention as needed to ensure optimal outcomes.

6.4.5 Pharmacological Management of Neonatal Jaundice

Pharmacological management of neonatal jaundice may be necessary in cases of severe hyperbilirubinemia that puts the baby at risk of developing kernicterus. Kernicterus is a rare but serious condition in which high levels of unconjugated bilirubin in the blood can lead to brain damage, hearing loss, and other neurological problems. The use of medications to treat neonatal jaundice is known as phototherapy and exchange transfusion.

- Phototherapy: Phototherapy is the most common treatment for neonatal jaundice. The baby is placed under special blue lights that help to break down bilirubin in the skin. The blue light converts bilirubin into a water-soluble form that can be excreted in the urine and feces. The light is usually delivered through a special blanket or bed that contains the light source.
- Exchange transfusion: Exchange transfusion is a more aggressive treatment that is used in cases of severe hyperbilirubinemia that do not respond to phototherapy. This involves removing a small amount of the baby's blood and replacing it with donor blood. The donor blood has lower levels of bilirubin, which helps to bring down the overall level of bilirubin in the baby's blood.

It is important to note that pharmacological management of neonatal jaundice should only be done under the guidance of a healthcare professional. The risks and benefits of treatment must be carefully weighed, and the baby's overall health status must be taken into consideration. In some cases, the benefits of treatment may outweigh the risks, while in other cases, close monitoring and supportive care may be all that is necessary.

6.4.6 Long-term Outcomes and Complications of Neonatal Jaundice

Neonatal jaundice is usually a benign condition that resolves without any long-term consequences. However, in some cases, severe or prolonged jaundice can lead to complications and long-term health problems.

One of the potential complications of neonatal jaundice is kernicterus, which is a rare but serious condition that occurs when high levels of bilirubin in the blood reach the brain and cause damage. Kernicterus can result in permanent brain damage, hearing loss, and movement disorders. Infants who have underlying medical conditions or who are premature are at higher risk of developing kernicterus.

Prolonged jaundice can also lead to delayed weight gain and growth, as well as feeding difficulties. In some cases, it may require hospitalization for phototherapy or exchange transfusion, which can cause discomfort and distress for the infant and increase the risk of infection.

In addition, neonatal jaundice has been associated with an increased risk of developmental delays and neurological problems in some studies. However, the exact relationship between jaundice and long-term outcomes is still not well understood, and more research is needed to explore this topic.

It is important for healthcare providers to monitor infants with neonatal jaundice closely and provide appropriate treatment to prevent complications and ensure optimal outcomes. Infants who are at higher risk for jaundice or who have prolonged jaundice may require more frequent monitoring and follow-up to ensure that bilirubin levels are within a safe range.

6.4.7 Prevention and Early Detection of Neonatal Jaundice

Neonatal jaundice is a common condition that affects many newborns, and it is caused by the buildup of bilirubin in the bloodstream. While most cases of neonatal jaundice are benign, severe cases can cause long-term health problems. Therefore, it is important to prevent and detect neonatal jaundice early on to avoid complications.

One key strategy for preventing neonatal jaundice is to ensure that newborns receive adequate nutrition, especially breast milk. Breastfeeding helps to promote the elimination of excess bilirubin through the stool, reducing the risk of jaundice. It is also important to ensure that newborns are hydrated, as dehydration can exacerbate jaundice.

Early detection of neonatal jaundice is crucial in order to prevent complications. Healthcare providers can use a variety of tools to detect neonatal jaundice, including visual inspection of the skin, transcutaneous bilirubinometry (TCB), and serum bilirubin measurement. Visual inspection of the skin is a simple and non-invasive method of detecting jaundice, but it can be subjective and less accurate than other methods. TCB is a portable device that uses light to measure bilirubin levels in the skin, and it can provide a quick and reliable estimate of bilirubin levels. Serum bilirubin measurement is the most accurate method of diagnosing jaundice, but it requires a blood draw and is more invasive than other methods.

Once jaundice has been detected, healthcare providers may recommend phototherapy or exchange transfusion to manage bilirubin levels. Phototherapy involves exposing the baby's skin to blue-green light, which helps to break down bilirubin in the skin. Exchange transfusion is a more invasive procedure that involves replacing the baby's blood with donor blood to remove excess bilirubin.

Preventing and detecting neonatal jaundice early on is crucial in order to avoid long-term complications. Strategies for prevention include ensuring adequate nutrition and hydration for newborns, while early detection methods include visual inspection of the skin, TCB, and serum bilirubin measurement. Management options for neonatal jaundice may include phototherapy or exchange transfusion, depending on the severity of the condition.

6.4.8 Screening and Treatment Guidelines for Neonatal Jaundice.

Neonatal jaundice is a common condition that affects approximately 60% of term and 80% of preterm newborns in the first week of life. Early detection and appropriate management are essential to prevent severe hyperbilirubinemia and its potential complications, including kernicterus. Screening and treatment guidelines have been established to guide healthcare providers in the management of neonatal jaundice.

Screening for neonatal jaundice is recommended for all newborns prior to discharge from the hospital or birth center, and again at 3-5 days of life. Bilirubin levels can be measured using

transcutaneous bilirubinometry or serum bilirubin levels obtained through a heel stick. In some cases, additional laboratory tests, such as a complete blood count and blood type and Coombs test, may be performed to identify the underlying cause of jaundice.

Treatment guidelines for neonatal jaundice are based on the degree of hyperbilirubinemia and the presence or absence of risk factors for severe hyperbilirubinemia. Phototherapy is the mainstay of treatment for neonatal jaundice and is recommended for infants with bilirubin levels approaching or exceeding the phototherapy threshold. The American Academy of Pediatrics (AAP) recommends phototherapy for infants with a total serum bilirubin level of 15 mg/dL or higher in term infants and 12 mg/dL or higher in preterm infants. Exchange transfusion is reserved for infants with severe hyperbilirubinemia and signs of acute bilirubin encephalopathy.

In addition to phototherapy and exchange transfusion, supportive care measures may be utilized in the management of neonatal jaundice. These may include frequent feeding to promote bowel movements and excretion of bilirubin, hydration to maintain adequate fluid and electrolyte balance, and monitoring for signs of dehydration or other complications.

Screening and treatment guidelines for neonatal jaundice are important tools for healthcare providers in the management of this common condition. Early detection and appropriate management can prevent severe hyperbilirubinemia and its potential complications, improving outcomes for neonates.

SUMMARY

- Neonates are newborn babies who are less than 28 days old. In the first few days of life, neonates undergo significant physiological changes as they adapt to the extra-uterine environment. This period is crucial in establishing good health and preventing potential complications.
- The Apgar score is a useful tool for healthcare providers to quickly evaluate neonatal health, and it can also provide reassurance to parents about their newborn's health.
- The Apgar score is a useful tool for assessing the health of newborns immediately after birth. The score is calculated based on five parameters: heart rate, respiratory effort, muscle tone, reflex irritability, and color, and is assessed at 1 minute and 5 minutes after birth.
- Preterm birth and low birth weight are two important risk factors that can impact an infant's health status at birth and can be associated with lower Apgar scores.
- Gestational age assessment is a critical aspect of neonatal management, as it provides important information about the timing of fetal development and can help guide appropriate care and management of newborns.
- Gestational age assessment plays a crucial role in predicting and managing preterm birth, which is defined as birth before 37 weeks of gestation. Accurate determination of gestational age is important for identifying women at risk of preterm birth and for monitoring fetal growth and development to ensure appropriate management and interventions.
- Gestational age assessment is an essential tool in identifying infants who may require ongoing monitoring and intervention in the neonatal period. Preterm and low birth weight infants are at increased risk of complications, including respiratory distress syndrome, jaundice, hypoglycemia, and sepsis, among others.
- Breastfeeding is one of the most effective and natural ways to promote optimal health and development for neonates. Breast milk contains a unique blend of nutrients, antibodies, and hormones that provide numerous benefits for both the infant and mother.
- Breastfeeding is a natural and essential part of neonatal care that provides numerous benefits for both the infant and the mother. However, despite the proven benefits of breastfeeding, many mothers struggle to initiate and maintain breastfeeding for various reasons.
- Neonatal jaundice is a common condition that affects many newborns in the first few days of life. It is caused by an excess of bilirubin, a yellow pigment that is produced when red blood cells are broken down.

- Neonatal jaundice is a common condition characterized by yellowish discoloration of the skin and mucous membranes due to elevated serum bilirubin levels in the neonate's blood. Bilirubin is a yellow pigment that is formed when red blood cells break down.
- Neonatal jaundice is a common condition that affects approximately 60% of newborns in the first week of life. The management of neonatal jaundice may involve non-pharmacological interventions such as phototherapy and exchange transfusion.

MULTIPLE CHOICE QUESTIONS

1. What is the recommended timing for the first Apgar score assessment in neonates?

a. At birth
b. 5 minutes after birth
c. 10 minutes after birth
d. 15 minutes after birth

2. Which of the following is a risk factor for neonatal jaundice?

a. Prematurity
b. Term birth
c. Exclusive breastfeeding
d. Maternal age over 35 years

3. What is the normal range for neonatal heart rate?

a. 60-90 bpm
b. 90-120 bpm
c. 120-150 bpm
d. 150-180 bpm

4. Which of the following is a non-pharmacological management strategy for neonatal jaundice?

a. Phototherapy
b. Exchange transfusion
c. Intravenous immunoglobulin
d. Increased feeding frequency

5. What is the most common cause of neonatal sepsis?

a. Group B streptococcus
b. Escherichia coli

c. Staphylococcus aureus
d. Haemophilus influenzae

6. What is the recommended duration for exclusive breastfeeding?
a. 3 months
b. 6 months
c. 9 months
d. 12 months

7. Which of the following is a risk factor for hypoglycemia in neonates?
a. Large for gestational age
b. Term birth
c. Low birth weight
d. Female sex

8. What is the most common cause of physiological neonatal jaundice?
a. Rh incompatibility
b. ABO incompatibility
c. Breastfeeding
d. Infection

9. What is the recommended timing for the first newborn metabolic screening test?
a. 24-48 hours after birth
b. 1 week after birth
c. 2 weeks after birth
d. 1 month after birth

10. What is the most appropriate method for assessing gestational age in neonates?
a. Ultrasound
b. Ballard score
c. New Ballard score
d. Dubowitz score

REVIEW QUESTIONS

1. When and how frequently should Apgar score assessments be conducted in neonates?
2. What are the limitations and criticisms of using the Apgar score as a tool for neonatal assessment?
3. How accurate are different methods for gestational age assessment in neonates?

4. Is there an association between gestational age and neonatal sepsis?
5. How can infants who may require ongoing monitoring and intervention in the neonatal period be identified?
6. What are some effective strategies for promoting and supporting breastfeeding in neonates?
7. What are the physiological mechanisms underlying neonatal jaundice?

Answers

1. (a)	2. (a)	3. (b)	4. (d)	5. (b)
6. (b)	7. (a)	8. (c)	9. (a)	10. (b)

REFERENCES

1. American Academy of Pediatrics. (2018). Guidelines for Perinatal Care, 8th Edition. Elk Grove Village, IL: American Academy of Pediatrics.
2. Bhutani, V. K., & Johnson, L. H. (2011). Kernicterus in preterm infants: past, present, and future. Pediatrics, 128(3), 744-745.
3. Chawla, D., Agarwal, R., & Deorari, A. K. (2018). Comprehensive neonatal care: an overview. Indian Journal of Pediatrics, 85(8), 633-638.
4. Eichenwald, E. C., & Stark, A. R. (2015). Management and outcomes of very low birth weight. New England Journal of Medicine, 372(19), 1877-1878.
5. Jain, S. K., & Aggarwal, R. (2017). Care of the newborn. Jaypee Brothers Medical Publishers.
6. Kliegman, R. M., & St Geme, J. W. (2019). Nelson textbook of pediatrics. Elsevier Health Sciences.
7. Maisels, M. J., & Newman, T. B. (2016). Jaundice in full-term and near-term babies who leave the hospital within 36 hours. Pediatrics, 138(2), e20161827.
8. National Institute for Health and Care Excellence. (2016). Neonatal jaundice. NICE guideline [NG99]. Retrieved from https://www.nice.org.uk/guidance/ng99
9. Singh, A., Yadav, A. K., & Singh, A. K. (2019). Essential newborn care. Indian Pediatrics, 56(2), 127-133.
10. World Health Organization. (2019). Survive and thrive: transforming care for every small and sick newborn. Retrieved from https://www.who.int/maternal_child_adolescent/documents/survive-thrive-technical-brief/en/



CHAPTER 7

High Risk Pregnancy Assessment and Management

"A high-risk pregnancy doesn't mean that something bad will happen. It just means that you need more monitoring and care."

—*Mariah Carey*

LEARNING OBJECTIVES

After studying this chapter, you will be able to:

1. Understand the high risk pregnancy
2. Discuss the management of high risk pregnancy

INTRODUCTION

A high-risk pregnancy is one where the health of the mother, fetus, or both are at an increased risk of experiencing complications or adverse outcomes. Some common factors that can increase the risk of a pregnancy include maternal age, pre-existing medical conditions (such as diabetes, hypertension, or autoimmune disorders), multiple gestation (twins, triplets, etc.), and a history of complications in previous pregnancies.



Assessment and management of high-risk pregnancies typically involve close monitoring of both the mother and fetus throughout the pregnancy to identify and manage any potential complications. This can include frequent prenatal visits, specialized testing, and consultations with various medical specialists.

Some common strategies for managing high-risk pregnancies include:

- Medication: Certain medications may be prescribed to help manage conditions such as high blood pressure, gestational diabetes, or preterm labor.
- Lifestyle changes: Making changes to diet, exercise, and other lifestyle factors may help reduce the risk of complications in high-risk pregnancies.
- Fetal monitoring: Regular ultrasounds and other fetal monitoring techniques may be used to track the growth and development of the fetus and identify any potential issues.
- Early delivery: In some cases, early delivery may be recommended to reduce the risk of complications or to manage existing conditions such as preeclampsia or placenta previa.

7.1 HIGH RISK PREGNANCY

The term "high-risk pregnancy" suggests that in order to have a healthy and successful pregnancy and delivery, extra care is needed. This is often the case if you suffer from a chronic illness or have other factors and conditions that may put you in the high-risk category.

It is even possible to begin a normal pregnancy and develop conditions that put you into the high-risk category. Regardless of what causes your pregnancy to become high-risk, it is likely that problems may persist with both you and/or the baby during the pregnancy, birth process, or even after the delivery.



7.1.1 Emotional Support for a High-Risk Pregnancy Diagnosis

A high-risk pregnancy can create many different feelings. In fact, you're likely to feel a mix of emotions. These emotions may make it hard to enjoy your pregnancy because of all the stress and worry these emotions may create. You may worry about your health as well as the health of your baby, but your doctor should be able to help you manage these feelings.

Ask your provider for information and resources that you can use to help manage your emotions. You should also start building a support network to help manage these emotions. Your support can come from family, friends, and even other women in a similar situation. Sharing your thoughts feelings and concerns will give you an outlet and help to keep you informed and more in control of your feelings.

You may hear and read about many issues and complications that could happen as a result of your high-risk pregnancy, but it doesn't necessarily mean that you won't have a healthy baby. Manage your emotions by using your support system to help you through those moments when fear and worry set in.

7.1.2 Common Diseases

Below are the most common diseases and other co-morbid conditions and the nursing interventions that are implemented.

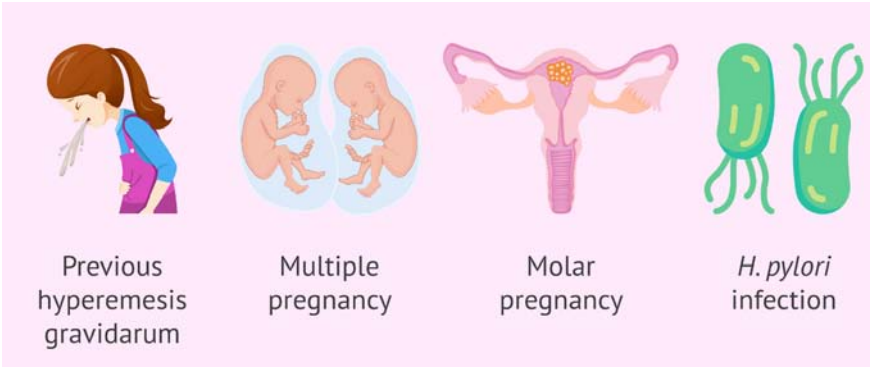
Hyperemesis Gravidarum. The main problem with hyperemesis gravidarum is intractable nausea and vomiting that the patient experiences beyond the first trimester of pregnancy. These episodes result in a depletion of fluids and electrolytes, as well as a **nutritional imbalance**. The leading cause of this is the adverse reaction of the patient's body to the effects of hCG.

- Signs and symptoms
  - Nausea and vomiting that is more pronounced during the morning, but may persist throughout the day.
  - Weight loss
  - Dehydration and fluid and electrolyte imbalances
  - Lack of appetite
  - Tooth discoloration (in some cases; due to the effect of gastric acids in the tooth enamel)
- Interventions

  Manage nausea and vomiting
  - Administer medications as may be prescribed- antiemetic (metoclopramide)
  - Advise to take ice chips- decreases sensitivity in the vomiting center

- Monitor intake and output; correct fluid and electrolyte imbalances
- Ensure adequate caloric intake
- Monitor fetal well-being- FHR, activity and growth rate
- Encourage oral food and fluid intake- easily digestible carbohydrates, proteins, and other nutrient-rich food
- Advise the patient to sit up after meals to prevent the urge to regurgitate.

Nutritional imbalance can be caused by an inability of the body to absorb certain nutrients or result from a poor diet.



Cardiac Diseases. Cardiac diseases render pregnant women problems with circulation, resulting in reduced circulatory capacity and decreased delivery of oxygen and nutrients to the tissues.

- Signs and symptoms:
  - Coughing and respiratory problems (wheezing in severe cases)
  - Easy fatigability and difficulty of breathing
  - Palpitations
  - In severe cases: edema in the lower extremities
  - Chest pains or chest tightness
- Interventions:
  - Check vital signs regularly, noting for heart rate and respiratory rate and effort.
  - Conserve oxygen demands by limiting physical activities and alternating activities with periods of rest.

- Ensure that all signs of respiratory and cardiac symptoms are appropriately assessed and documented. Notify the physician when necessary.
- Encourage adequate food and fluid intake, increasing food rich in iron and other nutrients in the diet.
- Monitor weight gain, noting for excessive increases or decreases as this may indicate fluid retention.
- Educate the patient about monitoring for her symptoms, especially nearing the time of delivery. A caesarian section may be an option for delivery when the patient's condition calls for it.

Gestational Diabetes Mellitus. This condition only happens during the second and third trimesters (24 to 28 weeks AOG) of pregnancy among patients who do not even have diabetes mellitus prior to pregnancy.

- Diagnosed by having the patient undergo a glucose tolerance test between the 24th and 28th week of pregnancy.
- Predisposing factors:
  - Obesity
  - Pregnancy at age over 35
  - Family history of diabetes mellitus
  - Polyhydramnios and LGA fetus
  - Multiple gestations
- Signs and symptoms
  - Fetus that is large for gestational age
  - Glucosuria and ketonuria
  - Excessive hunger and thirst
  - Weight loss
  - Recurrent urinary tract infections
  - Blurring of vision
- Interventions in the Prenatal Period
  - Ensure adequate weight gain through correction of diet and encouraging light to moderate physical activity.

- Maintain blood glucose levels between 65mg/dL to 130mg/dL (3.7 to 130mmoL).
- Monitor signs of increased blood sugar levels: ketonuria, glucosuria, hyperglycemia.
- If with insulin therapy: ensure administration with the time and dosage prescribed.
- Protect the patient from infection and resolve any infection present.
- Monitor fetal well-being regularly: FHR, amniotic fluid index, movements.

- Interventions during Labor
  - Ensure that the patient is hooked to the fetal monitor to assess fetal well-being during labor.
  - Prepare and position the patient for delivery (either vaginal or Caesarian section) and ensure that insulin administration is properly calibrated throughout delivery.
- Interventions during the Postpartum Period
  - Monitor the patient closely for indications of a hypoglycemic reaction.
  - Correct blood glucose problems through insulin administration, IV fluids and diet.
  - Evaluate patient response to delivery and therapy and report any complications to the physician.



Human Immunodeficiency Virus (HIV) and Acquired Immune Deficiency Syndrome (AIDS). HIV is a virus that is responsible for causing AIDS. It is sexually transmitted and may be passed on from the mother to her fetus. In some cases, when the HIV infection has progressed into full-blown AIDS, the patient presents with several complications that may threaten the pregnancy.

- Most individuals with HIV infections acquire it from unsafe sexual practice, sharing of infected needed (especially among drug users), through blood transfusion or placental transmission.
- Zidovudine is the drug of choice, especially among pregnant women, to help prevent maternal-to-fetal transmission of the disease. This is usually given in the second trimester (14th-week AOG) via an oral route and through IV during labor and delivery. The neonate born of an HIV-positive mother receives the drug 6 weeks after birth through oral drops (syrup).
- Because of the nature of HIV infections, the patient is also monitored to detect and prevent opportunistic infections.
- Signs and Symptoms vary according to the stage of infection the patient is in.
- Diagnosis of HIV/AIDS:
  - ELISA- a screening test for the presence of viruses in the blood sample of the patient. A positive result for ELISA does not necessarily mean a positive test for HIV/AIDS
  - Western Blot- confirmatory test for HIV/AIDS
- Interventions for the mother with HIV/AIDS:
  - Monitor closely for vital signs, noting for any indication of infection and other complications from HIV
  - Prevent opportunistic infections from occurring- isolate the patient when necessary
  - Encourage adequate nutrient and fluid intake.
  - Monitor weight closely, avoid excessive weight gain.
  - Provide psychosocial support- stress, anxiety and

depression are common mental health issues for the patient.

- Prepare for Caesarian delivery- vaginal delivery increases the likelihood of the fetus contracting the infection through the birth canal.
- Protect the patient from bleeding and infections during delivery
- Administer medications diligently (**Zidovudine**, anti-infectives, etc.)
- Instruct the patient care requisites for her newborn during the third trimester:
    - Zidovudine syrup from 6 weeks onwards
    - HIV culture to be taken at the first and fourth months of life to determine if the child is positive for the disease and determine viral counts
    - Monitoring the infant for signs and symptoms of HIV and reporting them to the physician

Zidovudine is used along with other medications to treat human immunodeficiency virus (HIV) infection. Zidovudine is given to HIV-positive pregnant women to reduce the chance of passing the infection to the baby.

Disseminated Intravascular Coagulation (DIC). A hemorrhagic disorder of pregnancy, DIC, is caused by systemic coagulation activation in response to a bleeding problem. The condition then cascades into the formation of clots in the microcirculation, depleting the body of platelets and clotting factors. This leads to internal hemorrhage and, if not appropriately resolved, could cause the patient's death.

- Predisposing factors:
    - Hemorrhagic disorders of pregnancy
        - Abruptio placentae
        - Placenta previa
    - Gestational hypertension
    - Intrauterine fetal death
    - HELLP syndrome
    - Amniotic fluid embolism
    - Liver disorders and Sepsis

- Signs and symptoms
  - Ecchymosis, purpura or bruising even in the absence of trauma
  - Unabated bleeding
  - Traces of bleeding in stool or vomitus
  - Excessive vaginal bleeding
  - Decreasing platelet counts and hematocrit levels
  - Increased prothrombin, partial thromboplastin and clotting times
- Interventions
  - Ascertain the underlying cause of bleeding and correct it.
  - Monitor vital signs closely, assessing carefully for signs of excessive bleeding and impending shock.
  - Administer oxygen therapy as prescribed
  - Prepare for the administration of blood transfusion, heparin therapy and IV fluids (to replace circulating fluid volume)

Ectopic Pregnancy. An ectopic pregnancy occurs when the fertilized ovum is implanted outside the uterine cavity. The most common site for ectopic pregnancy is in the ampulla of the fallopian tube.

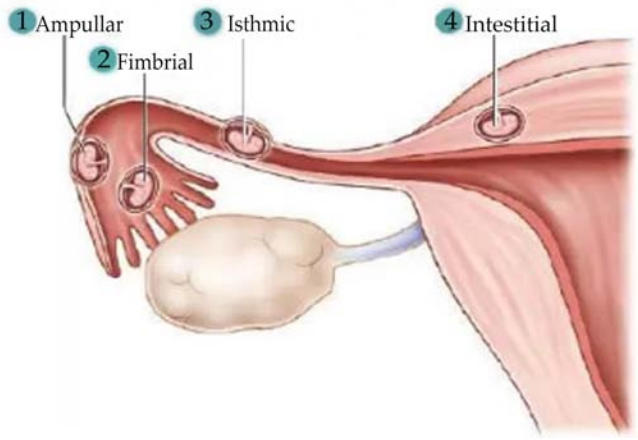


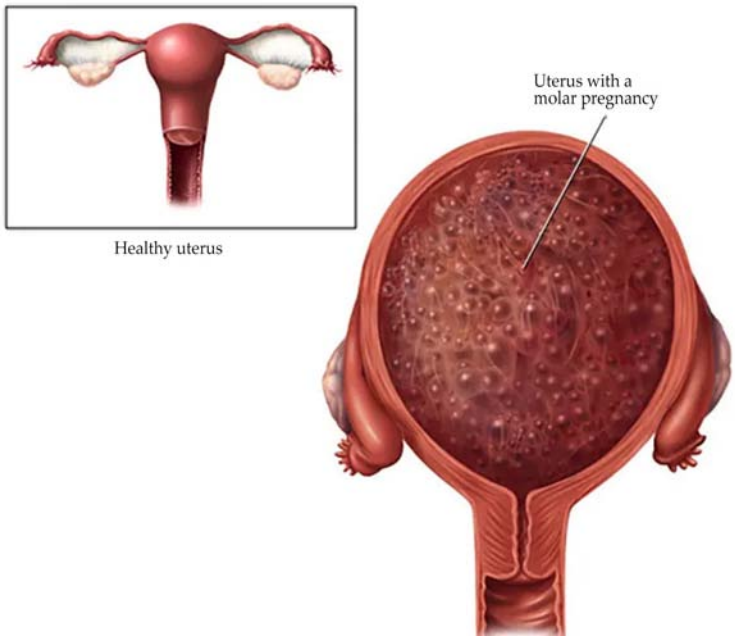
Figure 1. Common sites of ectopic pregnancy.

- Risk factors
  - Maternal age over 35 years old
  - Previous abdominal or pelvic surgery
  - History of multiple abortions
  - Endometriosis
  - History of pelvic inflammatory diseases
  - Certain sexually transmitted infections
- Signs and symptoms
  - Dull or aching abdominal pain
  - Missed menstrual periods
  - Positive pregnancy test (hCG)
  - Dark red to brownish vaginal bleeding or spotting
- Interventions
  - Monitor vital signs closely and assess for the presence of lower abdominal pain
  - Anticipate an order for methotrexate administration (The drug is administered to inhibit cellular division in the developing embryo, leading to embryonic death).
  - Anticipate an order to prepare the patient for surgical termination of the ectopic pregnancy: laparotomy with removal or repair of the affected fallopian tube
  - Administer antibiotics and other medications as may be prescribed.
  - Provide the patient and family psychosocial support
  - Refer the patient to a counselor if needed

Hydatidiform Mole (H-mole). An H-mole is a gestational trophoblastic disease that is usually detected in the second trimester of pregnancy. The main presentation is the presence of grape-like clusters of tissues that are clumped together. These are filled with fluid inside and may or may not be malignant.

Remember

When the ectopic pregnancy ruptures, the patient reports sudden, knifelike pain, referred pain along the shoulder, and exhibits signs of shock (hypotension, tachycardia, tachypnea; decreasing levels of consciousness).



- Signs and symptoms
  - Signs indicative of pregnancy- (+) hCG test, increase in fundal height (typically more significant than expected AOG), missing periods.
  - Absent fetal heart rate on doppler
  - Ultrasound reveals the presence of grape-like clusters instead of a fetal outline.
  - Vaginal bleeding, usually more pronounced towards the fourth week or until the second trimester
  - Increased blood pressure, (+) proteins in the urine- indicates pre-eclampsia.
- Interventions
  - Monitor vital signs, especially blood pressure
  - Anticipate an order for the evacuation of the H-mole
    - Vacuum aspiration
    - Administer oxytocin after aspiration to keep the uterus contracted- prevents hemorrhage.
    - Send tissue samples of the mole for histologic testing and determining malignancy.
  - Monitor hCG levels every 2 weeks until normal

levels are reached. Check levels once a year until the first year after evacuation.

- Teach patient and partner about birth control measures.

Remember

The patient is advised to prevent pregnancy during the 1-year monitoring period.

Abortion. An abortion is defined as a pregnancy terminated prior to 20 weeks of gestation, or when a fetus reaches the age of viability. This can happen spontaneously or may be done electively.

- Types of abortion
  - *Spontaneous*. The termination of pregnancy due to natural causes.
  - *Induced*. An abortion occurs as part of a therapeutic or elective procedure. It is usually a result of administering a mix of medications to trigger uterine contractions.
  - *Threatened*. Characterized by the presence of cramping sensation and light vaginal bleeding but without any change to the cervix.
  - *Inevitable*. It is marked by the presence of cramping and vaginal bleeding with accompanying cervical effacement and opening.
  - *Incomplete*. An abortion in which several fragments of the fetus or the placenta are still retained in the uterus. This necessitates an evacuation.
  - *Complete*. The fetus and all other products of conception are removed from the uterus.
  - *Missed*. Abortion that has happened without apparent symptoms. This requires induction and removal of all the products of conception.
  - *Habitual*. Occurs when abortion occurs in 3 or more successive pregnancies. It may indicate another problem: uterine structure, hormonal imbalances, autoimmune disorders, etc.
- Signs and symptoms
  - Spontaneous vaginal bleeding
  - Presence of mild to moderate lower abdominal pain
  - Uterine contractions (intensity may vary)
  - Passage of blood or clots through the vagina

- In some cases, the fetus may also be expelled from the vaginal opening.

- Interventions
  - Assess and document vital signs, including pain
  - Check for blood clots in the perineal pads; count the number of pads the patient used. Save any expelled tissues and clots if needed.
  - Maintain patient on bed rest
  - Keep IV line patent and administer fluids and medications as prescribed.
  - If products of conception are still retained in the uterus, prepare the patient for dilation and curettage.
  - Provide psychological support to the patient and significant others

TORCH Syndrome. A combination of multiple infections that threaten the well-being of both mother and fetus. These infections include:

- An infection brought about by the protozoa Toxoplasma gondii, resulting in an acute flu-like infection to the mother. The agent is usually contracted through ingestion of raw meat or handling cat litter. The infection may cause spontaneous abortion in the first trimester or can be passed from the mother to the fetus through the placenta.
- **Other infections.** May include HIV, AIDS, Hepatitis B, and other sexually transmitted diseases; West Nile virus, and others.
- Also known as German Measles, this infection is considered teratogenic, especially in the first trimester, affecting the fetus's eyes, heart, ears, and brain. May cross the placental barrier.
- Transmitted through close contact, CMV infections may also be transferred from the mother to the fetus via the placenta or during delivery through contact with the birth canal. Infection may cause low birth weights among infants, enlargement of the spleen and liver, jaundice, hearing loss, blindness, and seizure disorders.

- **Herpes simplex virus.** This infection typically causes the formation of painful fluid-filled vesicles and the external genitalia and may be transmitted from the mother to the infant during **vaginal delivery**. If a patient is diagnosed with this infection, delivery is usually done via a caesarian section and vaginal exams are discouraged. Contact precautions are also observed.

Vaginal delivery is the birth of offspring in mammals (babies in humans) through the vagina It is the most common method of childbirth worldwide.

Multiple Gestation. Also known as multiple pregnancies, this occurs when fertilization occurs for 2 ova (fraternal or dizygotic) or when a single fertilized ovum splits into two or more (identical or monozygotic). Multiple gestations place increased physical stress for the mother as she needs her body to cope with the growth and development of two or more fetuses.

- Signs and symptoms
  - Presence of excessive fetal activity
  - A uterus that is larger for gestational age
  - Multiple fetal outlines in ultrasound
  - Several large parts of the fetus felt upon palpation
  - Multiple fetal heart rates were recorded upon auscultation
  - Excessive weight gain for the mother
- Interventions
  - Monitor maternal well-being: vital signs, weight gain, fluid and nutrient intake; monitor for symptoms of anemia
  - Monitor fetal well-being: fetal heart rates, fetal activity, and growth patterns, amniotic fluid index
  - Prepare the patient for ultrasound, as recommended
  - Increase intake of vitamin supplements and iron preparations as needed
  - Assess for symptoms suggesting preterm labor, abortion, and other complications
  - Prepare for possible caesarian delivery
  - Provide emotional support to the patient and significant others.

7.1.3 Assessment and Screening to Be Done Regularly:

Assessment:

- Detailed assessment tells us the nature of the problem, helps in making a diagnosis and develops specific treatment recommendations.
- All cases in the high-risk category are identified at the first prenatal examination, preferably in the first trimester of pregnancy. Some risk factors may appear later and will be recognized during later visits.

Initial Screening History:

- Maternal age
- Reproductive history
- Family history

Diagnostic tests to be done:

Non–Invasive Tests

- Fetal ultrasound
- Cardiotocography (CTG)
- Non-stress test (NST)
- Contraction stress test (CST)



Invasive

- Embryoscopy
- Fetoscopy
- Chorionic villus sampling
- Amniocentesis
- Percutaneous umbilical cord blood sampling.

7.2 MANAGEMENT OF HIGH RISK PREGNANCY

Although it is aimed to have a non-problematic pregnancy, delivery and postpartum period, all pregnant women are in danger for a risky pregnancy. An actual or potential danger to the health/well-being of the mother and fetus and an unexpected medical or obstetric condition related to pregnancy is considered a high risk pregnancy. Worldwide, 20 million women have high-risk pregnancies, and more than 800 women die daily from perinatal causes. Of these losses, 6-33% are in the high risk pregnancy group. Worldwide, 5-10% of all pregnancies are complicated by preeclampsia. Malaria, tuberculosis and chronic iron deficiency anemia are among the other most common pregnancy complications.

There are many risk factors in high risk pregnancies. Conditions that may pose a potential risk for high-risk pregnancy have been classified by The National Institutes of Health (Table 1).

Table 1. Classification of potential risk factors for high risk pregnancy

Current health conditions	Hypertensive disorders, polycystic ovary syndrome, diabetes, kidney disease, autoimmune diseases, thyroid disease, infertility, obesity, HIV/AIDS
Age	Adolescent pregnancies, first pregnancy after the age of 35
Lifestyle factors	Use of alcohol, tobacco and illegal drugs
Pregnancy conditions	Multiple pregnancy, gestational diabetes, preeclampsia and eclampsia

Risk perception during pregnancy affects the status of high risk pregnant women seeking care and medical support. Risk perception is defined as "the person's expectation about the probability of an event happening". In a study conducted with nulliparous women, it was determined that pregnancy-related anxiety, medical risk conditions (reproductive history, medical

condition, pregnancy complications), gestational age, the effect of the healthcare provider, previous experiences and one's life philosophy can affect the risk perception during pregnancy. Attention should be given to individuality in care, as the way the pregnant woman defines pregnancy-related risks may affect her ability to seek obstetric care and her willingness to maintain/comply with the planned care plan.

7.2.1 Perinatal Optimality

It is necessary to provide optimal care in order to continue the process in a healthy way both during high-risk pregnancy and healthy pregnancies. Optimal care in high-risk pregnancies focuses on obtaining and developing optimal results for the pregnancy and postpartum process for the pregnant, fetus, and the family. Optimality approach aims to provide individual care services in the complex pregnancy process, unlike routine obstetric interventions. One of the main conditions for ensuring optimality in this care process is to benefit from evidence-based approaches. Evidence-based individual-centered care provides safe and effective practices, improving the quality of perinatal care given to high-risk pregnant women and fetuses, and standardizing the care provided.

High-risk pregnancies may require lifestyle changes, medical support, technical support, and even hospitalization. Depending on the seriousness of the pregnant woman's health condition, a hospital stay may be necessary, starting weeks or months before the birth of the baby in high-risk pregnancies. Long-term hospitalization causes physical changes in the pregnant woman such as muscle atrophy, cardiovascular problems and bone loss. Pregnant women hospitalized in the antepartum period may experience psychological problems such as shock, depression, anxiety, sleep disorders, boredom, fear for the fetus and their own health, guilt, feeling trapped, loss of control, weakness, loneliness, anger and anxiety. The hospitalized pregnant can often experience anxiety for weeks or months with fear of the unknown. In the literature, it has been stated that pregnant women have more anxiety in high risk situations such as preterm birth risk, gestational diabetes and hypertension compared to normal pregnancy period. In addition, headache, constipation, hemorrhoids, gastrointestinal disorders, edema, back and lower

abdominal pain that can be seen during pregnancy can be aggravated by hospitalization. High-risk pregnancy can also cause sleep problems, which are common during pregnancy, to emerge more prominently. One of the biggest problems experienced by high-risk pregnant women hospitalized is poor sleep quality. Poor sleep and short sleep time increase the risk of preterm birth and cesarean delivery.

Table 2. BETTER sleep program in hospitalized pregnant women with high-risk pregnancy

Hospital room	Light, noise and temperature in the room affect the pregnant woman's sleep. Try eye masks and earplugs for better sleep. White noise is very effective in blocking the corridor noise. If you have a private bathroom in the room, there might be a fan you can leave at night for a white sound source. Ask your nurse for a battery powered fan or sound machine. The fan also keeps you cool and helps relieve nausea. The sound machine should be at the lowest possible volume. Try the "wind" setting first, avoid water sounds (ocean, thunderstorm, rain) if you have frequent urination.
Exercise	Some daily activities are important for a good night's sleep. Ask your healthcare provider what physical activity is allowed. If you are at bed rest, you can consult your physical therapist about exercises you can do while in bed.
Stress	Ease your stress with relaxing activities in the evening to help you fall asleep. The relaxing activity can be reading a novel or solving a puzzle. Ask your nurse for reading material or a crossword book. Imagine lying on a sandy beach-feel the sun, rest your head on a beach towel, feel the hot sand on your legs and toes, listen to the waves. You can have a relaxation app you can try on your mobile phone or use the soothing options on your sound machine.
Time to try to sleep	You should give yourself the opportunity to sleep at least eight hours a night. Ask your nurse or doctor to put the "do not disturb" sign on the door of your room.
Eating and drinking	A light protein snack or warm milk can help you relax and sleep better. Have light foods like crackers, peanut butter, and yogurt at the bedside. Avoid using caffeine (chocolate, cola, coffee, tea) at night. Decaffeinated herbal tea can make it easier for you to fall asleep thanks to its soothing effect.
Rhythm	A consistent schedule for day/light and night/dark is essential for your brain's sleep chemistry and better sleep. Take some light from your window during the day. Avoid exposure to light at night. Ask your nurse to cover the monitors with a pad. Go to bed at the same times every day to sleep and wear your eye mask. Send signals to your brain that it's time to sleep, turn off your television, cell phone, and other unnecessary light sources when you're ready to go to sleep.

When the high-risk pregnant woman is hospitalized, her sleep becomes even more problematic as she experiences anxiety and stress for the fetus or her own health. Due to an uncomfortable bed, excessive light and sound exposure at night, and the foreign hospital environment, the sleep of the pregnant woman is frequently interrupted. In the study conducted by Lee and Gay to improve the sleep quality of high-risk pregnant women in antepartum period in line with the BETTER model, it was determined that the sleep time and sleep quality scores of pregnant women increased in line with the program implemented. The content of the sleep program developed in the study is given in Table 2. Accordingly, it may be suggested to perform new studies using the BETTER model to increase evidence-based studies in the care of high-risk pregnancies.

7.2.2 The Roles of the Nurse in Providing Optimal Care

Although the care of high-risk pregnant women requires a multidisciplinary approach, the responsibility of nurses in care is quite high. For this reason, nurses play a leading role in defining the problems and offering necessary solutions from the moment the high-risk pregnant woman encounters the healthcare team. Nurses in the multidisciplinary team have practiced on determining the real and possible risks in high risk pregnancies, making the necessary planning for care, supporting the implementation of care and treatment, and requesting consultation when necessary. Nurses have an important role in ensuring effective communication between the patient and the healthcare team and providing optimal care, since they are professionals within the health care team that the patient can easily reach. In addition, nurses should know the physiological care needs of high-risk pregnancy and aim to provide optimal care, and be sensitive about providing psychosocial support to the pregnant woman and her family. They should follow the technological applications that can be used in the optimal care and treatment of high-risk pregnancies, and inform the patient and her family about high-risk situations. Nurses should take responsibility for the administration of appropriate doses of drugs in the optimal care of high-risk pregnant women, and have information about their indications and side effects.

Concerns about the health of the pregnant woman can expose complex feelings about pregnancy and increase the level of **anxiety**. Proper and appropriate care provided by healthcare professionals positively affects the pregnancy and hospital stay experience. Interventions, especially to provide psychosocial support, of the nurses, who have the most interaction with high risk pregnant women in the hospital compared to other health professionals, will have a key role in the care. Celebrations can be held at the hospital on days such as the 28th or 32nd week of pregnancy. A special meal for the pregnant woman and her family can be planned so that they can spend time together. Varied/flexible visiting hours, support and group therapies can be beneficial to reduce feelings of isolation and depression. In order to reduce the boredom of the pregnant woman, she should be encouraged to plan activities such as waking up at the same time of the day, eating, reading a book or magazine, listening to music and exercising. In order for the pregnant woman to feel better during the day, she should be supported in wearing different clothes and caring for her hair instead of standing in pajamas all day. Since the feeling of staying in a foreign environment will increase the stress of the pregnant woman, she should be allowed to bring her familiar and loved things from her home to the hospital. Counseling should be given in a multidisciplinary approach to help the pregnant woman express her fears and provide psychological support. Nurses also take part in pharmacological treatments as well as providing psychological support to the pregnant woman hospitalized. Hypnotic agents, which are frequently prescribed for hospitalized high risk pregnant women, are not recommended for pregnant women due to their adverse effects on the fetus. If these agents are used in treatment, attention should be paid. Nurses should also perform their treatments with this awareness. Nurses should know that complementary therapies and behavioral approaches can be used in addition to pharmacological treatment in the treatment of high-risk pregnant women, and they should lead these practices to participate in the care process in cooperation with other health professionals. The effects of acupuncture, heat application and massage on pain and anxiety in hospitalized high-risk pregnant women, and it was found that the pain score was decreased from 84.5% to 61.4% and anxiety decreased by 70.9%.

7.2.3 Models/Theories that can be used in Optimal Care

Anxiety is a feeling of fear, dread, and uneasiness. It might cause you to sweat, feel restless and tense, and have a rapid heartbeat.

Models/theories can be used in the care and management of high risk pregnancy, which is a complex process. The most important purpose of using a model/theory is to obtain a harmonious whole from parts by establishing a relationship between concepts. Each conceptual model/theory reflects a different perspective on the nursing discipline and offers the researcher a different roadmap, framework and methodological rules. Models/theories used in the care and management of many diseases can be useful in strengthening the self-care of pregnant women in high-risk pregnancies, increasing maternal sensitivity, providing comfort, eliminating sexual problems, increasing maternal satisfaction, adaptation of the mother to the hospital and pain management. Orem's Self-Care Deficit Theory, Roy Adaptation Model, Rogers/ Unitary Human Theory, Comfort Theory, Functional Health Patterns Model, PLISSIT Model and Pender's Health Promotion Theory are among the models/theories that can be used in the care and management of high risk pregnancies. Orem's Self-Care Deficit Theory includes helping the individual in situations where she/he has difficulty in meeting her/his own care needs. Orem's Self-Care Deficit Theory can be used in providing/maintaining self-care of high-risk pregnant women who need to stay in a hospital or are on bed rest at home. The purpose of the Roy Adaptation Model is to help the individual to behave in harmony during the health and illness processes. It may be useful in helping high-risk pregnant women to adapt to the process physiologically and psychologically. According to Rogers/Unitary Human Theory, the interaction in the field of environment and human is continuous, reciprocal, simultaneous and spontaneous. This theory can be used to adapt high-risk pregnant women who are hospitalized. The Comfort Theory expresses relief, relaxation and the ability of the individuals to overcome their problems, depending on the type of individual needs that are not met. This theory can be used to provide and maintain the comfort of pregnant women in high risk pregnancies. The Functional Health Patterns Model is used to collect data from the patient about the disease and to organize the obtained information. The Functional Health Patterns Model can be used in the early diagnosis and treatment of high-risk pregnancies, in the management of the treatment process, and

in the follow-up of pregnant women for whom home visits are planned. Sexual counseling provided by the PLISSIT Model enables high-risk pregnant women to cooperate with health professionals. The model based on understanding and respecting the beliefs, value judgments and decisions of the patient can be used to help the sexual problems of high-risk pregnancies. Pender's Health Promotion Theory aims to improve the health of the individual, to increase his/her control over improving his/her own health. In high-risk pregnancies, this theory can be used to include pregnant women in care and treatment and to maintain the acquired healthy lifestyle behaviors. There is no finding about which model/ theory is more effective in the care of high-risk pregnancies. It has been reported that the use of a model/theory for the needs of high-risk pregnant women is appropriate.

7.2.4 Patient Safety Practices

Patient safety is an important issue of quality in healthcare services and is one of the important indicators of providing qualified service. The purpose of patient safety is to prevent the harm caused by health care services to individuals and to create a suitable physical and psychological environment for patients, relatives and healthcare professionals by ensuring that employees take the necessary precautions. Hospitalized individuals experience problems about patient safety arising from identity errors, communication problems, errors arising from patient delivery and failure to comply with safe surgical steps, errors related to drug safety, falls, healthcare-related infections, errors caused by inappropriate and misuse of medical devices, errors due to patient transfer and medical errors. When high-risk pregnant women who have to stay in the hospital are exposed to other complications, especially problems caused by falls, both their and their babies' lives are threatened. It is reported that if falls are not prevented, health care costs will increase due to complications arising from falls. It is estimated that the cost of fall injuries will be 55 million dollars annually until 2020. Today, it is stated that the most common cause of non-obstetric maternal deaths is trauma during pregnancy, and the most common form of trauma is falling (25%). This rate was found to be 54.9% in a study conducted in our country. The reason for hospitalization of approximately 24% of pregnant women

due to injury during pregnancy is falls. In a study evaluating postural balance and falls during pregnancy, an increase was observed in falls due to impaired posture, especially in the third trimester. In a study conducted with working pregnant women, it was determined that 26.6% of 2847 pregnant women fell at least once during their pregnancy and 6.3% of these falls occurred in the workplace. Walking on slippery ground, carrying heavy objects, and being in a hurry were shown to be among the main causes of falls. These results reveal how common falls are a problem in pregnant women and the importance of patient safety in hospitalized high-risk pregnancies.

The Joint Commission International prepared a report for all healthcare professionals, including nurses, to reduce falls and ensure patient safety. It was stated in the report that every individual hospitalized in the hospital should be evaluated in terms of fall risk and individuals in the high risk group should be followed up more closely. In the report, it was emphasized that nurses should be sensitive to determine the risky group by filling the fall risk assessment scale developed for pregnant women in pregnancy outpatient clinics, maternal and child health centers, emergency or services where high-risk pregnant women were hospitalized. A four-leaf clover symbol should be hung at the entrance of the room of pregnant women with high risk of falling. Hospitalized pregnant women should be informed about the use of the bed and about the location and use of the bathroom and call bell. When a pregnant woman wants to move or stand up, she should be informed about not getting up alone and asking for help from her nurse, and help with needs such as hygiene and toilet. In addition to these, nurses have responsibilities such as determining the history of falls, the risky drugs used, the balance status during pregnancy and the physical problems, raising awareness of the pregnant woman and her family about the risks of falling, and evaluating the data about falls. It is very important to determine the falling risks of high-risk pregnant women and to plan and implement appropriate interventions for these risks. Even if falls cannot be completely prevented, these scales should be used when diagnosing pregnant women, as falls can be reduced with effective protective measures and effective fall risk assessment scales.

7.2.5 Home Care and Mobile Applications

Providing health care in a natural environment at home allows the individual to feel more decisive in her/his life and at the same time to receive safer health care. Recent developments in information provision and communication technology have been used to increase the quality and speed of service delivery.

Three home visits were made during pregnancy and educational videos were used during the visits. As a result of the study, it was determined that in the group where home visits were organized, pregnancy and birth complications were less, benefiting from health services in one year after birth was more, and born children were healthier. In addition, higher level of knowledge, more use of health services, higher level of knowledge about pregnancy danger signs and higher rates of receiving home care were found in the group with home visits. It was determined that home trainings reduced the risk of preterm birth and facilitated learning about healthy lifestyle behaviors. In addition, home care reduced the duration and cost of hospital stay. In another study, it was determined that pregnant women who received home care in addition to routine prenatal care had fewer complications such as spontaneous premature rupture of membranes, **preterm birth** and hypertension compared to patients treated only in hospital. In addition to this, it was stated in the study that in home care services, healthcare providers would enable them to provide care in an environment where they could feel more comfortable and meet other family members. However, it was stated that today, the increasing workloads of healthcare professionals and developing new technologies emphasized the use of mobile health applications instead of constant home visits in home care of high-risk pregnancies.

Preterm birth, also known as premature birth, is the birth of a baby at fewer than 37 weeks gestational age, as opposed to full-term delivery at approximately 40 weeks.

World Health Organization defines mobile health (mHealth) as "Supporting public health and medical applications with personal digital devices, monitors, mobile phones and other mobile devices with wireless internet access". Mobile health applications are used in many areas such as training of healthcare personnel and patients, follow-up of patients in the diagnosis and treatment process, protection and improvement of health, and storage of health data. In recent years, the increasing use of mobile phones and other technological tools and applications suggests that mobile health will be a force in improving maternal health

services. During the prenatal period, the period in which mobile health applications are most frequently used is the pregnancy period. Mobile health applications are used to monitor and evaluate the health status of pregnant women and fetuses, to monitor high-risk situations occurring during pregnancy, to inform pregnant women about the pregnancy process and to gain healthy lifestyle behaviors. Tele ultrasound, Fetal Heart Rate Monitoring System/Mobile Integrated Doppler Device, The Pregnancy and Newborn Diagnostic Assessment (PANDA), Prenacell, telemedicine and telecare are among the most used mobile applications in the care of high risk pregnancies.

7.2.6 Tele Ultrasound

It is an up-to-date service useful in determining and preventing risk in high risk pregnancies. Examination with ultrasound in prenatal care has an important place in terms of fetus health and it maintains its importance from past to present. As a result of the ultrasound examination, an abnormality can be determined in the fetus, and findings regarding the continuation of the pregnancy can be revealed in genetic tests. However, access to ultrasound may not always be possible for all pregnant women. Pregnant women may have difficulties in accessing healthcare services, especially in rural areas due to transportation problems. Tele-ultrasound, which is one of the technological applications of today, enables a specialist doctor to evaluate the ultrasound from another location, especially in rural settlements and regions with insufficient resources.

7.2.7 Fetal Heart Rate Monitoring System/Mobile Integrated Doppler Device

The use of Non-stress Test (NST) devices is limited to the hospital environment. But today, it is possible to transfer instant data of the well-being of the fetus to the hospital database from mobile phone outside the hospital environment with the mDoppler device, without going to the hospital. The mDoppler device can be used from the 25th week, just like the NST devices used routinely.

7.2.8 The Pregnancy and Newborn Diagnostic Assessment (PANDA)

One of the applications that can be used in antenatal care of high risk pregnancies is PANDA, a mobile health application that evaluates pregnant women and newborns. This mobile application consists of four modules: Personal information, medical history, follow-up, health education and birth plan. Medical supplies such as thermometer, measuring tape, sphygmomanometer, urine kit, glucometer, stethoscope, rapid tests for screening HIV and syphilis, and gloves are included in the care bag.

7.2.9 Prenacell

In primary health care services, it is difficult for health service providers to include practices that improve health care services due to the workload. It has been reported in the literature that mobile applications such as SMS will be useful in the protection and improvement of health, in antenatal pregnancy follow up and care. Prenacell is a mobile application designed to distribute content related to antenatal care, pregnancy and baby development via SMS. These SMS messages include antenatal care, pregnancy and delivery physiology, postpartum care and contraception, and psychological support during pregnancy and postpartum period.

7.2.10 Tele Medicine and Tele Care

Tele medicine is a technology that aims to improve the quality of patient care, increase access to medical care for rural and difficultto-transport areas, and reduce patient transfer and treatment costs. Tele care is considered as a subcategory for tele medicine. In the field of perinatology, the purpose of using tele care is to identify problems in the early stages, to provide treatment recommendations to prevent further complications and preterm births, to improve the outcomes of high-risk pregnancies, to reduce the number of newborns hospitalized in the neonatal intensive care unit and to reduce the number of hospital visits. For example, the tele care short message service (SMS-based) can be used to care for diabetic pregnant women and better access to maternal and neonatal health services. In a study aiming

to reveal the results regarding the care of high-risk pregnant women living in rural areas of Tanzania through home visits, it was found that the rate of receiving two or more cares from healthcare workers and giving birth in hospital was higher in the group that received care and support through messages sent to their smart phones

7.2.11 Contribution of Mobile Applications to the Care of High Risk Pregnancies

Taking advantage of mobile health applications enables pregnant women to participate in their own health care practices and to ensure that the cost of care is effective. Benefiting from mobile health applications in the care of high-risk pregnancy, which is a complex and versatile process, facilitates the work of nurses who take an active role in every stage of care. Mobile applications in the field of nursing provide support in the care process of high risk pregnancy by facilitating communication between healthcare professionals who cannot be found in the same place. It facilitates the monitoring and follow-up of high risk pregnant women who do not have a health unit nearby or who cannot reach the health unit for various reasons. Mobile health applications also ensure that the care and counseling services to be provided by nurses are standardized. In addition, with mobile applications, nurses can train their high-risk pregnant women, provide consultancy and provide a safe care with continuous communication.

7.2.12 Counseling and Health Education for Improving Maternal and Fetal Health in High Risk Pregnancies

The pregnancy process includes psychosocial, physiological, economic, educational and family structure changes that do not cause unwanted situations in most cases. Although the pregnancy process is a physiological event, the risks related to pregnancy continue until this period ends. Some women may have pregnancy complications and for this reason they have “high risk” compared to other pregnant women. For this reason, it is very important for pregnant women to pay attention to their own health and the health of their babies, even for

pregnant women classified as "low risk" in order to detect the presence of pregnancy complications. If there is any risk during pregnancy, the risks should be detected early, necessary planning should be made and appropriate interventions should be taken. Risk management in high risk pregnancy should be a dynamic process, not a static process. Nurses have important responsibilities in determining the educational needs of high-risk pregnant women and providing education in this care process. Nurses should establish closer relationships with pregnant women in a multidisciplinary health team compared to other health professionals, and provide their care with a holistic and comprehensive approach. Nurses should guide and support high-risk pregnant women using plain and understandable language, and encourage high risk pregnant women to ask questions during health education. In addition, a hospitable and safe communication environment should be provided in health education groups through in-depth focus group meetings.

In the care of high-risk pregnant women, an individualized systematic care should be planned, facilitating the adaptation of pregnant women to the hospital and coping strategies should be developed. The use of mobile applications in the care of high risk pregnant women will increase the feelings of trust and privacy of pregnant women during the delivery process. Pregnant women who are planned to be hospitalized during pregnancy should be informed about the hospitalization, their concerns should be understood and solutions should be sought. This interaction will ensure that high-risk pregnant women establish a stronger bond with the healthcare team and feel safe for themselves and their babies. In addition, high-risk pregnant women included in the process will feel more self-confident with the awareness of taking responsibility. Therefore, in coping with high risk pregnancies, healthcare professionals should listen actively to pregnant women and include the pregnant woman and her family in the care process. High-risk pregnant women should be given as much information as possible about pregnancy, adequate nutrition, delivery, postpartum period, breastfeeding and neonatal care before delivery. Coping with the crisis caused by high-risk pregnancy, which is a complex and stressful process, is a very difficult situation for both the family and the pregnant woman. Nurses should learn about the coping mechanisms used by pregnant women and their

families in the past, and they should aim to bring them new coping mechanisms. It should not be forgotten that in high risk pregnancy, individualized care should be provided to the pregnant woman in hospital or at home.

7.2.13 Nursing Management to Promote Self-Care

Pregnancy is considered a time of health, not illness. Health promotion and maintenance activities are key to promoting an optimal outcome for the woman and her fetus. Pregnant women commonly have many questions about the changes occurring during pregnancy, how these changes affect their usual routine, such as working, traveling, exercising, or engaging in sexual activity, how the changes influence their typical self-care activities, such as bathing, perineal care, or dental care, and whether these changes are signs of a problem.

Remember

Women may have heard stories about or been told by others what to do and what not to do during pregnancy, leading to many misconceptions and much misinformation.

Nurses can play a major role in providing anticipatory guidance and teaching to foster the woman's responsibility for self-care, helping to clarify misconceptions and correct any misinformation. Educating the client to identify threats to safety posed by her lifestyle or environment and proposing ways to modify them to avoid a negative outcome are important. Counseling should also include healthy ways to prepare food, advice to avoid medications unless they are prescribed for her, and advice on identifying teratogens within her environment or at work and how to reduce her risk from exposure. The pregnant client can better care for herself and the fetus if her concerns are anticipated and identified by the nurse and are incorporated into teaching sessions at each prenatal visit.

Personal Hygiene

Hygiene is a necessity for the maintenance of good health. Cleansing the skin removes dirt, bacteria, sweat, dead skin cells, and body secretions. Counsel women to wash their hands frequently throughout the day to lower the bacterial count on their hands and under their fingernails. During pregnancy a woman's sebaceous (sweat) glands become more active under the influence of hormones, and sweating is more profuse. This increase may make it necessary to use a stronger deodorant and shower more frequently. The cervical and vaginal glands also

produce more secretions during pregnancy. Taking showers twice daily helps to keep the area dry and promotes better hygiene. Encourage the use of cotton underwear to allow greater air circulation. Taking a tub bath in early pregnancy is permitted, but closer to term, when the woman's center of gravity shifts, it is safer to shower to prevent the risk of slipping.

Hot Tubs and Saunas

Caution pregnant women to avoid using hot tubs, saunas, whirlpools, and tanning beds during pregnancy. The heat may cause fetal tachycardia as well as raise the maternal temperature. Exposure to bacteria in hot tubs that have not been cleaned sufficiently is another reason to avoid them during pregnancy.

Perineal Care

The glands in the cervical and vaginal areas become more active during pregnancy secondary to hormonal influences. This increase in activity will produce more vaginal secretions, especially in the last trimester. Advise pregnant women to shower frequently and wear all-cotton underwear to minimize the effects of these secretions. Caution pregnant women not to douche, because douching can increase the risk of infection, and not to wear panty liners, which block air circulation and promote moisture. Explain that they should also avoid perfumed soaps, lotions, perineal sprays, and harsh laundry detergents to help prevent irritation and potential infection.

Dental Care

Research has established that the elevated levels of estrogen and progesterone during pregnancy cause women to be more sensitive to the effects of bacterial dental plaque, which can cause gingivitis, an oral infection character ized by swollen and bleeding gums. Brushing and flossing teeth twice daily will help reduce bacteria in the mouth. Advise the woman to visit her dentist early in the pregnancy to address any dental caries and have a thorough cleaning to prevent possible infection later in the pregnancy. Advise her to avoid exposure to x-rays by informing the hygienist of the pregnancy. If x-rays are necessary, the abdomen should be shielded with a lead apron.

Researchers are exploring a link between prematurity and periodontitis, an oral infection that spreads beyond the gum tissues to invade the supporting structures of the teeth. Periodontitis is characterized by bleeding gums, loss of tooth attachment, loss of supporting bone, and bad breath due to pus formation. Unfortunately, because this infection is chronic and often painless, women frequently don't realize they have it. Additional guidelines that the nurse should stress regarding maintaining dental health include:

- Seek professional dental care during the first trimester for assessment and care.
- Obtain treatment for dental pain and infection promptly during pregnancy.
- Brush twice daily for 2 minutes, especially before bed, with fluoridated toothpaste and rinse well. Use a soft-bristled toothbrush and be sure to brush at the gum line to remove food debris and plaque to keep gums healthy.
- Eat healthy foods, especially those high in vitamins A, C, and D and calcium.
- Avoid sugary snacks.
- Chew sugar-free gum for 10 minutes after a meal if brushing isn't possible.
- After vomiting, rinse your mouth immediately with baking soda (1 /4 teaspoon) and warm water (1 cup) to neutralize the acid

Breast Care

Since the breasts enlarge significantly and become heavier throughout pregnancy, stress the need to wear a firm, supportive bra with wide straps to balance the weight of the breasts. Instruct the woman to anticipate buying a largersized bra about halfway through her pregnancy because of the increasing size of the breasts. Advise her to avoid using soap on the nipple area because it can be very drying. Encourage her to rinse the nipple area with plain water while bathing to keep it clean. The Montgomery glands secrete a lubricating substance that keeps the nipples moist and discourages growth of bacteria, so there is no need to use alcohol or other antiseptics on the nipples.

If the mother has chosen to breastfeed, nipple preparation is unnecessary unless her nipples are inverted and do not become erect when stimulated. **Breast shells** can be worn during the last 2 months to address this issue.

Breast shells fit inside your bra to prevent fabric rubbing against sensitive or sore nipples, allowing your skin to recover and promoting healing.

Around week 16 of pregnancy, colostrum secretion begins, which the woman may notice as moisture in her bra. Advise the woman to place breast pads or a cotton cloth in her bra and change them frequently to prevent build-up, which may lead to excoriation.

Clothing

Many contemporary clothes are loose-fitting and layered, so the woman may not need to buy an entirely new wardrobe to accommodate her pregnancy. Some pregnant women may continue to wear tight clothes. Point out that loose clothing will be more comfortable for the client and her expanding waistline. Advise pregnant women to avoid wearing constricting clothes and girdles that compress the growing abdomen. Urge the woman to avoid knee-high hose, which might impede lower-extremity circulation and increase the risk of developing deep vein thrombosis. Low-heeled shoes will minimize pelvic tilt and possible backache. Wearing layered clothing may be more comfortable, especially toward term, when the woman may feel overheated.

Exercise

Exercise is well tolerated by a healthy woman during pregnancy. It promotes a feeling of well-being, improves circulation, helps reduce constipation, bloating, and swelling, increases energy level, improves posture, helps sleep, promotes relaxation and rest, and relieves the lower back discomfort that often arises as the pregnancy progresses. However, the duration and difficulty of exercise should be modified throughout pregnancy because of a decrease in performance efficiency with gestational age. Some women continue to push themselves to maintain their prior level of exercise, but most find that as their shape changes and their abdominal area enlarges, they must modify their exercise routines. Modification also helps to reduce the risk of injury caused by laxity of the joints and connective tissue due to the

hormonal effects. Exercise during pregnancy is contraindicated in women with preterm labor, poor weight gain, anemia, facial and hand edema, pain, hypertension, threatened abortion, dizziness, shortness of breath, incompetent cervix, multiple gestation, decreased fetal activity, cardiac disease, and palpitations.

ACOG has stated that healthy pregnant women can perform the same activity recommended for the general population: 30 minutes or more of moderate exercise every day (Fig. 2). It is believed that pregnancy is a unique time for behavior modification and that healthy behaviors maintained or adopted during pregnancy may improve the woman's health for the rest of her life. The excess weight gained in pregnancy, which some women never lose, is a major public health problem. Exercise helps the woman avoid gaining excess weight during pregnancy.



Figure 2. Exercising during pregnancy.

Exercise during pregnancy helps return a woman's body to good health after the baby is born. The long-term benefits of exercise that begin in early pregnancy include improved posture, weight control, and improved muscle tone; exercise also aids in the prevention of osteoporosis after menopause and assists in keeping the birth weight of the fetus within the normal range. Teaching Guidelines 12.2 highlights recommendations for exercise during pregnancy.

Sleep and Rest

Getting enough sleep helps a person feel better and promotes optimal performance levels during the day. The body releases its greatest concentration of growth hormone during sleep, helping the body to repair damaged tissue and grow. Also, with the increased metabolic demands during pregnancy, fatigue is a constant challenge to many pregnant women, especially during the first and third trimesters.

The following tips can help promote adequate sleep:

- Stay on a regular schedule by going to bed and waking up at the same times.
- Eat regular meals at regular times to keep external body cues consistent.
- Take time to unwind and relax before bedtime.
- Establish a bedtime routine or pattern and follow it.
- Create a proper sleep environment by reducing the light and lowering the room temperature.
- Go to bed when you feel tired; if sleep doesn't occur, read a book until you are sleepy.
- Reduce caffeine intake close to bedtime.
- Limit fluid intake after dinner to minimize trips to the bathroom.
- Exercise daily to improve circulation and well-being.
- Use a modified Sims position to improve circulation in the lower extremities.
- Avoid lying on your back, which may compromise circulation to the uterus.
- Avoid sharply bending your knees, which promotes venous stasis below the knees.
- Keep anxieties and worries out of the bedroom. Set aside a specific area in the home or time of day for them.

CASE STUDY

NURSING CARE IN HIGH-RISK PREGNANCIES

Pregnancy is a physiological phenomenon that occurs without complications in most cases. However, 20% of pregnancies in Brazil are classified as high-risk, characterized by some health disturbance that threatens the life of the mother and/or of the fetus, originating from the process of gestation or another previous issue aggravated during the pregnancy. This group of mothers requires specialized support, which will include all levels of complexity and that will provide the required diagnosis and therapeutic proceedings.

Women's health care during the pregnant-puerperal cycle is set by the Brazilian Humanization in Pre-Natal and Birth Care Program and by the Stork Network. With regards to high-risk pregnancy, these guidelines dictate the evaluation of the clinical and obstetrical risks at every consultation, as well as guaranteed medical care and access to an outpatient and hospital care in a reference unit. The technical manual of the Brazilian Ministry of Health for high-risk pregnancy guides the care team in the diagnosis and treatment of the complications, and standardizes the procedures, thus contributing to a more closely-knit and effective support.

The nurse is a fundamental professional in multi-professional health work, being responsible for the nursing care in its various levels of care support, with the technical competence to perform preventive, promotional, protective, and rehabilitating roles.

The perspectives for the nurse in the area of obstetrics are possible due to the setting of the professional's working environment, supported by the resolution of the Brazilian Federal Nursing Council #0477, from April 14th 2015, which explains the role of nurses in caring for pregnant mothers, the parturient, and the puerperal being one of the roles, which, among others, including the consultations in obstetrical nursing and directed nursing care to severe obstetric patients.

However, there are few studies regarding the role of the nurse in high-risk pregnancies; this is because high-risk pregnancies account for the lowest rate among pregnant mothers, and because of the recognized prevalence of the work of the nurse in pre-natal care and in low-risk pregnancies.

It is seen that the production of knowledge and understanding in this area is relevant, as the high-risk pregnancies are complex events that lack specialized attention that is supported by scientific evidence. Adding to that, improving the quality of health care for the mother-child pair is one of the Millennium Development Goals of the United Nations; at the same time, the pregnant-puerperal cycle is one of the axes of the Brazilian National Agenda for Priorities in Health Research.

In this context, it is believed that while analyzing nursing care and reporting its scientific production aimed at high-risk pregnant mothers, the discussion generated can support the clinical practices of nurses in many spaces in which these professionals care for the pregnant mothers.

The aim is, therefore, to analyze the scientific production regarding the nursing care provided to high-risk pregnant mothers.

Method

This is an integrative review of literature regarding the nursing care in high-risk pregnancy, divided in the following steps: identification of the topic and determination of research question; creation of the criteria of inclusion and exclusion of articles; the definition of the information to be extracted; the evaluation of the studies included in the research; and the interpretation of results and presentation of the review.

The research question was designed according to the PVO strategy (P: Population, V: Variable and O: Outcomes): Which nursing care actions that are directed at high-risk pregnant mothers are reported in scientific literature?

The search was performed between September and October 2015, using the following electronic databases: PubMed, CINAHL with Full Text, SCOPUS, Web of Science, SciELO (Scientific Electronic Library Online), LILACS (Latin American and Caribbean Literature in Health Sciences, in Spanish), Medline (International Literature in Health Sciences) and BDENF (Nursing Database).

The criteria on inclusion were as follows: studies related to the topic, written in English, Portuguese, or Spanish, fully available in electronic format, without a time limit (due to the small number of articles in the past five years, as seen throughout this article). Articles were excluded if they were found to be duplicated, undergraduate final papers, dissertations, theses, editorials, case studies, and reviews of literature, as well as reflexive and opinion reviews.

The sample composed of 23 articles, according to the following diagram (Figure 1). With regards to the selection of the articles, the descriptors used were “Nursing Care”, “Pregnancy”, and “High-Risk”, in accordance with Descriptors in Health Sciences (DeCS), in Portuguese and Medical Subject Headings (MeSH), combined with the Boolean operator “AND”. The descriptors “Nursing” and “Obstetric Nursing” were used with “Pregnancy” and “High-Risk”; however, these elements did not increase the size of the sample.

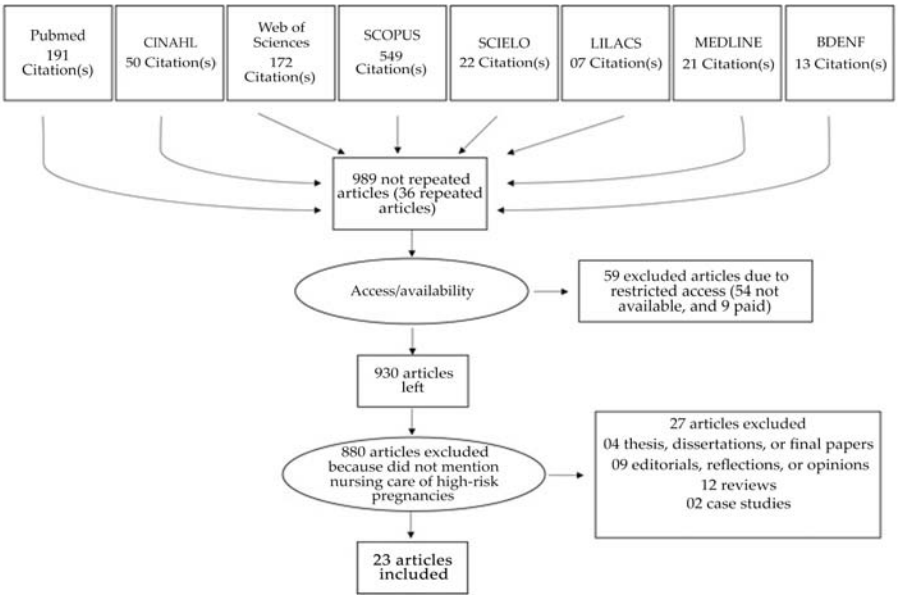


Figure 1. Diagram of sample construction. Fortaleza, Brazil, 2015.

It is important to mention that articles that only described the profile, risk factors, epidemiological aspects, or feelings and experiences of the high-risk pregnant mothers, and which did not comment on the nursing care of the public, were not included in the sample, once these studies did not fulfill the requirements of this research. The articles were organized in a chronological order, by their year of publication, and then the metadata was collected, such as title, authors, journal, type of study, type of risk pregnancy (clinical or social), proposed nursing care actions, and the result of these actions.

The IRAMUTEQ® (Interface de R pour lês Analyses Multidimensionnelles de Textes et de Questionnaires) software was used to process and analyze the data collected, which is structured under the R software, permitting various statistical analysis over textual corpuses. The software identifies and reformats the initial context units (ICU), which are switched to elementary context units (ECU). There is a vocabulary research, and the vocabulary is reduced based on their roots (stemming), being the vocabulary generated from its reduced structures, identified in active and supplementary forms, enabling the different types of analysis, such as the Descending Hierarchical Classification (DHC), the analysis of similarity, and word clouding[11].

The corpus was built by the description of the action, the results, and the conclusions from the studies, which were placed in one single text file, according to the tutorial of IRAMUTEQ®. The variables used to encode the articles were: number – 01 to 23; location – 01 for international, 02 for Brazilian; pregnancy risk – 01 for clinical, 02 for social, 03 for clinical-social; and type of study – 01 for random clinical essay, 02 for qualitative.

The analysis process was defined using the DHC, which illustrates, as seen in the dendrogram (Figure 2), the creation of classes of text segments, and the relationship between these classes. The results were publicized and discussed with the interlocution with the authors of these studies.

Results

Twenty-three articles were analyzed, which were selected based on the aims of this research, combined with the fulfillment of the criteria of inclusion/exclusion previously established.

They were available in Portuguese and in English, published between 1985 and 2015 in Brazilian and foreign journals, without a prevalence for a specific publication.

The methodological design of the research found was divided into random clinical essays and in qualitative methods; the objectives aimed to test, compare, identify or evaluate nursing interventions with high-risk pregnant mothers. These interventions were directed at social or clinical risk (with a prevalence for clinical issues), aiming to prevent and/or reduce premature birth, low weight at birth, and, as a consequence, influencing the mortality indexes.

The focus of the studies was directed at pre-natal care as the main strategy and place of interventions to reduce aggravation in high-risk pregnancies; the hospital environment was also mentioned as the place of experiences of nursing professionals and pregnant mothers, in which the nursing care has an influential role throughout pregnancy. No studies were found on the subject of education in nursing.

It is important to highlight the hegemony of the international studies, with the testing of interventions to evaluate the cost-benefit relationship. This analysis also includes the model of private health systems; however, when this comparison was made in the studies, there was a correlation between foreign and Brazilian research, as well as the proposals, which are characterized by the use of light care and low-cost technologies.

IRAMUTEQ® recognized the division of the corpus into 23 initial text units (UCI), 759 parts of texts (ECU), and 2,733 word occurrences. There was the use of 85.38% and the creation of six semantic classes of DHC, as demonstrated in the dendrogram (Figure 2).

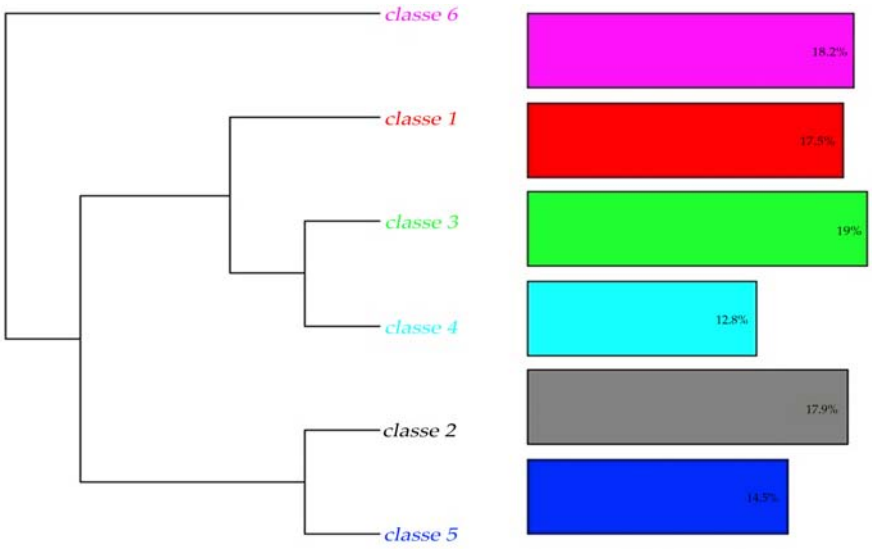


Figure 2. DHC of the corpus nursing care to high-risk pregnant mothers. Fortaleza, Brazil, 2015.

The thematic context was interpreted by naming the classes and their respective guidelines: 1 – motivations of nursing support to high-risk pregnancy mothers, 2 – specialized nursing care to high-risk pregnancy mothers, 3 – the educational role of the nurse to high-risk pregnancy mothers, 4 – nursing strategies to care for high-risk pregnancy mothers, 5 – the nurse as the multi-professional assistant for the high-risk pregnancy mothers, and 6 – the nursing care context in high-risk pregnancies. Each class was represented by the most significant words ($p \geq 0.0001$) and by their respective associations.

Thus, the chart with the articles that are part of the corpus of this research, grouped by significance and belonging to the classes designed and identified according to the colors of the DHC, is as follows (Figure 2).

Discussion

The following section provides descriptions and discussion of the classes according to the articles present on each of them.

Class 1 – Motivations of Nursing Support to High-Risk Pregnancy Mothers

This class groups 114 ECU, corresponding to 17.59% of the corpus, and it is near to classes 3 and 4.

The studies that are part of this class were random clinical essays that approached high-risk pregnancy as a major factor in premature births, and proposed and

individualized nursing pre-natal care directed at the pregnant mother and her family members with social support, emphasizing the promotion and education of health, monitoring and vigilance to prevent or to provide an early diagnosis of possible premature labor among these pregnant mothers.

In this sense, there are high levels of child morbimortality rates, the rates of child illnesses and syndromes related to low weight at birth and prematurity cases, which motivate the nursing actions towards the high-risk pregnant mothers.

The content identified demonstrates that quality prenatal care contributes to a better follow up of the high-risk pregnant mother and her general satisfaction with her state; however, the strategies used did not contribute to reducing the number of premature births[12-16], as the potential of prenatal care to reduce the prematurity rate, as well other complications during pregnancy, depends on the compromise of the pregnant mothers to the consultations and her willingness to communicate significant symptoms and keep up with the guidelines.

Class 2 – Specialized Nursing Care of High-Risk Pregnancy Mothers

It is composed of 116 ECU, representing 17.9% of the corpus, and it is associated with class 5.

These words portrayed the nursing care as an autonomous action based on scientific knowledge. Thus, the nursing process follows the technical-scientific model that guides and systematizes the work of the nurse, promoting continuous and qualified care, permitting the organization of the conditions to its fulfillment, and recording the provided assistance.

The plan of individualized care held in the nursing process was seen to be effective in developing interventions and achieving adequate results biologically, psychologically, and socially enabling differentiated and humanized care.

Class 3 – The Educational Role of The Nurse To High-Risk Pregnancy Mothers

In this class there are 123 ECU, comprising 18.98% of the corpus, and presenting a proximal relationship to class 4.

The articles that are part of this section suggest a care model to the high-risk pregnant mothers, as the nurse takes the role of teaching and counseling to promote healthy behavior, motivating an active participation, giving support to decision-making, and strengthening the social network.

Considering the differentiated experience of the high-risk pregnancy, the use of educational actions throughout the pregnant-puerperal cycle is fundamental. The

nurses must assume the position of educators, who share their understanding of women's autonomy and preparation, including for her family members, to experience the pregnancy, the birth, and the puerperal.

It is composed of random clinical essays, with the goal of evaluating the results and costs of actions of orientation and education in health, which is conveyed in results that demonstrate that these actions are beneficial. They do not generate extra costs, enable individualized care, and fulfill the requirements of the pregnant mothers.

Class 4 – Nursing Strategies to Care For The High-Risk Pregnancy Mothers

This represents 12.81% of the corpus, with 83 ECU, presenting a proximal relationship to class 3; and it is in opposition to class 1.

For professionals in APN, it was considered that those with a master's degree specialized in care practices for high-risk pregnant mothers and newborns. The actions involving an APN include: evaluation of the physical and emotional state of the pregnant mother and her partner to deal with pregnancy risks, identification of the supporting systems, monitoring fetal movements, and evaluation of family adaptation to the newborn.

The strategies used, such as home consultations and weekly telephone calls (or whenever necessary), forming the diagnosis of high-risk until the sixth week of life, were used by the advanced practice nurses to monitor and support the high-risk pregnant mothers at home. These proceedings enable adequate interventions from the moment the health issues are recognized by the pregnant mothers, reducing early or unnecessary hospitalizations.

The proximity with classes 3 and 4 is seen by the autonomy of the nurse in the care of high-risk pregnant mothers, and by the use of light technologies. Both other classes are close to class 1, in that the motivation to offer nursing assistance and the use of the resources mentioned in classes 3 and 4 is the reduction of low weight at birth rate, prematurity rate, and as a consequence, the child morbimortality rate.

Class 5 – The Nurse as the Multi-Professional Assistant For The High-Risk Pregnancy Mothers

This class gathers 94 ECU, corresponding to 14.51% of the corpus.

These articles present the work of the multi-professional team that assists the high-risk pregnant mothers in their prenatal consultations, the psychosocial and nutritional evaluation, the education in health, and the counseling before, during, and after birth. They consider the multidisciplinary approach, based on the shared communication, the experience, and the decision-making as the strongest elements of multi-professional

assistance, which have the potential to prevent and/or resolve a multitude of issues associated with pregnancy.

The close connection to class 2 can be perceived by the fact both present the role of the nurse in the health services. In class 2, the nurse is the manager of the care practices who is responsible for the systematization of the services; and in class 5, the nurse is a member of a multi-professional team. In both, the goal is to give effective attention to the real health necessities of the pregnant women and their families.

Class 6 – The Nursing Care Context In High-Risk Pregnancies

Class 6 was the first one to be built, with 18.21% of the corpus, grouping 118 ECU.

This lexicon expresses the experiences of nurses in the process of caring for pregnant mothers at risk; it is considered a stressful situation due to the risks the mother and the child are under, making theoretical-practical knowledge indispensable, as well the sensibility to understand the necessities of the health client.

They also explore the importance of the work of nurses to ameliorate the impact on the life of women and their family members upon a diagnosis of a risky pregnancy and the influence of the action and the decision in a timely manner on the results of this pregnancy.

Henceforth, the context of nursing care for the high-risk pregnant mother is filled with feelings of fear and uncertainties that require technical-scientific knowledge, an understanding of the problems faced by these pregnant women, and the necessary timely action that contributes to consolidating qualified care practice, with satisfactory health results for both the mother and the fetus.

SUMMARY

- A high-risk pregnancy is one where the health of the mother, fetus, or both are at an increased risk of experiencing complications or adverse outcomes. Some common factors that can increase the risk of a pregnancy include maternal age, pre-existing medical conditions (such as diabetes, hypertension, or autoimmune disorders), multiple gestation (twins, triplets, etc.), and a history of complications in previous pregnancies.
- The term "high-risk pregnancy" suggests that in order to have a healthy and successful pregnancy and delivery, extra care is needed. This is often the case if you suffer from a chronic illness or have other factors and conditions that may put you in the high-risk category.
- A high-risk pregnancy can create many different feelings. In fact, you're likely to feel a mix of emotions. These emotions may make it hard to enjoy your pregnancy because of all the stress and worry these emotions may create.
- Cardiac diseases render pregnant women problems with circulation, resulting in reduced circulatory capacity and decreased delivery of oxygen and nutrients to the tissues.
- HIV is a virus that is responsible for causing AIDS. It is sexually transmitted and may be passed on from the mother to her fetus. In some cases, when the HIV infection has progressed into full-blown AIDS, the patient presents with several complications that may threaten the pregnancy.
- A hemorrhagic disorder of pregnancy, DIC, is caused by systemic coagulation activation in response to a bleeding problem. The condition then cascades into the formation of clots in the microcirculation, depleting the body of platelets and clotting factors. This leads to internal hemorrhage and, if not appropriately resolved, could cause the patient's death.
- Nurses play a leading role in defining the problems and offering necessary solutions from the moment the high-risk pregnant woman encounters the healthcare team. Nurses in the multidisciplinary team have practiced on determining the real and possible risks in high risk pregnancies, making the necessary planning for care, supporting the implementation of care and treatment, and requesting consultation when necessary.
- Patient safety is an important issue of quality in healthcare services and is one of the important indicators of providing qualified service. The purpose of patient safety is to prevent the harm caused by health care services to individuals and to create a suitable physical and psychological environment for patients, relatives and healthcare professionals by ensuring that employees take the necessary precautions.

MULTIPLE CHOICE QUESTIONS

1. What is the most common cause of maternal mortality in high-risk pregnancies?

a. Preterm labor
b. Preeclampsia
c. Gestational diabetes
d. Placenta previa

2. Which of the following conditions is not considered a high-risk pregnancy?

a. Multiple gestation
b. Advanced maternal age
c. Gestational diabetes
d. Normal, singleton pregnancy

3. What is the most common medical complication of multiple gestation pregnancies?

a. Preterm labor
b. Gestational diabetes
c. Preeclampsia
d. Placenta previa

4. What is the most effective way to manage gestational diabetes?

a. Dietary modification
b. Exercise
c. Insulin therapy
d. All of the above

5. Which of the following is not a risk factor for placenta previa?

a. Previous C-section delivery
b. Advanced maternal age
c. Smoking
d. Multiparity

REVIEW QUESTIONS

1. What are some of the risk factors for a high-risk pregnancy?
2. What is the most common diseases in high-risk pregnancies?
3. What is pregnancy and newborn diagnostic assessment (PANDA)?
4. What is the roles of the nurse in providing optimal care?
5. What is the role of bedrest in the management of high-risk pregnancies?
6. What is the importance of regular prenatal care in the management of high-risk pregnancies?

Answers

1. (b) 2. (d) 3. (a) 4. (d) 5. (d)

REFERENCES

1. Alves C, Castro M, Souza R, Lira S, Sampaio R, Pereira P. Group of high-risk pregnant women as a health education strategy. Rev Lat Am Enfermagem 2019;40:1-8.
2. Dagklis T, Tsakiridis I, Chouliara F, Mamopoulos A, Rousso D, Athanasiadis A, et al. Antenatal depression among women hospitalized due to threatened preterm labor in a high-risk pregnancy unit in Greece. J Matern Fetal Neonatal Med 2018;31:919-25.
3. Errico D, Bicalho G, Oliveira D, Martins F. The work of nurses in high-risk prenatal care from the perspective of basic human needs. Rev Bras Fisioter 2018;71:1257-64.
4. Evans, A. T., and K. R. Niswander. Manual of Obstetrics , 6th ed. Hagerstown, MD: Lippincott Williams & Wilkins, 2000.
5. Garcia-Pratts, Joseph, et al. What to Do When Your Baby Is Premature: A Parent's Handbook for Coping with High-Risk Pregnancy and Caring for the Preterm Infant. Westminster, MD: Crown Publishing Group, 2000.
6. Gilbert, Elizabeth S., et al. Manual for High-Risk Pregnancy and Delivery. St. Louis, MO: Mosby, 2002.
7. Hackley, B., Kriebs, J. M., & Rousseau, M. E. (2007). Primary care of women: A guide for midwives and women's health practitioners. Sudbury, MA: Jones and Bartlett Publishers.
8. High-Risk Pregnancy: A Medical Dictionary, Bibliography, and Annotated Research Guide to Internet References. San Diego, CA: Icon Group International, 2004.
9. Kenner, C., & Lott, J. W. (2007). Comprehensive neonatal care: An interdisciplinary approach (4th ed.). St. Louis, MO: Saunders Elsevier.
10. Kuo C, Jamieson DJ, McPheeters ML, Meikle SF, Posner SF. Injury hospitalizations of pregnant women in the United States, 2002. Am J Obstet Gynecol 2007;196:161-6.
11. Lane, C. A. (2007). Nausea and vomiting in pregnancy: A tailored approach treatment. Clinical Obstetrics & Gynecology, 50(1), 100–111.
12. Majella MG, Sarveswaran G, Yuvaraj Krishnamoorthy KS, Arikrishnan K, Kumar SG. A longitudinal study on high risk pregnancy and its outcome among antenatal women attending rural primary health centre in Puducherry, South India. J Edu Health Promot 2019;8:12-9.
13. Meis, P. J., Klebanoff, M., Thom E., Dombrowski, M. P., Sibai, B., Moawad, A. H., et al. (2003). Prevention of recurrent preterm delivery by 17 alpha-hydroxyprogesterone caproate. New England Journal of Medicine, 348, 2379–2385
14. Olds, Sally, et al. Maternal-Newborn Nursing & Women's Health Care , 7th ed. Saddle River, NJ: Prentice Hall, 2004.

15. Perkins, C., Pivarnik, J. M., Paneth, N., & Stein, A. D. (2007). Physical activity and fetal growth during pregnancy. Obstetrics & Gynecology, 109(1), 81–87.
16. Reis PJ, Alligood MR. Prenatal yoga in late pregnancy and optimism, power, and well-being. Nursing Sci Q 2014;27:30-6.
17. Rezaeean SM, Abedian Z, Latifnejad Roudsar R, Mazloom SR, Dadgar S. Application of Orem's theory for promotion of self-care behaviors of pregnant women at risk for preterm delivery: A clinical trial. IJOGI 2017;20:68-77.
18. Rubarth LB, Schoening AM, Cosimano A, Sandhurst H. Women's experience of hospitalized bed rest during high-risk pregnancy. J Obstet Gynecol Neonatal Nurs 2012;41:398-407.
19. Singh, D., & Singh, J. R. (2008). Prenatal diagnosis for congenital malformations and genetic disorders. eMedicine. Available at: http://www.emedicine.com/oph/topic485.htm
20. The Joint Commission International. National Patient Safety Goals Effective January 2019. Nursing Care Center Accreditation Program, 2019.p.1-9.
21. U.S. Department of Health and Human Services. (2000). Healthy People 2010. Washington, DC: US Department of Health and Human Services.
22. Walsh, D. J. (2007). A birth center's encounters with discourses of childbirth: how resistance led to innovation. Sociology of Health & Illness, 29(2), 216–232.

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Midwifery and Obstetrics Nursing

Throughout the prenatal period, nurses and nurse-midwives provide care for pregnant women in clinics and health centers, and they also offer classes to help families prepare for childbirth. During labor and birth, they care for childbearing families in hospitals, birth centers, and sometimes at home. Obstetrics and midwifery are two related but different fields that focus on the care of pregnant and laboring women. Obstetrics deals with the problems and difficulties of pregnancy and labor, while midwifery emphasizes the normalcy of pregnancy and recognizes the vulnerability associated with the reproductive process. Midwifery emerged from the traditional social and physical support that women have given to one another during childbirth, while obstetrics gradually developed from the medical practices of ancient Greece and Rome, combined with modern anatomical research and surgery in premodern Europe. Obstetrics had its biggest impact in the late 18th century when the fundamentals of parturition were recognized, and large numbers of male medical practitioners began delivering babies. Anesthesia and antisepsis advanced obstetrics in the 19th century, and the introduction of sulfa drugs in the 20th century helped to reduce infections related to medical intervention during childbirth, which had been a leading cause of maternal death.

Today, obstetrics is becoming increasingly technological and focuses on the pathology of pregnancy, while midwifery continues to prioritize the normalcy of pregnancy and the importance of providing pregnant and laboring women with practical and emotional support. The rise of obstetrics had a mixed effect on midwifery, with some midwives clinging to traditional ways and others embracing new science and seeking retraining. National policies also influenced midwifery practice, with American and British midwives being excluded from hospitals and schools that used new techniques and obstetrical knowledge, while European midwives were regulated and re-educated under local and national authorities.

This book provides a comprehensive guide to midwifery and obstetrical nursing, covering all aspects of care during pregnancy, labor, delivery, and postnatal care. It contains seven chapters that cover different topics related to midwifery and obstetrical nursing. This book is designed for students to appreciate the concepts and principles of Midwifery and obstetrical nursing. It helps them to acquire knowledge and skills in rendering nursing care to normal and high risk pregnant woman during antenatal, natal and post natal periods in hospitals and community settings. It also helps to develop skills in managing normal and high-risk neonates and participate in family welfare program.

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