COURSE
GUIDE

**NSC 309**
**MATERNAL AND CHILD HEALTH NURSING I**

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**NATIONAL OPEN UNIVERSITY OF NIGERIA**

**CONTENTS**                                                    **PAGE**

## GENERAL INTRODUCTION

Hello, we are happy to have you doing NSC 309 – Maternal and Child Health Nursing (MCH) I. You must have taken courses in Maternal Child Health Nursing in your basic School of Nursing/School of Midwifery. This course will expand your scope of knowledge and update you with current trends in the care of women during pregnancy, labour, puerperium and the care of the newborn. Practical sessions will expose you to use of new technologies in the care of the mother and child.

Over a period of 15 weeks in the first semester of your third year (300 level), you are going to learn more about providing quality care to pregnant women throughout the ante-natal, intra natal, post natal periods. You will also acquire better skills in caring for the newborn. This course is pre-requisite for Maternal and Child Health Nursing II and has to be learnt along with the others nursing courses in performing your professional roles and in utilizing the new learning to improve your practice.

Maternal and Child Health Nursing I is a six (6) credits unit course for the students in the Bachelor of Nursing Science degree programme. The course is made up of 7 modules with 15 study units. It is important that you register for the course at the beginning of the Semester. Doing the course will help improve your competence for evidence based midwifery practice, in caring for the mother and child within family framework in or outside the hospital settings.

This Course Guide will give you essential information about the course to help you plan to do well in the course. It is important that you read, master and utilize the information in the course guide.

## COURSE OVERVIEW

Maternal and Child Health Nursing (MCHN) I is the first in the series of four courses in a nursing specialty, Maternal and Child Health Nursing and Midwifery Practice. This first course focuses on basic aspects of Midwifery. The course updates your knowledge on applied anatomy and physiology in reproduction and provides for the acquisition of basic professional proficiencies and decorum necessary for caring for families throughout the entire reproductive cycle. Wherever necessary, relevant examples in form of illustrations and illustrative diagrams are given for better understanding of the subject of discourse.

Maternal and Child Health Nursing (MCHN) focuses on the delivery of professional quality health care that recognises, focus on and help in

adaptation to the physical and psychosocial needs of the child bearing woman, the family, and the newly born offspring. The emphasis is on the provision of professional quality care that fosters family unity while maintaining physical safety of the child bearing unit. The course involves direct personal care to the child bearing woman and her infant as well as the related activities of teaching, counselling and supervision during the various phases of child bearing experience. The care is patient/consumer education oriented with respect to health maintenance and reproductive health. It differs from the practice of Nursing in other areas, in that the clinical focus involves primarily the care of the child bearing unit – the mother, father, and infants.

A significant observation about MCHN is that the care involves purposeful, sustained interactions between the nurse and her client(s). During this encounter the nurse makes an assessment of the client(s), the problem(s), the resources and then takes actions to relieve the problem(s) and support the strength(s) with appropriate nursing measures. Implicit in the delivery of effective professional nursing care is the ability to utilize a method that helps the nurse arrive at informed judgement about clients that have a sound database. With the data base, care can be planned and implemented so as to enable clients maintain or return to a state of high-level wellness using the nursing process. Maternal and Child Health Nursing I is designed in such a way to prepare students for future midwife role and to develop capacity to face future challenges in their professional careers. The aim of this course is to build the your capacity to be able to conceptualize safe and quality care services desirable to meet the health and health care needs of the family in the maternity cycle.

## COURSE OBJECTIVES

At the completion of this course, you will be able to:

a.    Discuss the anatomy and physiology of reproduction and the associated body systems with emphasis on changes associated with pregnancy, labour and puerperium.
b.    Describe the anatomy with various diameters and variations of female pelvis compared to the male pelvis
c.    Discuss the development process giving due considerations to physiological changes in the baby from conception through the perinatal period.
d.    Discuss the relationships between the anatomical structure of fetal skull and maternal pelvis.
e.    Discuss preconception care within the family and community contexts.

## DOING THE COURSE

The course will be delivered adopting the blended learning mode, 70% of online but interactive sessions and 30% of face-to-face during laboratory sessions. You are expected to register for this course online before you can have access to all the materials and have access to the class sessions online. You will have hard and soft copies of course materials, you will also have online interactive sessions, face-to-face sessions with instructors during practical sessions in the laboratory. The interactive online activities will be available to you on the course link on the Website of NOUN. There are activities and assignments online for every unit every week. It is important that you visit the course sites weekly and do all assignments to meet deadlines and to contribute to the topical issues that would be raised for everyone's contribution.

You will be expected to read every module along with all assigned readings to prepare you to have meaningful contributions to all sessions and to complete all activities. It is important that you attempt all the Self Assessment Questions (SAQ) at the end of every unit to help your understanding of the contents and to help you prepare for the in-course tests and the final examination. You will also be expected to keep a portfolio where you keep all your completed assignments.

## COURSE REQUIREMENTS AND EXPECTATIONS

### Pre-requisite Courses:

NSC 101 Human Anatomy I; NSC 104 Human Physiology I; NSC 201 Human Anatomy II; NSC 202 Human Anatomy III; NSC 203Human Physiology II; NSC 204 Epidemiology; NSC 212 Nutrition in Health and Disease; NSC 208 Nursing Ethics and Jurisprudence; NSC 209 Physical and Health Assessment.

### Concurrent Courses

NSC 301 Human behaviour in health and illness; NSC 303 Concepts and Strategies in Public/Community Health; NSC 305 Medical Surgical Nursing I; NSC 307 Clinical Pharmacology and Chemotherapy.

### Specific Expectations:

You are expected to:

1. Be versatile in basic computer skills
2. Participate in all clinical postings and attend all teaching and practice sessions up to 90%

3.  Submit personal anecdotal reports from clinical experiences on schedule
4.  Log in to the class online discussion board at least twice a week and contribute to ongoing discussions up to 80% of times
5.  Contribute actively to group seminar presentations.

Other expectations include attendance of 95% of all interactive sessions, submission of all assignments to meet deadlines; participation in all CMA, attendance of all laboratory sessions with evidence as provided in the log book, submission of reports from all laboratory practical sessions and attendance of the final course examination.

## COURSE MODE – BLENDED

70% online class sessions; 30% practical of face-to-face working with preceptors. To participate in online sessions, you will need to register for the course as indicated by the School of Health Science Website.

## NUMBER AND PLACES OF MEETING (ONLINE, FACE-TO-FACE, LABORATORY PRACTICALS)

The details of these will be provided to you at the time of commencement of this course

## DISCUSSION FORUM

There will be an online discussion forum and topics for discussion will be available for your contributions. It is mandatory that you participate in every discussion every week. You participation link you, your face, your ideas and views to that of every member of the class and earns you some mark.

## COURSE EVALUATION

This will be done through group review, written assessment of learning during clinical posting; teacher-learner joint review of clinical posting. Students evaluation: The students will be assessed and evaluated based on the following criteria.

**In-Course Examination:**
In line with the university's regulation, in-course examination will come up in the middle of the semester. These would come in form of one compulsory Tutor Marked Assignment (TMA's) and three (3).
Group Assignments, projects and case studies will constitute 10% of the total mark for the course

**Clinical Experiences:** Students will be expected to gain clinical experience in public hospitals, private hospitals and primary health care facilities approved by the university. Students will be required to write anecdotal report and present seminar papers on relevant concepts or phenomenon experienced during the clinical posting. The anecdotal reports will be graded along with seminar presentations for the group. Every student will be expected to present a case study each of obstetric condition he/she managed during the posting. The total grade for the clinical posting will be 30%.

**Final Examination:** The final written examination will come up at the end of the semester comprising essay and objective questions covering all the contents covered in the course. The final examination will amount to 60% of the total grade for the course.

## GRADING CRITERIA

The total of 100% for this course shall be made up as follows:

| | | | |
|---|---|---|---|
| Continous Assessment | - | 30% | } 100% |
| End of Course Examination | - | 70% | |

**Practical aspect shall be graded as follow:**

| | | | | |
|---|---|---|---|---|
| Countinous Assessment | (Theory | 10%) | } 30% | |
| | (Practical | 20%) | | |
| End of course | (Theory | 40%) | } 70% | 100% |
| | (Practical | 30%) | | |

**Examination Format -**

One Theory Paper 3 hours

| | | | |
|---|---|---|---|
| Essay | – | 40 | } 70% } 100% |
| Objective | – | 60 | |
| Course work | – | 30% | |

## GRADING SCALE

A = 70-100
B = 60 - 69
C= 50 - 59
F = $\leq$ 49

## SCHEDULE OF ASSIGNMENTS WITH DATES

Every Unit has activity that must be done by you as spelt out in your course materials. In addition to this, specific assignment will also be provided for units and modules by the facilitator.

## SPECIFIC READING ASSIGNMENTS

To be provided by each module

## GRADE POLICY

A= 70% and above
B= 60-69
C= 50-59.

## EQUIPMENT AND SOFTWARE NEEDED TO ASSESS THE COURSE

Students will be expected to have the following tools:

1.        A computer ( laptop or desktop or a Tablet)
2.        Internet access, preferably broadband rather than dial-up access
3.        MS Office software – Word PROCESSOR, Powerpoint, Spreadsheet
4.        Browser – Preferably Internet Explorer, Moxilla Firefox
5.        Adobe Acrobat Reader 8

## SITES OF PRACTICAL

As would be specified at the time of registration for the course.

## REFERENCES

Fraser D. M. & Cooper M. A. (2003). Myles Textbook for Midwives (14th ed). New York: Churchill Livingstone.

London .M.L, Ladewig .P.W, Ball .J.W, Binder .R.C and Cowen .K.J, (2011). Maternal and Child Nursing Care, Pearson New York 3rd Edition.

Merson, Michael H., Robert E. Black, & Anne J. Mills (2006), International Public Health: Diseases, Programs, Systems, and Policies. London: Jones and Bartlett Publishers.

Phlliteri A (2010). Maternal and Child Health Nursing (6th edition) Philadelphia: Lippincot.

**MAIN COURSE**

## CONTENTS                                              PAGE

**MODULE 1        TRENDS, REGULATION AND HISTORY
                          OF MIDWIFERY**

Unit 1        Introduction to Maternal and Child Health Nursing
Unit 2        Regulations and organizations of midwifery Practice
Unit 3        Legal roles of nurses in Maternal and Child Health

**UNIT 1        INTRODUCTION TO MATERNAL AND CHILD
                      HEALTH NURSING**

**CONTENTS**

**1.0    INTRODUCTION**

Midwifery is as old as when the first child was born and it's the first health profession documented in history (Gen 35:17). For centuries, birth was part of family life and took place at home. Women learned about pregnancy and childbirth by asking female family members or friends and by being present when other women gave birth. In this present age, while most deliveries are hospital based, midwives are trying to bring maternal and child health services to women in their community and homes.

In this module, you will learn how historical factors affect pregnancy and child birth. Also you will understand how the reward that come

from skilled nursing practice can be especially rich, by giving due consideration to fathers, partners and family members.

The care of childbearing and child-upbringing families is our major focus here, because to have healthy adults you must have healthy children. To have healthy children, it is important to promote the health of the childbearing woman and her family before she begins to bear children through the period of child bearing and thereafter until the children adulthood. Both pre-conceptual and prenatal care are essential contributions to the health of a woman and fetus and to a family's emotional preparation for childbearing and childrearing. As children grow, families need continued health supervision and support. You should understand that as children reach maturity and plan for their families, a new cycle begins and new support becomes necessary. The nurse's role in all these phases focuses on promoting healthy growth and development of the child and family in health and in illness.

Although the field of nursing typically divides its concerns for families during childbearing and childrearing into two separate entities, maternity care and child health care, the full scope of nursing practice in this area is not two separate entities, but one: maternal and child health nursing.

**Goal of Maternal and Child Health Nursing**

The primary goals of maternal and child health nursing care are the promotion and maintenance of optimal family health to ensure cycles of optimal childbearing and child-upbringing. Major philosophical assumptions about maternal and child health nursing are listed in Box 1.1. The goals of maternal and child health nursing care are necessarily broad because the scope of practice is so broad. The range of practice includes the care of the mother and child.

In this unit, however, we are going to look at the philosophical underpinnings and framework, the trends, some socio-cultural influences and general terminologies used in MCHN.

**2.0    OBJECTIVES**

At the end of this unit, you should be able to:

- discuss the  philosophy of Maternal and Child Health Nursing
- discuss the trends of MCHN and Midwifery practice, globally and nationally .
- explore the Socio cultural influences of Maternal &Child health Nursing.
- apply the use of  Obstetrical terminologies  in the discourse of Maternal &Child health Nursing and Midwifery practice
- discuss the regulatory practices associated with midwifery practices.
- discuss the philosophy and framework of maternal and child health nursing
- discuss the trends of maternal and child health nursing.
- describe the Socio cultural influences of Maternal &Child health Nursing.
- explain different Obstetrical terminologies used Maternal &Child health Nursing.

**3.0    MAIN CONTENT**



***Figure 1: Mother and child         Source :www.nphcda.gov.ng***

*Figure 2: An African woman – Happy healthy woman with high potential for healthy reproductive life - Source: afrikangoddess mag.com*

## 3.1    Framework for Maternal and Child Health Nursing Care

Maternal and child health nursing can be visualized within a framework in which nurses, using nursing process, nursing theory, and evidence-based practice, care for families during childbearing and childrearing years through four phases of health care:

- Health promotion
- Health maintenance
- Health restoration
- Health rehabilitation.

Examples of these phases of health care as they relate to maternal and child health are shown   below:

Table 1.1 Phases of health care

| Term | Definition | Examples |
|------|------------|----------|
| Health promotion | Educating clients to be aware of good health through teaching and role modeling | Teaching women the importance of rubella immunization before pregnancy; teaching children the importance of safer sex practices |
| Health maintenance | Intervening to maintain health when risk of illness is present | Encouraging women to come for prenatal care; teaching parents the |

| | | importance of safeguarding their home by childproofing it against poisoning |
|---|---|---|
| Health restoration | Promptly diagnosing and treating illness using interventions that will return client to wellness most rapidly | Caring for a woman during a complication of pregnancy or a child during an acute illness |
| Health rehabilitation | Preventing further complications from an illness; bringing ill client back to optimal state of wellness or helping client to accept inevitable death | Encouraging a woman with gestation trophoblastic disease to continue therapy or a child with a renal transplant to continue to take necessary medication |

## 3.2    Philosophy of Maternal and Child Health Nursing

• Maternal and child health nursing is family-centered; assessment data must include a family and individual assessment.

• Maternal and child health nursing is community-centered; the health of families depends on and influences the health of communities.

• Maternal and child health nursing is research-oriented, because research is the means whereby critical knowledge increases.

• Both nursing theory and evidence-based practice provide a foundation for nursing care.

• Maternal and child health nurse serves as an advocate to protect the rights of all family members, including the fetus.

• Maternal and child health nursing includes a high degree of independent nursing functions, because teaching and counselling are so frequently required.

• Promoting health is an important nursing role because this protects the health of the next generation.

• Pregnancy or childhood illness can be stressful and can alter family life in both subtle and extensive ways.

• Personal, cultural, and religious attitudes and beliefs influence the meaning of illness and its impact on the family. Circumstances such as illness or pregnancy are meaningful only in the context of a total life.

• Maternal and child health nursing is a challenging role for a nurse and is a major factor in promoting high-level wellness in families

### 3.3    Trends and Nature of Maternal &Child Health Nursing

### 3.3.1  Maternal and child health nursing today

### Introduction

Nigeria is one of the world's leading producers of oil, one of the few industrialized African countries and due to a high birthrate a rapidly growing population. About 122 million people live today in Nigeria (most populous in Africa). A majority of Nigeria's population live in rural villages. Obviously, as an oil rich nation with a tremendous capacity to sustain population growth and a growing economy, one of the major health challenges facing Nigeria today is the capacity to sustain the increasing infant and maternal health.

Nigeria's birthrate peaked during the oil boom years and is now tapering off in direct proportion to the nation's debt-related responsibility. Although, each year, Nigerian women obtain approximately 610,000 abortions (a rate of 25 abortions per 1,000 women aged 15–44 years), the rate is much lower in the poor, rural regions of northern Nigeria than in the more economically developed southern regions (Merson, et al,2006). Although highly restricted, abortions take place in large numbers in Nigeria, under both safe and unsafe conditions. Policies to improve access to contraceptive services would reduce unplanned pregnancy and abortion, which together with a greater access to safe abortion would help preserve the health and lives of Nigerian women (Merson, et al, 2006).
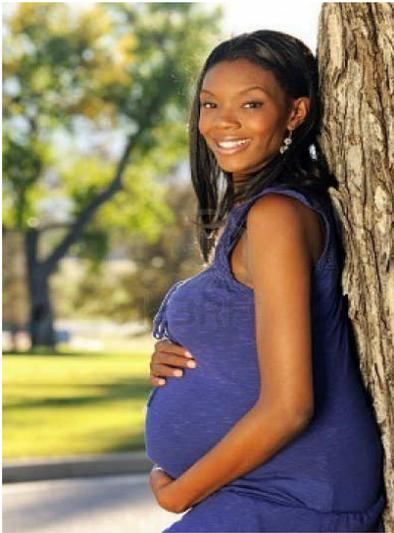
*Figure 3        A pregnant woman - Source:
              njorokejustus.wordpress.com*



*Figure 4: Pregnancy - Source: aapoliticalpundit.blogspot.com*

- Medical technology has contributed to a number of important advances in maternal and child health: childhood diseases such as
- measles and poliomyelitis are almost eradicated through immunization;
-  specific genes responsible for many inherited diseases have been identified;
- stem cell therapy may make it possible in the next few years to replace diseased cells with new growth cells;

7

- new fertility drugs and techniques allow more couples than ever before to conceive; and the ability to delay preterm birth and improve life for premature infants has grown dramatically.

In addition, a growing trend toward health care consumerism, or self-care, has made many child bearing and childrearing families active participants in their own health monitoring and care. Health care consumerism has also moved care from hospitals to community sites and from long-term hospital stays to overnight surgical and ambulatory settings.

Even in light of these changes, much more still needs to be done. National health care goals established in 2000 for the year 2010 continue to stress the importance of maternal and child health to overall community health. These and other social changes and trends have expanded the roles of nurses in maternal and child health care and, at the same time, have made the delivery.

## 3.4    Trends in the Maternal and Child Health Nursing Population

The maternal and child population is constantly changing because of changes in social structure, variations in family lifestyle, and changing patterns of illness.

Table 1.2 summarizes some of the social changes that have occurred over the past 20 to 30 years that have altered health care priorities for maternal and child health nurses. Today, client advocacy, a philosophy of cost containment, an increased focus on health education, and new nursing roles are ways in which nurses are adapting to these changes.

**Deleted:** -

### Table 1.2: Trends in Maternal and Child Health Care and Implications for Nurses

| 1 | Families are smaller than in previous decades. | Fewer family members are present as support in a time of crisis. Nurses must fulfil this role more than ever before |
|---|---|---|
| 2 | Single parents are increasing in number. | A single parent may have fewer financial resources; this is more likely if the parent is a woman. Nurses need to inform parents of care options and to provide a backup opinion when needed |
| 3 | An increasing number of women work outside the home. | Health care must be scheduled at times a working parent can bring a child for care. Problems of latch-key children and the |

| | | selection of child care centres need to be discuss |
|---|---|---|
| 4 | Families are more mobile than previously; there is an increase in the number of homeless women and children | Good interviewing is necessary with mobile families so a health database can be established; education for health monitoring is important |
| 5 | Abuse is more common than ever before. | Screening for child or intimate partner abuse should be included in family contacts. Be aware of the legal responsibilities for reporting abuse |
| 6 | Families are more health-conscious than previously. | Families are ripe for health education; providing this can be a major nursing role |
| 7 | Health care must respect cost containment | Comprehensive care is necessary in primary care settings because referral to specialists may no longer be an option |

### 3.4.1 Socio-cultural Aspects of Maternal and Child Health Nursing

**Introduction**

The standards and philosophy of maternal and child health nursing and the trends in maternal and child health nursing was discussed earlier. Information on how to care for people from diverse cultures will be discussed in this part of the unit. This is important information because it can enrich care and helps protect the health of both women and children.

Nurses need to assess socio-cultural status, ethnicity, and cultural beliefs to understand why people take preventive health measures or seek care for illness as these factors can strongly influence their responses (Josten et al., 2002)

### 3.4.2 Ethnicity

Refers to the cultural group into which a person was born, although the term is sometimes used in a narrower context to mean only race. **Culture** is a view of the world and a set of traditions that a specific social group uses and transmits to the next generation. **Cultural values** are preferred ways of acting based on those traditions. The way people react to health care is a cultural value.

9

Cultural values differ from nation to nation because they often arise from environmental conditions (for instance, in a country where water is scarce, daily bathing is not values; in a country where meat is scarce, ethnic recipes use little meat). The usual values of a group are termed **mores** and **norms**. Expecting women to come for prenatal care and for parents to bring children for immunizations are examples of norms in infant welfare clinic in Nigeria and also beliefs worldwide. Actions that are not acceptable to a culture are called **taboos**. Taboos surrounding care of the newborn varies from one ethnic group to the other,and various continent.

Cultural values influence the manner in which people plan for childbearing and childrearing and respond to health and illness. In a culture in which men are the authority figures, for example, it might be expected that the father rather than the mother answers questions about an ill child. If you are from a culture in which women are expected to provide all childcare, you might find it annoying to hear a man taking over the responses at a health interview. A nurse who has been culturally influenced to believe that stoic behaviour is the "proper" response to pain may be impatient with a woman who has been influenced to believe that expressing discomfort during childbirth is "proper". Nurses need to include all cultural groups in nursing research samples so more can be learned about cultural preferences in relation to nursing interventions and care.

**Stereotyping:** means expecting a person to act in a characteristic way without regard to his or her individual characteristics. It is generally derogatory in nature. Statements such as, "men do not know how to bath babies" or "Hausa women rely on their husbands to know their expected day of delivery" are examples of stereotyping. Stereotyping occurs largely because of lack of exposure to enough people in a particular group and, consequently, a lack of understanding of the wide range of differences among people. In the above examples, the first speaker, having seen one man change diapers poorly, assumes that this represents the entire male population. The second example demonstrates lack of knowledge of a changing culture. If this person were exposed to more Hausa women, she or he certainly would find that the statement is not true. Using such stereotype, you could plan health care that will be inappropriate and would be resisted.

On the other hand, it is important not to ignore cultural characteristics, because most people are proud of their cultural heritage. It is possible to acknowledge and celebrate a client's culture without stereotyping by assessing the way in which he or she expresses cultural characteristics.

### 3.4.3   Nursing Process Overview

**That Respects Socio-cultural Aspects of Care**
*Assessment*
Assessment of sociocultural factors is important to be certain that care is planned based not on predetermined assumptions but on the actual preferences of the family. To do this, assess each client as an individual, not merely as one of a group. Note the cultural characteristics of the client that differ from the cultural expectations in which care is being provided so that potential conflicts may be acknowledged and culturally competent care can be planned. Learn as much as you can about different cultures by reading about or talking to member of as many different ethnic groups as possible.

Assessing the culture of a community is as important as assessing individual families because families are intrinsically joined to their community. An important area to assess is whether the family matches the dominant culture in the community. This is important because the type of foods stocked in supermarkets, the type of entertainment events that are planned, and the values and history that are stressed in schools and work settings are all influenced by the dominant culture.

Communities age the same as families. When homes are first built, many families tend to be young adults with children. Over the years, these families "settle in" to middle age and then are filled with families at retirement.

Older adults may find it difficult to relate if they move into a "young" community. A family who moves into a retirement-age community with young children may feel equally out of place. In all instances, a family that is of a culture other than the dominant one may have strong ties within the family but may have difficulty making strong, effective relationships in the community, they may be more isolated than they would like to be.

*Nursing Diagnosis*
Several nursing diagnosis speak to the consequences of ignoring cultural preferences in care. Examples are:

- Powerlessness related to sociocultural related to expectations of care not being respected
- Powerlessness related to sociocultural isolation impaired verbal communication related to English not being primary language
- Nutrition, less than body requirements, related to cultural preferences for not bathing while ill.

-     Fear related to inability to buy food due to poor economic status

*Outcome Identification and Planning*
Planning needs to be very specific for the family and circumstances involved because sociocultural preferences tend to be very personal. Care may begin with in-service education for health care providers who are unfamiliar with a particular cultural practice and its importance to the specific family involved. It may include arranging for variations in policy, such as the length of family visiting hours, types of food serve, or kind of childcare. Such planning is beneficial because it can make health care more acceptable to a child or family and can also motivate providers to examine policies and question the rationale behind them.

*Implementation*
Appreciate that cultural values are ingrained and usually very difficult to change (in yourself and in others). An example of implementing care might be making arrangements for a new Native American mother to take home the placenta if that is important to her, or planning home care for a Chinese-American child whose family believes in herbal medicine. It might be establishing a network of health care agency personnel or personnel from nearby university or importing firm to serve as interpreters. It might be educating a child, family, or community about the reason for a hospital practice. Do not feel that you and the health care agency are always the ones who must adapt; a particular situation may call for both sides to adjust (cultural negotiation).

*Outcome Evaluation*
Evaluation by assessing whether outcomes have been met should reveal that a family's sociocultural preferences were considered and respected during care. If this was not achieved, procedures may need to be modified until this can be realized. Examples of expected outcomes that might be established are:

- Parents list three ways they are attempting to preserve cultural traditions in their children
- Child states she no longer feels socially isolated because of cultural differences
- Family members state they have learned to substitute easily purchased foods unavailable in local stores in order to obtain adequate nutrition.
- Child with severe hearing impairment writes that he feels communication with ambulatory care staff has been adequate.

### 3.4.4  Socio-Cultural Differences and Their Implications For Maternal and Child Health Nursing

Respecting sociocultural values is important in maternal and child health because childbearing and childrearing are both times in life surrounded by many cultural traditions. Nurses can better provide multicultural influences on families (Munoz, 2001).



**Figur 5 – The world of multiculture      Source :survey.mohio.edu**
**What is culture?**

Culture is a view of the world and a set of traditions that a specific social group uses and transmits to the next generation. Cultural values differ from nation to nation because they often arise from environmental conditions (for instance, in a country where water is scarce, daily bathing is not values; in a country where meat is scarce, ethnic recipes use little meat). The usual values of a group are termed mores and norms. Maternal and child health are seen as exclusively women's business. Mothers are expected to ensure their children are immunized and not necessarily the responsibility of men. These are examples of norms in Nigeria. Cultural values influence the manner in which people plan for childbearing and childrearing and respond to health and illness. In most Nigerian culture, men are the authority figures, for example, it might be expected that the mother rather than the fathers, answers questions about an ill child.

### 3.4.5 Impact of Socio-Economic Variations on Maternal and Child Health in Nigeria

Nigeria is a country made up of people from different ethnic groups and cultural practices with the dominant groups being Igbos, Yorubas and Hausas. It has more than 250 ethnic groups with different cultural practices. Some of these cultural practices, which have endured centuries of practice work for the people. These influence not only the health of mothers and their children but also social relationships, contribution to societal functioning and disease condition.

**Stress**
The concept of stress has become so much part of common culture that it does not seem to need definition. Becoming pregnant, especially for the first time, is one of the greatest changes in a woman's life and, as change induces stress, it can be one of the most stressful periods for a woman. One study assessed married pregnant women of similar age and social status that had deliveries in the same hospital. The result showed that those women who had the most social stressors had about three times the frequency of complications of pregnancy and delivery. A few studies suggest that women with stressful jobs may be slightly more likely than women with low-stress jobs to develop preeclampsia (a pregnancy-related disorder that includes high blood pressure and can result in poor fetal growth and other problems). Also, pathological vomiting (*hyperemesis*) occurred in pregnant women who had repeated severe life-stress events (social stressors) as contrasted to non-vomiting pregnant women who did not have many stressful episodes.

**Educational status**
Education is a factor which offers the possibility of affecting the magnitude of maternal and child mortality in a number of different ways. Exposure to new ideas and alternative lifestyles might lead to questioning of traditional norms and motivate greater willingness to adopt innovative behavioural models. Educated women may have more understanding of the physiology of reproduction and be less disposed to accept the complications and risks of pregnancy as inevitable, than illiterate or uneducated women.

**Feeding culture**
Among the Igbos of Nigeria, post partum period is believed to be a period of rest and recuperation for the newly delivered mother and child. The woman's mother comes over to the home to handle the care of mother and child, during this period called 'Omugwo'. It affords the woman the opportunity to each nutritious food and rests well. Another feeding culture is forced feeding, which is a widespread childcare

practice in Yoruba culture. The practice is learnt by females through socialization process, and practiced as an expected role of a responsible mother. The elderly women in the family, "Iya agba," assist the young mothers to force- feed their babies in order to provide enough guidance about child care practice. However, forced feeding practice remains major childcare practice for some other reasons. In many rural areas, where women faced strenuous work with little or no time spared for child feeding; serious low income earning; ignorance on child nutritional health; as well as gender stereotype; and babies' attitude against bitter drugs, there is a resurgence of forced feeding practice. Also enhancing the practice of forced feeding are the notions that forced feeding brings intimacy between mother and child; and that babies fed with bottle-feed are "cow babies", and such babies do not like to eat voluntarily.

**Economic status**
A large number of studies have shown that a woman's position in the household largely determines her range of acceptable reproductive options. A Women's status is a broad concept that encompasses multiple facets of women's lives. It has been defined as the degree of women's access to (and control over) material resources (including food, income, land and other forms of wealth) and to social resources (including knowledge, power and prestige) within the family, in the community and in society at large. Also, because of their economic status women overwork themselves to support the family, and this has adverse effect on their health.

### 3.4.6  Nursing Implication

If you are from a culture in which women are expected to provide all childcare, you might find it annoying to hear a man taking over the responses at a health interview. A nurse who has been culturally influenced to believe that stoic behaviour is the "proper" response to pain may be impatient with a woman who has been influenced to believe that expressing discomfort during childbirth is "proper". Nurses need to include all cultural groups in nursing research samples so more can be learned about cultural preferences in relation to nursing interventions and care.

**SELF-ASSESSMENT EXERCISES**

Explain the concept of male involvement in Midwifery practice as a socio-cultural issue and its implications for maternal and child health nursing.

**Notes on Self-Assessment Exercise (SAQS) For Unit 1**
**SAQ 1** Several factors have therefore been recognized to be responsible for Africa's high maternal and child mortality and morbidity ratio. Some of these are cultural beliefs and practices, poor maternal and child health services, low economic status of women, illiteracy, gender inequality, poor government funding of the health sector, men's low participation and involvement in the health of their women and children. Nigerian men are socially and economically dominant and they exert a strong influence over their wives, determining the timing and conditions of sexual relation and family size. As in many other patriarchal societies, pregnancy, childbirth and child-care are regarded as exclusively women's affairs. Because of this disturbing trend, the International Conference on Population and Development (ICPD) (1994) urged that special efforts should be made to emphasize men's shared responsibility and promote their active involvement in maternity care. But several evidences suggested that male involvement in maternal and child health care can positively impact antenatal and postnatal attendance, availability of skilled birth attendant at delivery, the use of family planning and contraceptives, emotional, physical and socio-economic support for women during pregnancy and child care, childhood routine immunization, couple communication, and birth preparedness. This will improve maternal, child and family health, which will consequently lead to a better health indices in Nigeria.

**Obstetrical terminologies**
**Amniocentesis**. Laboratory analysis of amniotic fluid. About two tablespoons worth of amniotic fluid is removed from the sac surrounding the baby, inside the mother's womb, to determine if any genetic abnormalities exist. The test, typically performed during the second trimester, is extremely reliable and can also be used to determine the baby's sex.
**Antepartum**. Before labor or delivery.
**Anti-D Gamma Globulin**. Immunoglobulin for prevention of Rh-sensitization.
**Apgar Score**. Physical assessment of a newborn baby; usually conducted at one minute and five minutes after birth.
**Basal body temperature (BBT)**. A woman's body temperature at rest; used for detection of ovulation.
**Blood count**. A test used to detect anemia and infection.
**Breakthrough bleeding**. Nonorganic endometrial bleeding during the use of oral contraceptives.
**Cervical ectropion or eversion**. Migration of cells from the lining of the endocervical canal (endocervix) to the outer portion of the cervix (ectocervix). Sometimes inaccurately called erosion or abrasion, which

implies damage. Cervical ectropion is a normal condition and is common in young women and women taking birth control pills.

**Cesarean Section**. A surgical procedure, during which the fetus is delivered through an incision in the lower abdomen and the uterine wall.

**Cholesterol test**. A blood test performed to check levels of cholesterol, a substance that helps transport fat through the blood.

**Colposcopy**. Examination of the vagina and cervix by using an instrument that provides low magnification.

**Embryo**. A developing baby during the first trimester.

**Epidural**. Type of anesthesia administered through the back during labor. Not the same as a "spinal."

**Estimated Date of Confinement (EDC)**. Also known as the due date. Calculated as 40 weeks—about nine months—from the first day of the last menstrual period (LMP). Keep in mind, though, that any delivery within 38 to 42 weeks is considered normal. The term comes from the fact that pregnant women were once confined during the last trimester of pregnancy.

**Fecal Occult Blood Test**. Test in which a stool sample is checked for blood that could indicate colon or rectal cancer.

**Fetus**. A developing baby after the first trimester.

**Gestation**. Pregnancy.

**Gynecology**. The branch of medicine that involves care of woman's health, including the reproductive system and breasts.

**Laparoscopy**. Direct visualization of the peritoneal cavity, ovaries, and the outer surfaces of the fallopian tubes and uterus by using a laparoscope. A laparoscope is a slender instrument—essentially a miniature telescope—with a fiber optic system that can illuminate the inside of the abdomen.

**LMP**. First day of a woman's last menstrual period before pregnancy; important to know when calculating the estimated date of confinement (the "due date").

**Mammography (Mammogram)**. An X-ray of the breast, used to detect breast cancer.

**Menopause**. Permanent cessation of the menses, either naturally caused by ovarian failure or resulting from surgical removal of the ovaries.

**Mucus, Cervical**. Secretion of the cervical mucous glands; the quality and quantity of these secretions are influenced by estrogen and progesterone. Estrogen makes secretions abundant and clear, with spinnbarkeit and afernpattern on drying. Progesterone makes secretions scant, opaque and cellular, without a fern pattern on microscopic examination.

**Obstetrician-Gynecologist**. A doctor with special skills, training, and education in women's health care.

**Obstetrics**. Branch of medicine that involves care of a woman during pregnancy, labor, childbirth and after the baby is born.

**Osteoporosis**.  Atrophy of bone caused by demineralization.

**Pap Test**.  A test in which cells are taken from the cervix and examined in a lab for abnormalities that could signal cancer.

**Preeclampsia**.  A dangerous condition unique to pregnancy, characterized by elevated blood pressure, protein in the urine and severe swelling (edema). Preeclampsia can occur anytime after 20 weeks of pregnancy and up to six weeks after birth. Approximately seven percent of pregnant women in the U.S. develop the condition. Eclampsia, which can be fatal, occurs when the above symptoms are followed by seizures. About one in 20 preeclampsia cases develops into eclampsia.

**Post partum**.  After delivery, or childbirth.

**Residency**.  The period of training in a specific medical specialty that occurs after graduation from medical school. The length of residency can vary from three to seven years, depending upon the specialty.

**RhoGAM**.  Rh immunoglobulin (RhIg), also known as RhoGAM, is a special blood product that can prevent an Rh-negative mother's antibodies from reacting to Rh-positive cells. Women diagnosed as Rh-negative receive an initial RhIg dose at about the 28th week of pregnancy and a second dose within 72 hours after delivery.

**Risk factors**.  Individual attributes (such as age, gender and family history) and habits (such as sexual activity, smoking and drug abuse) that are more common among people who contract a particular disease than in people who do not contract the disease.

**Rubella (German Measles)**.  An acute exanthematous viral disease that may cause fetal malformation if contracted during the first trimester of pregnancy.

**Salpingectomy**.  Surgical removal of a fallopian tube.

**Salpingo-oophorectomy**.  Surgical removal of a fallopian tube and ovary.

**Sexually Transmissible Disease**.  A disease that spreads by sexual contact, including chlamydia infection, gonorrhea, genital warts, herpes, syphilis, and infection with human immunodeficiency virus (HIV, the cause of acquired immunodeficiency syndrome [AIDS]).

**Schiller Test**.  Application of a solution of iodine to the cervix. The iodine is taken up by glycogen in normal vaginal epithelium, giving it a brown color. Areas lacking in glycogen are white or whitish-yellow, and may indicate leukoplakia (white lesions) or cancerous tissue. Although the test is not diagnostic of cancer, it can aid in choosing a precise location for biopsy.

**Sigmoidoscopy**.  Test in which a slender device is placed into the rectum and lower colon to look for cancer.

**Trimester**.  A time period of three calendar months. Gestation is divided into three trimesters.

**Tubal ligation**.  Permanent sterilization by surgically cutting and tying the fallopian tubes. Commonly referred to as having one's "tubes tied."

Can be performed at the same time as a cesarean section, which eliminates the need for a second surgery, or six weeks or more after a vaginal delivery. In the latter case, a small incision is made near the bellybutton.

**Urinalysis**. A test for signs of chemical changes in the urine that can signal a health problem.

**Urine dip-stick**. A chemically sensitive strip that can be immersed in a urine sample to provide immediate test results; used to screen for such conditions as diabetes, infection, or preeclampsia.

**Varicella**. Virus that causes chicken pox.

**Vulva**. The lips of the external female genital area.

For more terminologies visit http://obgnursing.blogspot.com

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**UNIT 2    REGULATIONS AND ORGANIZATIONS OF
            MIDWIFERY PRACTICE**

**CONTENTS**

**1.0    INTRODUCTION**

What year were you indexed by the Nursing and Midwifery Council of
Nigeria? Are you a registered nurse? The Nursing and Midwifery
Council of Nigeria is a category B parastatal of the Federal Ministry of
Health established by Decree No. 89, 1979 now known as Nursing and
Midwifery (Registration etc) act. Cap. N143, Laws of the Federation of
Nigeria, 2004. The Council is a body Corporate with perpetual
succession and a common seal.

It is the only legal, administrative, corporate and statutory body charged
with the performance of specific functions on behalf of the Federal
Government of Nigeria in order to ensure the delivery of safe and

effective Nursing and Midwifery care to the public through quality education and best practices. The Council is mandated by Law to regulate the standards of Nursing and Midwifery Education and Practice in Nigeria and to review such standards from time to time to meet the changing health needs of the society.

## 2.0    OBJECTIVES

At the end of this unit, you should be able to:

- discuss the origin, establishment and functions of the nursing and midwifery council of Nigeria
- describe the roles of various national and international organizations involved in health care services.
- describe the legal Roles of the Maternal and Child Health Nursing practice

## 3.0    MAIN CONTENT

## 3.1    Nursing and Midwifery Council of Nigeria

The Nursing and Midwifery Council of Nigeria is a category B parastatal of the Federal Ministry of Health On 28th Day of September 1979, the Federal Military Government established by Decree No. 89, 1979 a body to be known as the "Nursing and Midwifery Council of Nigeria of the Nursing" (Hereafter in this Decree referred to as "the Council") and Midwifery which shall be a body corporate with perpetual succession and a common seal and may sue and be sued by name aforesaid. It is  now known as Nursing and Midwifery (Registration etc) act. Cap. N143, Laws of the Federation of Nigeria, 2004. The Council is a body Corporate with perpetual succession and a common seal.

The primary objectives of the Nursing and Midwifery Council of Nigeria are to ensure high quality of Nursing and Midwifery education in Nigeria, maintain high standard of professional nursing and midwifery practice and enforce discipline within the profession. The Council has its headquarters in Abuja with Zonal Offices in Sokoto, Kaduna, Bauchi, Enugu, Port-Harcourt and Lagos.

**Figure 6: Nursing and Midwifery Council of Nigeria logo –
Source: nmcnigeria.org/portal/images/banner.jpg**

## 3.2    Origin

Nursing as a profession, came into existence as early as human existence. It is the foremost caring profession. It rested, savored and consolidated its position through the ages by developing its own language, rituals, arts and sciences from the physical, psycho-social and spiritual needs of the patients. The history of Nursing Education and Practice in Nigeria is closely interwoven with the history of nursing as a universal profession, the history of education and the history of Nigeria itself.

Modern scientific nursing started with the crusading efforts of Miss Florence Nightingale (1820-1910) during and after the Crimean¬ War (1854-1856). She combined Christian ideals, strict discipline and a sense of mission to open the door for what is known today as the nursing profession. Nursing was the first profession in the health industry to form an international organization - the International Council of Nurses formed in 1899. In 1916, the Royal College of Nursing was founded, while in 1919 the General Nursing Council for the England and Wales came into existence.

The early missionaries who arrived in Nigeria in the early nineteenth century, had the strong belief that Jesus Christ is the spiritual King, the greatest Nurse and Physician capable of caring for and healing whatever affects the body, mind and soul. They combined their missionary work with the provision of medical and nursing care to the sick.

With the Amalgamation of the Colony and the Protectorates of Nigeria into one country in 1914, Nigeria became a colony of Britain. Nursing like all other professions developed and witnessed rapid changes to meet

the changing needs of the society it serves. The first and second world wars also had impact on the growth and development of the nursing profession.

## 3.3 Establishment

The Nursing and Midwifery Council of Nigeria is a category B parastatal of the Federal Ministry of Health On 28th Day of September 1979, the Federal Military Government established by Decree No. 89, 1979 a body to be known as the "Nursing and Midwifery Council of Nigeria of the Nursing" (Hereafter in this Decree referred to as "the Council") and Midwifery which shall be a body corporate with perpetual succession and a common seal and may sue and be sued by name aforesaid. It is now known as Nursing and Midwifery (Registration etc) act. Cap. N143, Laws of the Federation of Nigeria, 2004. The Council is a body Corporate with perpetual succession and a common seal.

It is the only legal, administrative, corporate and statutory body charged with the performance of specific functions on behalf of the Federal Government of Nigeria in order to ensure the delivery of safe and effective Nursing and Midwifery care to the public through quality education and best practices. The Council is mandated by Law to regulate the standards of Nursing and Midwifery Education and Practice in Nigeria and to review such standards from time to time to meet the changing health needs of the society.

The primary objectives of the Nursing and Midwifery Council of Nigeria are to ensure high quality of Nursing and Midwifery education in Nigeria, maintain high standard of professional nursing and midwifery practice and enforce discipline within the profession. The Council has its headquarters in Abuja with Zonal Offices in Sokoto, Kaduna, Bauchi, Enugu, Port-Harcourt and Lagos.

The Council is headed by a Secretary General/Registrar and is assisted by other professionals and non-professional staff. They are responsible to a Board headed by a Chairman with members drawn from various institutions and zones in the country. In order to assist the Federal Government in achieving its Health-Care Reform Agenda, the Council has close working relationship with other sister organizations under the Federal Ministry of Health. These include the Medical and Dental Council of Nigeria, Pharmacist Council of Nigeria and other health parastatal. The aim of creating this rapport is to work as a team in assisting the Government in actualizing its objectives in the health-care sector.

The Council also works in partnership and collaboration with national and international non-governmental organisations such as WHO, UNICEF, USAID, The British Council, International Council of Nurses, International Council for Midwives, Institute of Human Virology, Nigeria (IHVN), International Centre for AIDS Care and Treatment Programs (ICAP),West African Health Organization (WAHO), IPAS, Netherlands Leprosy Relief Organisation, JSI/MMIS-Nigeria, Family Health International, GHAIN, PATHS, NACA, Pathfinder International, Society For Family Heath etc, in developing and implementing various health programmes, projects, workshops/seminar etc., aimed at uplifting the standards of Nursing and Midwifery Education and Practice in the country.

The Council also maintains close relationship with National Board of Technical Education (NBTE), National Universities Commission (NUC), Federal and State Universities, Polytechnics, Joint Admission and Matriculation Board (JAMB), Administrative Staff College of Nigeria, Centre for Management Development, Federal Training Centres (for academic and professional training programme for staff)



**Figure 7:     The Lawyers logo - Source: www.eofdream.com**

### 3.4     Functions

The primary objectives of the Nursing and Midwifery Council of Nigeria are to ensure high quality of Nursing and Midwifery education in Nigeria, maintain high standard of professional nursing and midwifery practice and enforce discipline within the profession.
Broadly, the Council's functions are related to those of designing, implementing and evaluating various nursing and midwifery educational programmes, of indexing, examination, registration, certification, licensure of professional nurses and midwives and monitoring standards of nursing and midwifery practice in the Country.

Specifically, the Council's functions are as follows:

1.  Index all categories of nursing and midwifery students on commencement of their training.
2.  Develop and review periodically, the different curricula utilized for the education of all categories of Nurses and Midwives.
3.  Co-operate with recognized bodies interested in conducting new schemes for Basic and Post Basic Education of Nurses and Midwives such as: National Universities Commission, World Health Organization.
4.  Accredit all training institutions and clinical practice areas utilized for the education of all categories of Nurses and Midwives in Nigeria.
5.  Conduct Professional Examinations for all categories of Nurses and Midwives in Nigeria.
6.  Establish and maintain Registers of all persons qualified to practice the discipline of Nursing and Midwifery in Nigeria.
7.  Conduct Registration interviews for Nurses and Midwives trained outside Nigeria who are seeking to practice in Nigeria.
8.  Issue and update Professional Practicing Licenses every three years to all cadres of qualified Nurses and Midwives.
9.  Issue Professional Certificates to all cadres of Nurses and Midwives at the end of their training.
10. Revoke and/or Restore Professional Certificates as applicable.
11. Determine and maintain standards of knowledge and competencies in Nursing and Midwifery Education and Practice in Nigeria.
12. Organize and Conduct Mandatory Continuing Professional and Educational Development Programmes for all cadres of Nurses and Midwives.
13. Conduct and Promote Research in relevant areas of Nursing and Midwifery.
14. Maintain discipline within the Nursing and Midwifery profession in Nigeria through the Nurses and Midwives Tribunal.
15. Prosecute illegal Training Institutions.
16. Regulate and control the practice of Nursing and Midwifery in all its ramifications.

**Council Structure**
The Nursing and Midwifery Council of Nigeria has a Governing Council/Board. The Board of the Council is made up of nineteen (19) members, appointed by the Federal Government, on the recommendations of the Federal Ministry of Health. The Board formulates policies' that brings improvement to Nursing education and Nursing practice in Nigeria. The Secretary General/Registrar, who is the Chief Executive of the Council, gives effect to the policy decisions of the Council. The Secretary General/Registrar is responsible for the day

to day administration of the organization. She is also the Accounting officer of the organization. The Registrar is assisted by four Directors who are head of the Council's four major departments, other cadres of Nursing officers and a multidisciplinary team of staff. There are presently 203 staff on the nominal roll of the Nursing and Midwifery Council of Nigeria. In the year 2001, the Council, after critical review of its activities by a team of Management experts from the Presidency, was upgraded from category 'C' to category 'B' Federal Health Parastatal. The new status of the Council has given rise to the creation of four major departments, namely, Education, Inspectorate, Planning, Research and Statistics, Human Resources /Finance & Accounts.

**Board members**
- THE CHAIRMAN who is appointed by the Honorable Minister of Health.
- THE HEAD OF NURSING SERVICES at the Federal Ministry of Health.
- FOUR NURSES each of whom shall be a Head of Nursing Services in the State Ministry of Health from the Four Health Zones on rotation among the States within each Zone.
- FOUR NURSES each of whom shall be an Educator in Nursing, Midwifery, Public Health Nursing and Psychiatric Nursing who will serve on rotation from the four Health Zones.
- TWO NURSES to represent the National Association of Nigeria Nurses and Midwives.
- TWO PEOPLE to represent Public Interest.
- TWO NURSES to represent Universities offering Degree Programmes in Nursing.
- ONE REGISTERED MEDICAL PRACTITIONER who shall be an Obstetrician and Gynecologist.
- THE SECRETARY TO THE BOARD who is the Secretary-General/Registrar of the Council.

The Council conducts its affairs through Standing Committees, which under the auspices of the Secretary-General, meet to deliberate on vital Professional, Educational and Administrative matters and make necessary recommendations to the Board.

The Standing Committees include:-
- Education Committee
- Examination Committee
- Registration Committee
- Finance and General Purposes Committee
- Standards and Accreditation Committee
- Appointment, Promotion and Disciplinary Committee
- Nurses and Midwives Disciplinary Tribunal

### 3.5 The Role of National and International Organization in Maternal and Child Health Nursing

**Introduction**

Midwifery, like nursing is a profession that is guided by rules and regulations of the professio0n regulations. Accordance to International Confederation of Midwives (1996) a professional regulation could simply be described as the means by which order, consistency and control are brought to a profession and its practice. In Nigeria, the Nur5sing and Midwifery Council of Nigeria regulate midwifery practice while UKCC is the regulating body for United Kingdom. However, the International Confederation of Midwives (ICM) is one of the foremost actors in the global arena working to improve maternity services through the empowering of midwives and promotion of good practice. Apart from the already mentioned profession bodies, other national and international organizations, which play important roles in the practice of midwifery are:

1. Nursing and Midwifery Council of Nigeria
2. World Health Organization (WHO)
3. The united Nations Children Emergency Fund now renamed United Nations Children Fund (UNICEF)
4. West African College of Nursing
5. United Nations Economic Development Program (UNEP)
6. United Nations Development Program (UNDP)
7. United Nations of American International Development Agency (USAID)

### 3.6 International Confedration of Midwives (ICM)

The International Confederation of Midwives (ICM) is a non-governmental organization, which came into being in 1919 as the International Midwives union. According to Bennett and Brown (1999), the purpose was to improve the services available to child bearing women through campaigning for a stronger, better educated and properly regulated midwifery profession' (ICM 1994 P.I) The united Nations accredited ICM in 1960. It has more than 75 member associations that cover approximately 66 countries. ICM's office is situated in London, England. This office welcomes both visitors and enquiries from midwives and midwifery organizations from anywhere in the world. The ICM collaboratively with other agencies thereby contributing to the increase acceptance of the midwife as a key provider of quality maternity care. For example, the ICM worked with WHO and

the International Federation of Gynecologists and Obstetrician (FIGO) to develop the international definition of the midwife.

**Roles of ICM**
Improvement of the services available to childbearing women through campaign for a stronger, better educated and coordinating of the International Day of the Midwife annually.

Assisting midwives and midwifery association to unite under a central banner to promote the role and responsibilities of the midwife under a specific theme.

Bringing together group of midwives from different countries for workshops, seminars and triennial congress. The triennial congress is valuable because it has been a useful vehicle for promoting midwives and midwifery in the host country.

Through the action orientation of the pre-congress workshops, midwives from a variety of countries developed plans and activities for improving midwifery services to women nationally and globally. For example, the 1990 congress in Kobe, Japan took its theme, midwifery education for safe motherhood and it was at the pre-congress workshop that the midwifery modules for safe motherhood initiative (WHO 1996) were first formulated.

The ICM triennial congress 1990 was preceded by a workshop to discuss safe motherhood. The results of the workshop were (i) recommendations for action to strengthen the curriculum for midwives (ii) making the curriculum more community based and including management of selected obstetric emergencies.

**The United Kingdom Central Council for Nursing Midwifery ABD Health Visiting (UKCC) Now NMC**
The UCKK (Now NMC) is the regulatory body for nursing, Midwifery and health visiting in the United Kingdom. The statutory control of the practice, education and supervision of midwives became the responsibility of the UKCC, National Boards of Nursing, Midwifery and Health Visiting Boards on 1st July 1983 (Bennett and Brown 1999).

**Roles of UCKK (NOW NMC)**
a.   To maintain register for qualified nurses, midwives and health visitors.
b.   To set standards for Nursing, midwifery and health visiting education practice and conduct.

c.  To provide advice for Nurses, midwives and health visitors on professional standards
d.  To consider allegations of misconduct or unfitness to practice due to ill health
e.  The UKCC (1992a) Publishes a booklet entitled 'The scope of professional practice' to guide practitioners in judging when this scope may appropriately be adjusted
f.  To protect the public from unsafe practices
g.  Registration and protection of title
h.  To confer accountability, identity and status upon the midwife
i.  To ensure quality care.

## 3.7    The Nursing and Midwifery Council of Nigeria

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**Roles**
•  Index all categories of nursing and midwifery students on commencement of their training.

- Develop and review periodically, the different curricula utilized for the education of all categories of Nurses and Midwives.
- Co-operate with recognized bodies interested in conducting new schemes for Basic and Post Basic Education of Nurses and Midwives such as: National Universities Commission, World Health Organization, etc.
- Accredit all training institutions and clinical practice areas utilized for the education of all categories of Nurses and Midwives in Nigeria.
- Conduct Professional Examinations for all categories of Nurses and Midwives in Nigeria.
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- Revoke and/or Restore Professional Certificates as applicable.
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- Organize and Conduct Mandatory Continuing Professional and Educational Development Programmes for all cadres of Nurses and Midwives.
- Conduct and Promote Research in relevant areas of Nursing and Midwifery.
- Maintain discipline within the Nursing and Midwifery profession in Nigeria through the Nurses and Midwives Tribunal.
- Prosecute illegal Training Institutions.
- Regulate and control the practice of Nursing and Midwifery in all its ramifications.

## 3.8    The World Health Organization (WHO)

The World health Organization was founded in 1947 and it now has 154 member states. Its headquarters are located in Geneva, Switzerland and it has six regional offices (Lucas and Gilles (1998).

These regional Offices and their locations are as follows:
African Regional offices (AFRO) – Brazzaville Congo.
Regional Office for the Americans (AMRO) – Washington, D.C. U.S.A
European Regional Office (EURO) – Copenhagen Denmark.
South East Asia Regional Office (SEARO) – New Delhi, India.

West Pacific Regional Office (WPRO) – Manila, Philippines.

**Its Roles**
Launch midwifery education modules for safe motherhood in 1996.
Fund workshop and seminar on midwifery practice including Research.
WHO (1994) produced the mother-baby package: a practical guide to implement safe motherhood in various countries (WHO 19094b) in the package the following recommendations were made "Appropriately trained midwifery Personnel living and working in the community is recognized as the key to successful safe motherhood.

Countries should give priority to developing the midwifery skills of their health personnel especially those proving community based care.

Strengthen midwifery skills in all aspects of maternity care- provision that must include the immediate management of selected        obstetric emergencies such as hemorrhage prolonged and obstructed labor, puerperal sepsis and hypertension in pregnancy.

Provision of technical information through the publication of World Health Bulletin.

Sponsoring training of various Cadres of maternal and child workers
Planning of Expanded programs on immunization WHO works collaboratively with the ICM and FIGO to formulate internationally accepted definition of a midwife.

**The UNICEF**



Figure 8 UNICEF Source : sohipp.org

The United Nation's children emergency fund now renamed United Nations children fund is an International Organizational financed almost entirely by voluntary contributions from government, private

foundations and public donations. It is particularly concerned with the well being of children in developing societies.

**Its Roles**
Assisting countries to establish accelerated program of immunization Sponsoring of workshops and seminars on children's welfare Promote awareness through jingles through the electronic media and posters.

Promote children well being through growth monitoring, oral rehydration, breast feeding, immunization and family planning.

Sponsor female literacy programmed and supplementary feeding.

**The West African College of Nursing (WACN)**
This body was inaugurated in April 1981 in Banjul, Gambia as one of the special agencies of the West African Health Community. (WAHC). They assist in pursuance of the goal of nursing and midwifery education at the basic and post basic level. They maintain standards of practice of nurses and midwives within the community.

**Roles**
Sponsoring of in-service educational programs Assist in providing facilities for nursing and midwifery education.

Encourage and promote research in the field of nursing and midwifery. Production of textbooks and journal on current issues in nursing and midwifery practice.

Disbursement of research fund to member states.
Assist in the formation of nursing and midwifery education program and to support the management and funding of such program in accredited institution in the member state.

Promote interaction among nurses and midwives by organizing workshops and seminars to disseminate information for client better care.

**Others are:**
UNEP – United Nations Environmental Program is concerned with matters affecting the environment.
UNDP – United Nations Environmental program co-ordinates UN activities in the area of development.
USAID – Makes provision for funds and commodity for operational research.

THE PATHFINDER – sponsors family planning program through provision of commodities and funding of family planning education program

## 3.9    Legal Roles for Nurses in Maternal and Child Health

As trends in maternal and child health care change, so do the roles of maternal and child health nurses. All maternal and child health nurses function in a variety of settings as caregivers, client advocates, researchers, case managers, and educators.

Maternal and child health nurses function in variety of advanced-practice roles. In addition, staff nurses with a specified number of years of direct patient contact and validation supporting completion of pertinent continuing education programs can become certified in a specialty. This certification recognizes clinical expertise. The field of maternal and child health nursing has numerous opportunities for certification.

## 3.10    Legal Roles for Nurses in Maternal and Child Health

*Women's Health Nurse Practitioner*
A **women's health nurse practitioner** is a nurse with advanced study in the promotion of health and prevention of illness in women. Such a nurse plays a vital role in educating women about their bodies and sharing with them methods to prevent illness; they care for women with illness such as sexually transmitted diseases and counsel them about and offer information regarding reproductive life planning. They play a large role in helping women remain well so they can enter a pregnancy in good health and maintain their health throughout life.

*Family Nurse Practitioner*
A **family nurse practitioner** (FNP) is an advanced practice role that provides health care not only to women but also to all persons throughout the age span. In conjunction with a physician, an FNP can provide prenatal care for the woman with an uncomplicated pregnancy. The FNP takes the health and pregnancy history, performs physical and obstetric examinations, orders appropriate diagnostic and laboratory tests, and plans continued care through pregnancy and for the family afterwards. FNPs then follow the family indefinitely to promote health and optimal family functioning.

*Neonatal Nurse Practitioner*
The **neonatal nurse practitioner** (NNP) is skilled in the care of newborns, both well and ill. NNPs may work in level 1, 2, or 3 newborn

nurseries, neonatal intensive care units, neonatal follow-up clinics, or physician groups, or in transporting the ill infant. The NNP's responsibilities include managing patient acre in an intensive care unit, conducting normal newborn assessments and physical examinations, and providing high-risk follow-up discharge planning.

### *Pediatric Nurse Practitioner*

A **pediatric nurse practitioner** (PNP) is a nurse prepared with extensive skills in physical assessment, interviewing, and well-child counselling and care. In this role, a nurse interviews parents as part of an extensive history and performs a physical assessment of the child if the nurse's diagnosis is that the child is well, he or she discusses with the parents any childbearing problems mention in the interview, gives any immunizations needed, offers necessary anticipatory guidance (based on the plan of care), and arranges a return appointment for the next well-child checkup. The nurse serves as a primary health caregiver or as the sole health care person the parents and child see at all visits.

If the PNP determines that a child has a common illness (e.g., iron deficiency anaemia), he or she orders the necessary laboratory tests and prescribe appropriate drugs for therapy. If the PNP determines that the child has a major illness (e.g., congenital subluxated hip, kidney disease, or heart disease), he or she consults with an associated paediatrician; together, they decide what further care is necessary. Nurse practitioners may also work in inpatient or specialty settings providing continuity of care to hospitalized children. As school nurse practitioners, they provide care to all children in a given community or school setting.
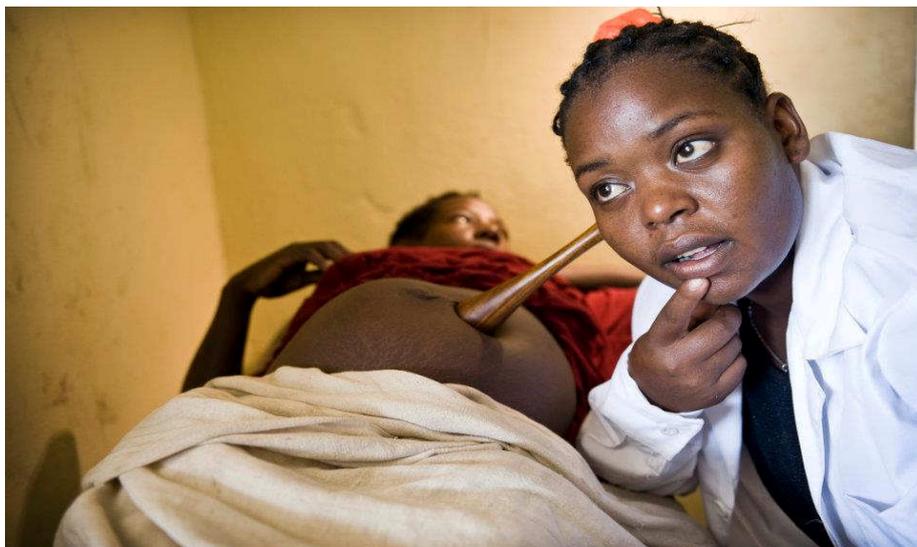


**Figure 9: A Nurse-Midwife listening to Foetal Heart Rate**
**Source: womennetwork.net**

35

Throughout history, the **nurse-midwife**, an individual educated in the discipline of nursing and midwifery and licensed according to the requirements of the American college of Nurse-Midwives (ACNM), has played an important role in assisting women with pregnancy and childbearing. Either independently or in association with an obstetrician, the nurse-midwife can assume full responsibility for the care and management of women with uncomplicated pregnancies. Nurse-midwives play a large role in making birth an unforgettable family event as well as helping to ensure a healthy outcome for both mother and child.

### *Clinical Nurse Specialists*

**Clinical nurse specialists** are nurses prepared at master's degree level who are capable of acting as consultants in their area of expertise, as well as serving as role models, researchers, and teachers of quality nursing care. Examples of areas of specialization are neonatal, maternal, child and adolescent health care; childbirth education; and lactation consultation.

Consider, for example, how a child health clinician might intervene to help in the care of a 4-years-old child with diabetes mellitus who has been admitted to the hospital. The child is difficult to care for because he is so fearful of hospitalization and perplexed because his parents are having difficulty accepting his diagnosis. A child health clinician could be instrumental in helping a primary nurse organize care and meet with the parents to help them accept what is happening. Neonatal clinicians manage infants' care at birth and in intensive care settings; they provide home follow-up care to ensure the newborn remains well. Childbirth educators teach families about normal birth and how to prepare for labour and delivery. Lactation consultants educate women about breast-feeding and support them while they learn how to breast-feed.

### *Case Manager*

A **case manager** is a graduate-level nurse who supervises a group of patients from the time they enter a health care setting until they are discharged from the setting, monitoring the effectiveness and cost and satisfaction of their health care. Case management can be a vastly satisfying nursing role because if the health care setting is one with "seamless walls" or follows people both during an illness and on their return to the community, it involves long-term contacts and lasting relationships.

## 3.11   Legal Considerations of Practice

Legal concerns arise in all areas of health care. Maternal and child health nursing carries some legal concerns that extend above and beyond other areas of nursing, because care is often given to an "unseen client" - the fetus- or to clients who are not of legal age for giving consent for medical procedures. In addition, labour, delivery and birth of neonate are considered "normal" events, so the risks for a lawsuit are greater when things go wrong. Nurses are legally responsible for protecting the rights of their clients, including confidentiality, and are accountable for the quality of their individual nursing care and that of other health care team members. Understanding the **scope of practice** (the range of service and care that may be provided by the nurse based on state requirements) and standards of care can help nurses practice within appropriate legal practitioners.

Informing clients about their rights and responsibilities is helpful in protecting them. In a society in which child abuse is of national concern, nurses are becoming increasing responsible for identifying and reporting incidents of suspected abuse in children.

Documentation is essential in protecting the nurse and justifying his or her actions. This concern is long-lasting, because children who feel they were wronged by health care personnel can bring a lawsuit at the time they reach legal age. This means that a nursing note written today may need to be defended as many as 21 years in the future. Nurses need to be conscientious about obtaining informed consent for invasive procedures and in determining that pregnant women are aware of any risk of the fetus involved with a procedure or test. In divorced or blended families (those in which two adults with children from previous relationships now live together), it is important to establish who has the right to give consent for health care. Personal liability insurance is strongly recommended for all nurses so they do not incur great financial losses during a malpractice or professional negligence suit.

If a nurse knows that the care provided by another practitioner was inappropriate or insufficient, he or she is legally responsible for reporting the incident. Failure to do so can lead to a charge of negligence or breach of duty.

The specific legal ramifications of procedures or care are discussed in later chapters with procedures or treatment modalities.

### 3.12    Ethical Considerations of Practice

Ethical issues are increasing in frequency in health care today. Some of the most difficult decisions in health care settings are those that involve children and their families. Just a few of the major potential conflicts include:

➢    Conception issues, especially those related to in vitro fertilization, embryo transfer, ownership of frozen oocytes or sperm, cloning, stem cell research, a surrogate mothers.
➢    Abortion, particularly partial-birth abortions
➢    Fetal rights versus rights of the mother
➢    Use of fetal tissue for research
➢    Resuscitation (how long should it be continued)
➢    The number of procedures or degree of pain that a child should be asked to endure to achieve a degree of better health
➢    The balance between modern technology and quality of life.

Legal and ethical aspects of issues are often intertwined, which makes the decision-making process complex. Because maternal and child health nursing is so strongly family-centered, it is common to encounter some situations in which the interests of one family member are in conflict with those of another. It is not unusual for the values of a client no to match those of a health care provider. For example, when a pregnancy causes a woman to develop a serious illness, the family must make a decision either to terminate the pregnancy and lose the child or keep the pregnancy and work to support the mother through crisis. If the fetus is also at risk from the illness, the decision may be easier to make; however, the circumstances are usually not clear-cut and the decisions that need to be made are difficult. These and other issues are bound to emerge during the course of practice. Nurses can help clients facing such difficult decisions by providing factual information and supportive listening and by helping the family in clarification of values.

The pregnant Woman's Bill of Rights and the United Nations Declaration of Rights of the Child provide guidelines for determining the rights of clients in regards to health care.

### SELF-ASSESSMENT EXERCISE

Now that you have completed this study session, you can assess how well you have achieved its Learning Outcomes by answering these questions. You can check your answers with the Notes on the Self-Assessment Questions at the end of this Module.

**SAQ 1.1 (tests learning outcome 1.1)**
What is pre conception care?
**SAQ 1.2 (tests learning outcome 1.2)**
What is the trend in the Maternal and Child Health Nursing Population
**SAQ 1.3 (tests learning outcome 1.3)** Describe male Orientation as a socio-cultural difference and its implications for maternal and child health nursing
**SAQ 1.4 (tests learning outcome 1.4)** what is Schiller Test?
**SAQ 1.5 (tests learning outcome 1.5)** State the decree that established the Nursing and Midwifery Council of Nigeria
**SAQ 1.6 (tests learning outcome 1.6)** Write briefly on WACN.
**SAQ 1.7** Enumerate the major ethical potential conflicts in the family and child health care
**SAQ 1.8:** Two decree that establishment of the Nursing and Midwifery Council of Nigeria are
The council shall be charged with the general duty of
(a)     Determining who are Nurses and midwives for the purpose of this Decree;
(b)     Determining what standard of knowledge and skill are to be attained by persons seeking to become member of the profession of nursing and midwifery

This body was inaugurated in April 1981 in Banjul, Gambia as one of the special agencies of the West African Health Community. (WAHC
They assist in pursuance of the goal of nursing and midwifery education at the basic and post basic level. They maintain standards of practice of nurses and midwives within the community.

**Roles**
Sponsoring of in-service educational programs
Assist in providing facilities for nursing and midwifery education.
Encourage and promote research in the field of nursing and midwifery.
Production of textbooks and journal on current issues in nursing and midwifery practice.

Disbursement of research fund to member states.
Assist in the formation of nursing and midwifery education program.
 Support the management and funding of such program in accredited institution in the member state.

Promote interaction among nurses and midwives by organizing workshops and seminars to disseminate information for client better care.

**SAQ 2.3**
The major ethical potential conflicts in the family and child health care

- Conception issues, especially those related to in vitro fertilization, embryo transfer, ownership of frozen oocytes or sperm, cloning, stem cell research, a surrogate mothers.
- Abortion, particularly partial-birth abortions
- Fetal rights versus rights of the mother
- Use of fetal tissue for research
- Resuscitation (how long should it be continued)
- The number of procedures or degree of pain that a child should be asked to endure to achieve a degree of better health
- The balance between modern technology and quality of life

## 4.0    CONCLUSION

The Council is mandated by Law to regulate the standards of Nursing and Midwifery Education and Practice in Nigeria and to review such standards from time to time to meet the changing health needs of the society.

## 5.0    SUMMARY

Standards of maternal and child health nursing practice have been formulated by the American Nurses Association And The Association Of Women's Health, Obstetric And Neonatal Nurses (AWHONN) to serve as guidelines for practice.

- Nursing theory and use of evidence-based practice are methods by which maternal and child health nursing expands and improves.
- The most significant measure of maternal and child health is the infant mortality rate. It is the number of deaths in infants from birth to 1 year of age per 1000 live births. This rate is declining steadily, but in the United States it is still higher than that of 20 other nations.
- Trends in maternal and child health nursing includes changes in the settings of care, increased concern about health care costs, improved preventive care, and family-centered care.
- Advanced-practice roles in maternal and child health nursing include women's health, family, neonatal, and pediatric nurse practitioners; nurse-midwives; clinical nurse specialists; and case managers. All of these expanded roles contribute to making maternal and child health care an important are of nursing and health care.

- Maternal and child health care has both legal and ethical considerations and responsibilities over and above those in other areas of practice because of the role of fetus and child.

## 6.0 TUTOR-MARKED ASSIGNMENT

Working with your preceptors, find out the presence of any of the international organizations nearest to you. Visit the organization and document the activities of such organizations.
- discuss how these organizations improve service delivery in the hospital or at the community level in your discussion forum online.

## 7.0 REFERENCES/FURTHER READING

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## MODULE 2 REPRODUCTIVE AND SEXUAL HEALTH

Unit 1 Review of the Reproductive Development
Unit 2 The Female Bony Pelvis
Unit 3 The Fetal Skull

## UNIT 1 REVIEW OF THE REPRODUCTIVE DEVELOPMENT

### CONTENT

1.0 Introduction
2.0 Objective
3.0 Main Contents
    3.1 Review of Reproductive development
    3.2 Intra-Uterine Development
    3.3 Pubertal Development
    3.4 The Hormonal Axis Underlying Puberty
    3.5 Hormonal Changes of Normal Puberty
    3.7 Secondary Sex Characteristics
    3.8 Review of Anatomy and Physiology of Female and male
        Reproductive System
        Male Reproductive System
        Male External Structures
        Male Internal Structures
        Female Reproductive System
        Female External Structures
        Female Internal Structures
        Mammary Gland
        Menstrual Cycle
        Menopause
4.0 Conclusion
5.0 Summary
    Activities
6.0 Self-Assessment Exercise
7.0 References/Further Reading

## 1.0 INTRODUCTION

It is of great importance for a professional midwife to have a deep understanding of the structures of the female reproductive system. In this module, you will learn the structure of the mother and child and how these dictate the birth experience, both for you the midwife and the mother.

Regardless of whether someone is planning on childbearing or not, everyone is wiser by being familiar with reproductive anatomy and physiology and his or her own body's reproductive and sexual health. Women and their partners who are planning on child bearing may be especially curious about reproductive physiology and the changes a pregnant woman will undergo during pregnancy, so this is an opportune time to educate both partners on reproductive and gynecological health (Allen & Fountain, 2007).

Although the general public is becoming increasingly sophisticated about their bodies, misunderstandings about sexuality, conception (preventing or promoting), and child bearing still abound. Sexuality is a major area of concern for school age children and adolescents. When caring for children of these ages, they may ask you a variety of detailed questions about sexuality or reproductive health. For instance, many young adults want to know what is considered a "normal" sexual response or the "normal" expected frequency for sexual relations. A general rule in answering this question is that normal sexual behavior includes any act mutually satisfying to both sexual partners. Actual frequency and type of sexual activity vary widely (MacKay, 2009).

One of the greatest contributions nurses can make is to encourage clients to ask questions about sexual and reproductive functioning. With this attitude, problems of sexuality and reproduction are brought out into the open and made as resolvable as other health concerns or problems. If this is an area that you were raised to not discuss freely, learning to be comfortable with the topic and your own sexuality can be the first step needed.

Nurses who can clearly explain the physical and emotional changes of puberty to the adolescent, the physiological changes of pregnancy to a young adult couple or the expected changes of menopause to a middle-aged woman provide much-needed health teaching information.

National Health Goals that speak directly to improving reproductive health are as shown below

- Reduce the proportion of adolescents who, by age 15, have engaged in sexual intercourse to no more than 15%, from the baseline rate of 27% of girls and 33% of boys.
- Increase to at least 50% the proportion of sexually active, unmarried people who use a condom at last sexual intercourse, from baseline rate of 19%

- Reduce deaths from cancer of the uterine cervix to no more than 1.3 per 100,000 women, from a base line rate of 2.8 per 100,000.
- Reduce breast cancer deaths to no more than 20.6 per 100,000 women, from a baseline rate of 23 per 100,000 (http://www.nih.gov).

Nurses can help the nation achieve these goals by educating adolescence about abstinence and refusal skills, safer sex practices, and the advantage of obtaining a vaccine against the human papiloma virus (HPV), the virus associated with cervical cancer. Women need to participate in screening activities such as breast mammography and vulvar self-examination.

## 2.0    OBJECTIVES

At the end of this unit, you should be able to:

- describe anatomy and physiology pertinent to reproductive and sexual health.
- identify national health goals related to reproductive health and sexuality that nurses can help the nation achieve.
- use critical thinking to analyze ways in which clients reproductive and sexual health can be improved for healthier childbearing and adult health within a family-centered framework.
- identify appropriate outcomes for reproductive and sexual health educations.
- evaluate expected outcomes for achievements and effectiveness of care
- identify areas of care in relation to reproductive and sexual health that could benefit from additional research or application of evidence-based practice
- integrate knowledge of reproductive health and sexuality with nursing process to achieve quality maternal and child health nursing care.

## 3.0    MAIN CONTENT

## 3.1    Review of Reproductive Development

**Intra-Uterine Development**
The sex of an individual is determined at the moment of conception by the chromosome information supplied by the particular ovum and sperm that joined to create the new life. A Gonad is a body organ that produces

the cells necessary for reproduction (the ovary in females, the testes in males). At approximately week 5 of inter-uterine life, primitive gonadal tissue is already formed. In both sexes, two undifferentiated ducts; the mesonephric and para-mesonephric ducts are present. By week 7 or 8 in chromosomal males, this early gonadal tissue differentiates into primitive testes and begins formation of testosterone. Under the influence of testosterone, the mesonephric duct begins to develop into the male reproductive organs and the para-mesonephric duct regresses. If testosterone is not present by week 10, the gonadal tissue differentiates into ovaries and the para-mesonephric ducts develops into female reproductive organs. All of the oocytes (cells that will develop into eggs throughout the woman's mature years) are already formed in the ovaries at this stage (MacKay, 2009).

At about 12 weeks, the external genitals develops. In males, under the influence of testosterone, penile tissue elongates and the uro-genital fold on the ventral surface of the penis closes to form the urethra; in females, with no testosterone present, the urogenital fold remains open to form the labia minora. What would be formed as scrotal tissue in the male becomes the labia majora in the female. If for some reason, testosterone secretion is halted in utero, a chromosomal male could be born with female-appearing genitalia. If a woman should be prescribed a for of testosterone during pregnancy or if the woman because of metabolic abnormality produces a high level of testosterone, a chromosomal female could be born with male appearing genitalia. (Torrensani & Biason-Lauber, 2007).

## 3.2    Pubertal Development

Puberty is a defining developmental stage of every child's life, both physically and psychosocially. Concerns about the normalcy of pubertal development and menstrual patterns are among the most common questions posed to every physician caring for children. This article reviews the primary physiologic changes in the hypothalamic-pituitary-gonadal (HPG) axis and in adrenal androgen and growth hormone (GH) production that underlie the normal pubertal milestones. Understanding of these changes allows interpretation of laboratory data in children suspected of having pubertal abnormalities.

Puberty is the developmental stage during which a child becomes a young adult, characterized by the maturation of gametogenesis, secretion of gonadal hormones, and development of secondary sexual characteristics and reproductive functions. Adolescence is used widely as a generally synonymous term for puberty, but the term often is used

to convey an added connotation of cognitive, psychological, and social change.

The larche denotes the onset of breast development, an estrogen effect.Pubarche denotes the onset of sexual hair growth, an androgen effect.Menarche indicates the onset of menses and spermarche the appearance of spermatozoa in seminal fluid. Gonadarche refers to the onset of pubertal function of the gonads, which produce most of the sex hormones that underlie the pubertal changes in secondary sex characteristics. Adrenarche refers to the onset of the adrenal androgen production that contributes to pubarche.

## 3.3    The Hormonal Axes Underlying Puberty

### The Hypothalamic-Pituitary-Gonadal Axis

Normal puberty results from sustained, mature activity of the HPG axis. The major hormones of the HPG axis are shown in fig 1 In response to a single gonadotropin-releasing hormone (GnRH), the pituitary gland releases two gonadotropins: luteinizing hormone (LH) and follicle-stimulating hormone (FSH). GnRH is secreted by specialized neurons of the hypothalamus in a pulsatile fashion. Pituitary LH and FSH secretion consequently is pulsatile and can be sustained only in response to pulsatile GnRH signals. LH acts primarily on the specialized interstitial cells of the gonads to stimulate formation of androgens, and FSH acts primarily on the follicular/tubular compartment to stimulate formation of estrogen from androgen precursors, inhibin, and gametes. The function of the two compartments of the gonads is coordinated by paracrine regulatory mechanisms.
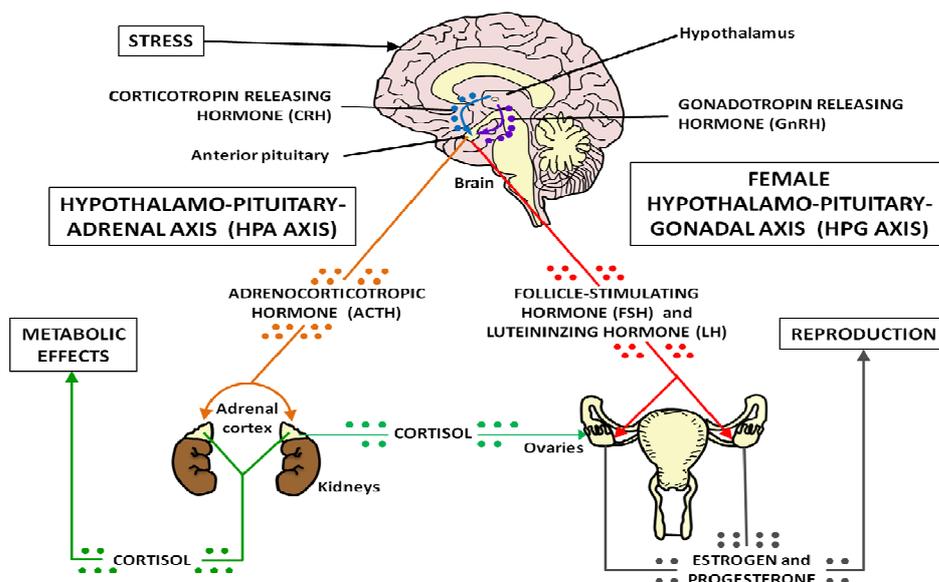


*Source: www.sfu.ca*
*Figure 10: The Hypothalamic-Pituitary-Gonadal Axis*

**The hypothalamic-pituitary-gonadal axis**. Hypothalamic neurons release gonadotropin-releasing hormone (GnRH) into the pituitary portal venous system, where it stimulates gonadotropin (luteinizing hormone [LH] and follicle-stimulating hormone [FSH]) secretion. LH primarily stimulates specialized interstitial cells (theca cells in the ovary or Leydig cells in the testes) to secrete androgens. FSH primarily stimulates the ovarian follicle or seminiferous tubules to form estrogen, inhibin, and gametes (eggs or sperm). The interstitial and follicular/tubular compartments act cooperatively through paracrine mechanisms to form estrogen and to regulate sex steroid and gamete development. Sex steroids exert endocrine closed-loop negative feedback effects on GnRH and gonadotropin secretion. Inhibin exerts negative feedback on FSH secretion. In mature females, a critical estradiol concentration for a critical duration exerts a transient positive feedback effect to stimulate the LH surge that initiates ovulation.

The HPG axis is active during three phases of development: fetal, neonatal, and adult, with puberty being the period of transition to mature function. Changes in GnRH secretion underlie the changing activity of the HPG axis. The sexually dimorphic patterns of sex hormone secretion during the prenatal and neonatal periods of HPG activity appear to play a role in programming sexually dimorphic patterns of behavior, metabolism, and neuroendocrine function in later life.

The HPG axis is established during the first trimester. Its activity in the second trimester contributes to the establishment of normal penile size and the inguinal-scrotal phase of testicular descent. In the latter half of pregnancy, activity is suppressed by the high estrogens elaborated by the fetoplacental unit.

The HPG axis promptly functions at a pubertal level in the newborn after withdrawal from maternal estrogens. This "minipuberty of the newborn" is subclinical, except for contributing to genital growth, acne, and transient thelarche in the neonate.

HPG function subsequently comes under gradual central nervous system restraint at the end of the neonatal period. The axis is relatively, but not absolutely, dormant throughout childhood, particularly in girls, who have slightly higher FSH concentrations than boys and a few ultrasonographically visible ovarian follicles as evidence of this effect. The HPG axis becomes increasingly active again in the late prepubertal period, as central nervous system restraint recedes, followed by an increasing tempo throughout puberty.

The gonads account for the most important circulating estrogen (estradiol) and androgen (testosterone). Gonadal function accounts for more than 90% of estradiol production in the female (50% in the male) and more than 90% of testosterone production in the male (50% in the female).
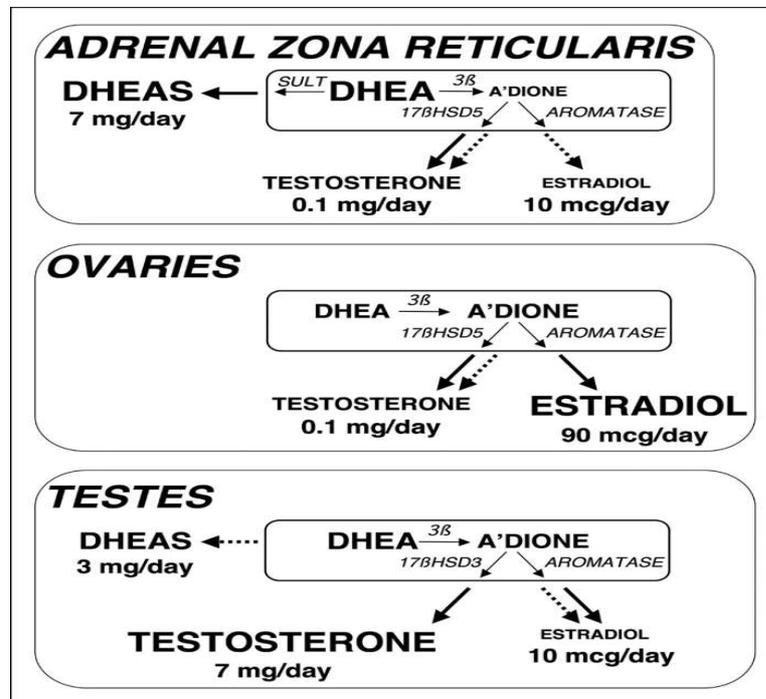


*Figure 11: Simplified diagram of sex steroid production by the adult adrenal glands, follicular phase ovaries, and testes.*

Blood production rates shown are the sum of direct secretion (heavy solid arrows) and peripheral formation from secreted precursors (dotted arrows). Several key steroidogenic enzyme activities expressed in these glands, such as sulfotransferase (SULT), 3β-hydroxysteroid dehydrogenase (3β), aromatase, and 17β-hydroxysteroid dehydrogenase type 5 (17βHSD5), are also expressed in peripheral tissues such as liver, fat, and skin. Type 3 17βHSD (17βHSD3) is only expressed in testes. Peripheral conversion from secreted androstenedione accounts for 50% of testosterone in women, and about 10% of estradiol and DHEAS similarly arise from circulating precursors. Estrone, the intermediate in the pathway from androstenedione to estradiol, is not shown. DHEA=dehydroepiandrosterone, DHEAS=dehydroepiandrosterone sulfate, A'DIONE=androstenedione

## 3.4    Hormonal Changes of Normal Puberty

The first hormonal change of puberty is a sleep-related increase in the pulsatile release of LH by the pituitary gonadotropes. FSH is secreted in

parallel but increases relatively less. At the beginning of puberty, a unique diurnal variation of pubertal hormones occurs, with little LH secretion during the day and a significant increase in pulsatile secretion during sleep. In response to nocturnal LH secretion, the pattern of gonadal sex steroid secretion differs between the sexes: ovarian secretion of estradiol peaks in mid-day and testicular secretion of testosterone peaks promptly during sleep. In addition, girls' pubertal hormone secretion is subclinically cyclic from early puberty. As puberty progresses, LH secretion persists further into the daytime. After menarche, this diurnal variation no longer exists. Adult sex steroid concentrations, however, have a mild diurnal variation, being highest on awakening.

The two gonadotropins each act primarily on specific gonadal cell types. LH stimulates the interstitial cells of the ovaries (theca cells) to form androgenic precursors of estradiol and those of the testes (Leydig cells) to secrete testosterone itself. FSH acts on the sex cord derivatives of the ovary (granulosa cells) and testes (Sertoli cells) to stimulate gametogenesis and gonadal growth. In granulosa cells, FSH strongly stimulates aromatase to form estradiol from thecal androgens.

As the gonads become increasingly sensitized to gonadotropin stimulation, they grow and secrete sex hormones at steadily increased rates. Within 3 years of rising above the prepubertal range, estradiol increases yearly to reach the mid-adult range and testosterone increases yearly to reach the lower adult range. These concentrations then gradually induce their effects. The hormonal increases culminate in positive feedback in girls, which refers to the female neuroendocrine system becoming capable of secreting a mid-cycle surge of LH when the ovary signals that it is prepared for ovulation via a critical and sustained level of estrogen secretion.

Estrogen stimulates the classic female target tissues: the female genital tract (eg, endometrial growth, cervical mucus secretion) and breasts. Androgen stimulates the classic male target tissues (eg, sexual hair and sebaceous gland). Both stimulate sexual drive and function. Both sex steroids account for the pubertal growth spurt, directly and indirectly via growth hormone. Both directly stimulate epiphyseal growth and epiphyseal maturation, which is indexed by bone age radiographs and peak bone mass accrual. However, they differ in some of their effects on skeletal growth. Androgen is responsible for the wider bones (the laryngeal enlargement accounting for the pubertal voice change), while estrogen is ultimately necessary for epiphyseal fusion and is the more potent inhibitor of bone resorption. They also affect growth of a wide variety of other somatic tissues. During puberty, estrogen promotes

50

lipogenesis and lower body fat distribution. In contrast, androgens generally are lipolytic, although they favor the development of visceral fat stores, and promote muscular development. The similar increase of body mass index during puberty in girls and boys, thus, is due to differences in body composition, with a higher percent being body fat in girls and lean body mass in boys.

The menstrual cycle arises from cyclic maturation of ovarian follicles that result in cyclic changes in sex hormones, particularly estradiol and progesterone, which entrain cyclic changes in gonadotropin concentrations. The biologic goal of this monthly variation is to select and nurture one dominant follicle to the point of ovulation for potential fertilization. A normal average 28-day cycle consists of two phases: the follicular phase (variable in duration, averaging 14 days at maturity) and the luteal phase ($14\pm1$ SD days), with the latter occurring only in ovulatory cycles. The follicular phase begins with the onset of menses and culminates in the mid-cycle LH surge, which induces ovulation from the follicle. The empty follicle forms the corpus luteum, initiating the luteal phase. Progesterone increases steadily to be sustained at very high levels for several days, along with lesser but substantial increases in estradiol. Progesterone and estradiol secretion from the corpus luteum maintain the endometrial layer of the uterus in preparation for potential pregnancy. If pregnancy does not occur, with its resultant increase in human chorionic gonadotropin, the corpus luteum life span is exhausted, which results in withdrawal of female sex steroids, followed by endometrial sloughing and menstrual flow.

Assessment of pubertal hormone concentrations requires reliable hormone assays in addition to consideration of the diurnal changes of early puberty and cyclic changes in girls. Although early pubertal children have greater average hormone concentrations than prepubertal children, their values still are much less than those of adults. The widely available, older generation of polyclonal antibody-based radioimmunoassays for gonadotropins do not possess sufficient sensitivity and specificity for optimal diagnosis of pubertal disorders. The modern multichannel platform assays available in many community hospitals are generally adequate for these purposes, as indicated by sensitivities of 0.1 to 0.15 U/L for LH and FSH. These platform assays are also reliable for DHEAS assays. On the other hand, platform assays are very unreliable for measuring testosterone and estradiol at the relatively low values that are normal for pubertal children and women. The practitioner should not order these tests unless provision can be made to assay them by accurate methodology, preferably in consultation with a pediatric endocrinologist.

Daytime pubertal hormone concentrations may not indicate the early stages of puberty accurately because of diurnal and cyclic variations. For this reason, GnRH-stimulated values may be necessary to diagnose pubertal disorders. A peak LH value greater than approximately 4.0 U/L in response to GnRH or GnRH agonist testing has been suggested as indicative of the onset of puberty.

## 3.5    Secondary Sex Characteristics

Secondary sex characteristics are features that appear during puberty in humans and sexual maturity but that are not directly part of the reproductive system.

Sexual differentiation begins during gestation, when the gonads are formed. General habitus and shape of body and face, as well as sex hormone levels, are similar in prepubertal boys and girls. As puberty progresses and sex hormone levels rise, differences appear, though puberty causes some similar changes in male and female bodies. Male levels of testosterone directly induce growth of the testicles and penis, and indirectly (via dihydrotestosterone (DHT)) the prostate. Estradiol and other hormones cause breasts to develop in females. However, fetal or neonatal androgens may modulate later breast development by reducing the capacity of breast tissue to respond to later estrogen.

**Males**
In males, testosterone directly increases size and mass of muscles ,vocal cords, and bones, deepening the voice, and changing the shape of the face and skeleton. Converted into DHT in the skin, it accelerates growth of androgen-responsive facial and body hair, but may slow and eventually stop the growth of head hair. Taller stature is largely a result of later puberty and slower epiphysealfusion.

- Growth of body hair, including underarm, abdominal, chest hair and pubic hair. Loss of scalp hair androgenic alopeciacan also occur.
- Greater mass of thigh muscles in front of the femur, rather than behind it as is typical in mature females
- Growth of facial hair
- Enlargement of larynx (Adam's apple) and deepening of voice[3]
- Increased stature; adult males are taller than adult females, on average
- Heavier skull and bone structure
- Increased muscle mass and strength

- Larger hands, feet and nose than women, prepubescent boys, and girls
- Larger bodies
- Square face
- Small waist, but wider than females
- Broadening of shoulders and chest; shoulders wider than hips[4]
- Increased secretions of oil and sweat glands, often causing acne and body odor[3]
- Coarsening or rigidity of skin texture due to less subcutaneous fat
- Higher waist-to-hip ratio than prepubescent or adult females or prepubescent males, on average
- Lower body fat percentage than prepubescent or adult females or prepubescent males, on average
- Enlargement (growth) of the penis.

**Females**

In females, breasts are a manifestation of higher levels of estrogen; estrogen also widens the pelvis and increases the amount of body fat in hips, thighs, buttocks, and breasts. Estrogen also induces growth of the uterus, proliferation of the endometrium, and menses.

- Enlargement of breasts and erection of nipples.[4]
- Growth of body hair, most prominently underarm and pubic hair
- Greater development of thigh muscles behind the femur, rather than in front of it
- Widening of hips;[5] lower waist to hip ratio than adult males
- Smaller hands and feet than men
- Elbows that hyperextend 5-8° more than men[6]
- Rounder face
- Smaller waist than men
- Upper arms approximately 2 cm longer, on average, for a given height[7]
- Changed distribution in weight and fat; more subcutaneous fat and fat deposits, mainly around the buttocks, thighs, andhips

### 3.6    Review of Anatomy and Physiology of the Reproductive System

## Male Reproductive System

The male reproductive system consists of both external and internal divisions.

**Male Reproductive Anatomy**
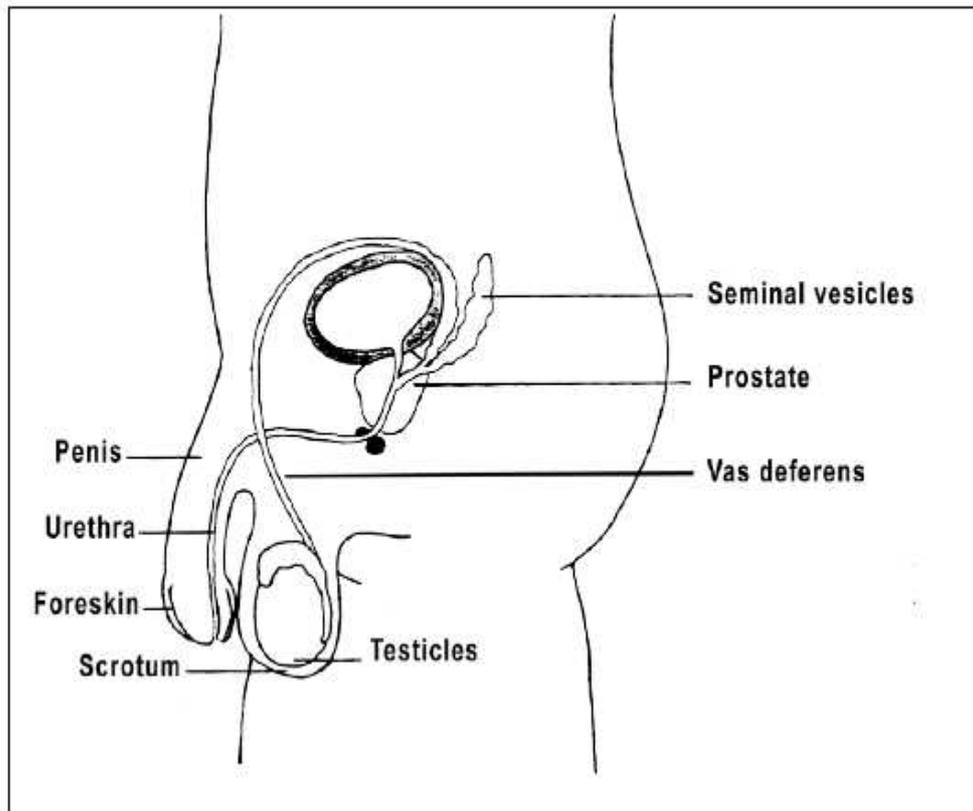


*Figure 3: Male Internal and External Structure*

## Male External Structures

External genital organs of the male reproductive system include the testes (which are encased in the scrotal sac) and the penis.

**Scrotum**: The scrotum is a rugated, skin-covered,muscular pouch suspended from the perineum. The major function of the scrotal sac is to keep the testes cooler than thirty-seven degrees Celsius (ninety-eight point six degrees Fahrenheit). The external appearance of the scrotum varies at different times in the same individual depending upon temperature and the subsequent contraction or relaxation of two muscles. These two muscles contract involuntarily when it is cold to move the testes closer to the heat of the body in the pelvic region. This causes the scrotum to appear tightly wrinkled. On the contrary, they

relax in warm temperatures causing the testes to lower and the scrotum to become flaccid. The temperature of the testes is maintained at about thirty-five degrees Celsius (ninety-five degrees Fahrenheit), which is below normal body temperature. Temperature has to be lower than normal in order for spermatogenesis (sperm production) to take place.
The two muscles that regulate the temperature of the testes are the dartos and cremaster muscles:

**Dartos Muscle**
The dartos muscle is a layer of smooth muscle fibers in the subcutaneous tissue of the scrotum (surrounding the scrotum). This muscle is responsible for wrinkling up the scrotum, in conditions of cold weather, in order to maintain the correct temperature for spermatogenesis.

**Cremaster Muscle**
The cremaster muscle is a thin strand of skeletal muscle associated with the testes and spermatic cord. This muscle is a continuation of the internal oblique muscle of the abdominal wall, from which it is derived.

**Testes:** The testes (singular, testis) are located in the scrot um (a sac of skin between the upper thighs). In the male fetus, the testes develop near the kidneys, then descend into the scrotum just before birth. Each testis is about 1.5 inches long by 1 inch wide. Testosterone is produced in the testes which stimulates the production of sperm as well as give secondary sex characteristics beginning at puberty.

**Blood Supply**
The testes receive blood through the testicular arteries (gonadal artery). Venous blood is drained by the testicular veins. The right testicular vein drains directly into the inferior vena cava. The left testicular vein drains into the left renal vein.

**Penis:** The penis is an external genital organ. The penis is composed of three cylindrical masses of erectile tissues in the penis shaft; two termed the corpus cavernosa and the third termed corpus spongiosum. The urethra, which is the last part of the urinary tract, traverses the corpus spongiosum and its opening, known as the meatus, lies on the tip of the glans penis. It is both a passage for urine and for the ejaculation of semen. The distal end of the penis is called the glans penis and is covered with a fold of skin called the prepuce or foreskin. Within the penis are masses of erectile tissue. Each consists of a framework of smooth muscle and connective tissue that contains blood sinuses, which are large, irregular vascular channels.

**Male Internal Structures**

The male internal organs are the following:

**Epididymis:** The epididymis is a tube that is about 2 inches that is coiled on the posterior surface of each testis. The seminiferous tubules join together to become the epididymis. The seminiferous tubules are the functional units of the testis, where spermatogenesis takes place. Within the epididymis the sperm complete their maturation and their flagella become functional. This is also a site to store sperm, nourishing them until the next ejaculation. Smooth muscle in the wall of the epididymis propels the sperm into the ductus deferens. Vasa efferentia from the rete testis open into the epididymis which is a highly coiled tubule. The epididymis has three parts-

1.  Head or caput epididymis- it is the proximal part of the epididymis. It carries the sperms from the testis.
2.  Body or corpus epididymis- it the highly convoluted middle part of the epididymis
3.  Tail or cauda epididymis- it is the last part that takes part in carrying the sperms to the vas deferens. The cauda epididymis continues to form less convoluted vas deferens.

**Vas Deferens (Ductus Deferens):** The ductus (vas) deferens, also called sperm duct, or, spermatic deferens, extends from the epididymis in the scrotum on its own side into the abdominal cavity through the inguinal canal. The inguinal canal is an opening in the abdominal wall for the spermatic cord (a connective tissue sheath that contains the ductus deferens, testicular blood vessels, and nerves. The  smooth muscle layer of the ductus deferens contracts in waves of peristalsis during ejaculation.

**Seminal Vesicles:** The pair of seminal vesicles are posterior to the urinary bladder. They secrete fructose to provide an energy source for sperm and alkalinity to enhance sperm mobility. The duct of each seminal vesicle joins the ductus deferens on that side to form the ejaculatory duct.

**Ejaculatory Ducts:** There are two ejaculatory ducts. Each receives sperm from the ductus deferens and the secretions of the seminal vesicle on its own side. Both ejaculatory ducts empty into the single urethra.

**Prostate Gland:** The prostate gland is a muscular gland that surrounds the first inch of the urethra as it emerges from the bladder. The smooth muscle of the prostate gland contracts during ejaculation to contribute to the expulsion of semen from the urethra.

**Bulbourethral Glands:** The bulbourethral glands also called Cowper's glands are located below the prostate gland and empty into the urethra. The alkalinity of seminal fluid helps neutralize the acidic vaginal pH and permits sperm mobility in what might otherwise be an unfavorable environment.

**Urethra:** The urethra is a hollow tube leading from the base of the bladder, which after passing through the prostrate gland, continuesto the outside through the shaft and glans of the penis. It is about 8 inches (18-20cm) long. Like other urinary tract structures, it is lined with mucous membrane.

**Composition of human semen**
The components of semen come from two sources: sperm, and "seminal plasma". Seminal plasma, in turn, is produced by contributions from the seminal vesicle, prostate, and bulbourethral glands. Seminal plasma of humans contains a complex range of organic and inorganic constituents. The seminal plasma provides a nutritive and protective medium for the spermatozoa during their journey through the female reproductive tract. The normal environment of the vagina is a hostile one for sperm cells, as it is very acidic (from the native microflora producing lactic acid), viscous, and patrolled by immune cells. The components in the seminal plasma attempt to compensate for this hostile environment. Basic amines such as putrescine, spermine, spermidine and cadaverine are responsible for the smell and flavor of semen. These alkaline bases counteract the acidic environment of the vaginal canal, and protect DNA inside the sperm from acidic denaturation.

A 1992 World Health Organization report described normal human semen as having a volume of 2 ml or greater, pH of 7.2 to 8.0, sperm concentration of $20 \times 10^6$ spermatozoa/ml or more, sperm count of $40 \times 10^6$ spermatozoa per ejaculate or more and motility of 50% or more with forward progression (categories a and b) of 25% or more with rapid progression (category a) within 60 minutes of ejaculation.

**Hormone Regulation**
Hormones which control reproduction in males are:
Gonadotropin-Releasing Hormone (GnRH): The hypothalamus secretes this hormone into the pituitary gland in the brain. There are two gonadotropic hormones, FSH and LH.
• Luteinizing Hormone (LH): The pituitary gland secretes this hormone after receiving a GnRH signal from the hypothalamus. LH stimulates Leydig cells, in the testes, telling them to produce testosterone.

- Follicle-Stimulating Hormone (FSH): The pituitary gland also secretes this hormone. Testosterone helps FSH run through the bloodstream to make Sertoli cells, located in the seminiferous tubules of the testes, to make immature sperm to mature sperm.

Testosterone: Also known as "the male hormone" and "androgen": Testosterone is vital for the production of sperm.

The erection of the penis is its enlarged and firm state. It depends on a complex interaction of psychological, neural, vascular and endocrine factors. The term is also applied to the process that leads to this state. A penile erection occurs when two tubular structures that run the length of the penis, the corpora cavernosa, become engorged with venous blood. This is a result of parasympathetic nerve induced vasodilation. This may result from any of various physiological stimuli. The corpus spongiosum is a single tubular structure located just below the corpora cavernosa, which contains the urethra, through which urine and semen pass during urination and ejaculation, respectively. This may also become slightly engorged with blood, but less so than the corpora cavernosa. Penile erection usually results from sexual stimulation and/or arousal, but can also occur by such causes as a full urinary bladder or spontaneously during the course of a day or at night, often during erotic or wet dreams. An erection results in swelling and enlargement of the penis. Erection enables sexual intercourse and other sexual activities (sexual functions), though it is not essential for all sexual activities.

**Ejaculation**
Emission is the term used when sperm moves into the urethra. Ejaculation is the term used when sperm is forced out of the urethra and the penis. These are both stimulated by sympathetic nerves.

**Sperm Production**
A spermatozoon or spermatozoan (pl. spermatozoa), from the ancient Greek σπέρμα (seed) and ζῷον (living being) and more commonly known as a sperm cell, is the haploid cell that is the male gamete. A mature human Spermatozoon Spermatagonia divides several times during the process of sperm development. The entire process of sperm formation and maturation takes about 9-10 weeks. The separate divisions that take place and what happens in each are as follows:
- First division: The first division is done by mitosis, and ensures a constant supply of spermatocytes , each with the diploid number of chromosomes.
- Second division: Spermatocytes then undergo a series of two cell divisions during meiosis to become secondary spermatocytes .

- Third division: Secondary Spermatocytes finally become spermatids . Spermatids, which are haploid cells, mature slowly to become the male gametes, or sperm.

The sperm is the main reproductive cell in males. The sperms differ in that each carry a set of chromosomes dividing each into either a male, or female sperm. The females differ in that they carry a X gene, while the male sperm carry a Y gene. The female sperm also differ phenotypically in that they have a larger head in comparison to the male sperms. This contributes to the male sperm being lighter, and therefore faster and stronger swimmers than their female counterparts (although statistically there is still a 50% chance of an either XY or XX embryo forming.

Spermatozoan stream lines are straight and parallel. The tail flagellates, which we now know propels the sperm cell (at about 1-3 mm/minute in humans) by rotating like a propeller, in a circular motion, not side to side like a whip. The cell is characterized by a minimum of cytoplasm. During fertilization, the sperm's mitochondria gets destroyed by the egg cell, and this means only the mother is able to provide the baby's mitochondria and mitochondrial DNA, which has an important application in tracing maternal ancestry. However it has been recently discovered that mitochondrial DNA can be recombinant.

Spermatozoa are produced in the seminiferous tubules of the testes in a process called  permatogenesis. Round cells called spermatogonia divide and differentiate eventually to become spermatozoa. During copulation the vagina is inseminated, the spermatozoa move through chemotaxis (see glossary) to the ovum inside a Fallopian tube or the uterus.

**Sperm Pathway**
Spermatogenesis takes place inside a male's testes, specifically in the walls of the seminiferous tubules. The epididymis is a tortuously coiled structure topping the testis, it receives immature sperm from the testis and stores it for several days. When ejaculation occurs, sperm is forcefully expelled from the tail of the epididymis into the ductus deferens. Sperm travels through the ductus deferens and up the spermatic cord into the pelvic cavity, over the ureter to the prostate behind the bladder. Here, the vas deferens joins with the seminal vesicle to form the ejaculatory duct, which passes through the prostate and empties into the urethra. Upon the sperm's exit from the testes, into the vas deferens, muscular movements take over. When ejaculation occurs, rhythmic muscle movements of peristalsis propel the sperm forward. This continues throughout the remainder of the sperm's journey through the male reproductive system. Sperm cells become even more active when they begin to interact with the fertilizing layer of an egg cell. They

swim faster and their tail movements become more forceful and erratic. This behavior is called "hyper activation." A recent discovery links hyper activation to a sudden influx of calcium ions into the tails. The whip-like tail (flagellum) of the sperm is studded with ion channels formed by proteins called CatSper. These channels are selective, allowing only calcium ion to pass. The opening of CatSper channels is responsible for the influx of calcium. The sudden rise in calcium levels causes the flagellum to form deeper bends, propelling the sperm more forcefully through the viscous environment.

Acrosome reaction on a Sea Urchin cell The sperm use their tails to push themselves into the epididymis, where they complete their development. It takes sperm about 4 to 6 weeks to travel through the epididymis. The sperm then move to the vas deferens, or sperm duct. The seminal vesicles and prostate gland produce a whitish fluid called seminal fluid, which mixes with sperm to form semen when a male is sexually stimulated.

The penis, which usually hangs limp, becomes hard when a male is sexually excited. Tissues in the penis fill with blood and it becomes stiff and erect (an erection). The rigidity of the erect penis makes it easier to insert into the female's vagina during sexual intercourse, and the extended length allows it to reach deeper into the female's oviduct , the passage from the ovaries to the outside of the body (allowing a shorter travel distance for the spermatozoa).

When the erect penis is stimulated to orgasm, muscles around the reproductive organs contract and force the semen through the duct system and urethra. Semen is pushed out of the male's body through his urethra - ejaculation. The speed of the semen is about 70 mph when ejaculation comes and it can contain 100 to 600 million sperm cells. When the male ejaculates during intercourse, semen is deposited into the fornix at the base of the female's vagina, near the cervix. From the fornix, the sperm make their way up through the cervix and move through the uterus with help from uterine contractions.

Sperm hyperactivity is necessary for breaking through two physical barriers that protect the egg from fertilization. The first barrier to sperm is made up of so-called cumulus cells embedded in a gel-like substance made primarily of hyaluronic acid. The cumulus cells develop in the ovary with the egg and support it as it grows.

The second barrier coating the oocyte is a thick shell formed by glycoproteins called the zona pellucida. One of the proteins that make up the zona pellucida binds to a partner molecule on the sperm. This

lock-and-key type mechanism is species-specific and prevents the sperm and egg of different species from fusing. There is some evidence that this binding is what triggers the acrosome to release the enzymes that allow the sperm to fuse with the egg. When a sperm cell reaches the egg the acrosome releases its enzymes. These enzymes weaken the shell, allowing the sperm cell to penetrate it and reach the plasma membrane of the egg. Part of the sperm's cell membrane then fuses with the egg cell's membrane, and the sperm cell sinks into the egg (at which point the sperm tail falls off). Upon penetration, the egg cell membrane undergoes a change and becomes impenetrable, preventing further fertilization. The binding of the sperm to an ovum is called a zygote. A zygote is a single cell, with a complete set of chromosomes, that normally develops into an embryo.

**Aging**
For most men, testosterone secretion continues throughout life, as does sperm production, though both diminish with advancing age. Probably the most common reproductive problem for older men is prostatic hypertrophy, enlargement of the prostate gland. This causes the urethra to compress and urination becomes difficult. Residual urine in the bladder increases the chance of urinary tract infections. Prostate hypertrophy is usually benign, but cancer of the prostate is one of the more common cancers in elderly men. A TURP is commonly used to correct this problem if the symptoms do not improve in response to home treatment and medication. Erectile dysfunction (ED) is another common problem seen in aging males. In older men, ED usually has a physical cause, such as disease, injury, or side effects of drugs. Any disorder that impairs blood flow in the penis or causes injury to the nerves has the potential to cause ED. Although it is not an inevitable part of aging, incidences increases with age: About 5 percent of 40-year-old men and between 15 and 25 percent of 65-year-old men experience ED. As discouraging as Erectile dysfunction may be, it is treatable at any age, and awareness of this fact has been growing. More men have been seeking help and returning to normal sexual activity because of improved, successful treatments for ED.

**Things that can go wrong with the male reproductive system**
Boys may sometimes experience reproductive system problems. Below are some examples of disorders that affect the male reproductive system (Disorders of the Scrotum, Testicles, or Epididymis).

1.      Conditions affecting the scrotal contents may involve the testicles, epididymis, or the scrotum itself.
2.      Testicular trauma. Even a mild injury to the testicles can cause severe pain, bruising, or swelling. Most testicular injuries occur

when the testicles are struck, hit, kicked, or crushed, usually during sports or due to other trauma.

3.    Testicular torsion, when 1 of the testicles twists around, cutting off the blood supply, is also a problem that some teen males experience - although it's not common. Surgery is needed to untwist the cord and save the testicle.

4.    Varicocele. This is a varicose vein (an abnormally swollen vein) in the network of veins that run from the testicles. Varicoceles commonly develop while a boy is going through puberty. A varicocele is usually not harmful, although in some people it may damage the testicle or decrease sperm production, so it helps for you to take your child to see his doctor if he is concerned about changes in his testicles.

5.    Testicular cancer . This is one of the most common cancers in men younger than 40. It occurs when cells in the testicle divide abnormally and form a tumor. Testicular cancer can spread to other parts of the body, but if it's detected early, the cure rate is excellent. Teen boys should be encouraged to learn to perform testicular self-examinations.

6.    Epididymitis is inflammation of the epididymis, the coiled tubes that connect the testes with the vas deferens. It is usually caused by an infection, such as the sexually transmitted disease chlamydia, and results in pain and swelling next to 1 of the testicles.

7.    Hydrocele. A hydrocele occurs when fluid collects in the membranes surrounding the testes. Hydroceles may cause swelling of the testicle but are generally painless. In some cases, surgery may be needed to correct the condition.

8.    Inguinal hernia. When a portion of the intestines pushes through an abnormal opening or weakening of the abdominal wall and into the groin or scrotum, it is known as an inguinal hernia. The hernia may look like a bulge or swelling in the groin area. It can be corrected with surgery.

**Disorders of Penis**

1.    Disorders of the Penis Disorders affecting the penis include the following:

2.    Inflammation of the penis. Symptoms of penile inflammation include redness, itching, swelling, and pain. Balanitis occurs when the glans (the head of the penis) becomes inflamed. Posthitis is foreskin inflammation, which is usually due to a yeast or bacterial infection.

3.    Hypospadias. This is a disorder in which the urethra opens on the underside of the penis, not at the tip.

4.      Phimosis. This is a tightness of the foreskin of the penis and is common in newborns and young children. It usually resolves itself without treatment. If it interferes with urination, circumcision (removal of the foreskin) may be recommended.

5.      Paraphimosis. This may develop when a boy's uncircumcised penis is retracted but doesn't return to the unretracted position. As a result, blood flow to the penis may be impaired, and your child may experience pain and swelling. A doctor may try to use lubricant to make a small incision so the foreskin can be pulled forward. If that doesn't work, circumcision may be recommended.

6.      Ambiguous genitalia. This occurs when a child is born with genitals that aren't clearly male or female. In most boys born with this disorder, the penis may be very small or nonexistent, but testicular tissue is present. In a small number of cases, the child may have both testicular and ovarian tissue.

7.      Micro penis. This is a disorder in which the penis, although normally formed, is well below the average size, as determined by standard measurements.

8.      Sexually transmitted diseases. Sexually transmitted diseases (STDs) that can affect boys include human immunodeficiency virus/ acquired immunodeficiency syndrome (HIV/AIDS), human papillomavirus (HPV, or genital warts), syphilis, chlamydia, gonorrhea, genital herpes, and hepatitis B. They are spread from one person to another mainly through sexual intercourse.

9.      Erectile dysfunction. E.D. is the inability to get or keep an erection firm enough for sexual intercourse. This can also called impotence. The word "impotence" may also be used to describe other problems that can interfere with sexual intercourse and reproduction, such as problems with ejaculation or orgasm and lack of sexual desire. Using the term erectile dysfunction clarifies that those other problems are not involved.

**Contraceptive for Men**

Vasectomy: In the procedure the vas deferens of each testes is cut and tied off to prevent the passage of sperm. Sperm is still produced and stored in crypt sites causing inflammation. Because of this inflammatory response the immune system acts on them destroying them and then having antisperm antibodies. This causes a lower possibility if the vasectomy is reversed to becoming fertile again.

Condoms: A device, usually made of latex, or more recently polyurethane, that is used during sexual intercourse. It is put on a man's penis and physically blocks ejaculated semen from entering the body of

a sexual partner. Condoms are used to prevent pregnancy, transmission of sexually transmitted diseases (STDs - such as gonorrhea, syphilis, and HIV), or both.

1.  Phlliteri A (2010). Maternal and Child Health Nursing (6th edition) Philadelphia: Lippincot
2.  Fraser D. M. & Cooper M. A.(2003). Myles Textbook for Midwives (14th ed). New York: Churchill Livingstone.

The female reproductive system, like the male system, has both internal and external components. (Anderson & Genadry,2007).

**Female External Structures**
The structure that form the female external genitalia are termed the vulva (from the Latin word for "covering") and are illustrated below



**Female External Genitalia. (Vulva) (Anderson & Genadry, 2007)**

**External Female Reproductive Anatomy**
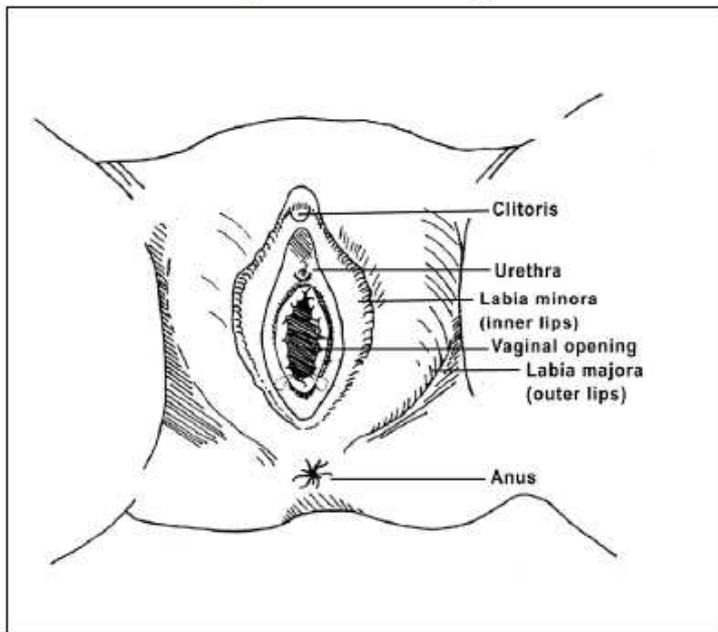


*Figure 4:* **Female External Genitalia. (Vulva) (Anderson & Genadry, 2007)**

**Mons Veneris or Mons Pubis:** The mons veneris, Latin for "mound of Venus" (Roman Goddess of love) is the soft mound at the front of the vulva (fatty tissue covering the pubic bone). It is also referred to as the mons pubis. The mons veneris protects the pubic bone and vulva from the impact of sexual intercourse. After puberty, it is covered with pubic hair, usually in a triangular shape. Heredity can play a role in the amount of pubic hair an individual grows.

**Labia Majora (greater lip):** The labia majora are the outer "lips" of the vulva. They are pads of loose connective and adipose tissue, as well as some smooth muscle. The labia majora wrap around the vulva from the mons pubis to the perineum. The labia majora generally hides, partially or entirely, the other parts of the vulva. There is also a longitudinal separation called the pudendal cleft. These labia are usually covered with pubic hair. The color of the outside skin of the labia majora is usually close to the overall color of the individual, although there may be some variation. The inside skin is usually pink to light brown. They contain numerous sweat and oil glands. It has been suggested that the scent from these oils are sexually arousing.

**Labia Minora (lesser lip):** Medial to the labia majora are the labia minora. The labia minora are the inner lips of the vulva. They are thin stretches of tissue within the labia majora that fold and protect the vagina, urethra, and clitoris. The appearance of labia minora can vary widely, from tiny lips that hide between the labia majora to large lips

65

that protrude. There is no pubic hair on the labia minora, but there are sebaceous glands. The two smaller lips of the labia minora come together longitudinally to form the prepuce, a fold that covers part of the clitoris. The labia minora protect the vaginal and urethral openings. Both the inner and outer labia are quite sensitive to touch and pressure.

**Other External Organs:** The vestibule is the flattened smooth surface inside the labia. The opening to the bladder (the urethra) and the uterus (vagina) both arise from the vestibule. The clitoris is a small (approximately 1-2cm) rounded organ of erectal  tissue at the forward junction of the labia minora.  It is covered by a fold of skin ( the prepuce). The clitoris is sensitive to touch and temperature and is the centre of sexual arousal and orgasm in a woman. Arterial blood supply to the clitoris is plentiful. When the ischio cavernosus muscle surrounding it contracts with sexual arousal, the venous outflow for the clitoris is blocked leading to clitoral erection.

Two skene's glands (para-urethral gland) are located just lateral to the urinary meatus one on each sides, their ducts open into the urethra.

**Bartholin's glands (vulvo-vagina glands):** These are located just lateral to the vaginal openings on bothe sides, their ducts open into the distal vagina. Secretions from both of these glands help to lubricate the external genitalia during coitus. The alkaline pH of the secretions help to improve sperm survival in the vagina. Both Skene's and Bartholin's glands may become infected and produce a discharge and local pain.

**Urethra:** The opening to the urethra is just below the clitoris. Although it is not related to sex or reproduction, it is included in the vulva. The urethra is actually used for the passage of urine. The urethra is connected to the bladder. In females the urethra is 1.5 inches long, compared to males whose urethra is 8 inches long. Because the urethra is so close to the anus, women should always wipe themselves from front to back to avoid infecting the vagina and urethra with bacteria. This location issue is the reason for bladder infections being more common among females.

**Hymen:** The hymen is a thin fold of mucous membrane that separates the lumen of the vagina from the urethral sinus. Sometimes it may partially cover the vaginal orifice. The hymen is usually perforated during later fetal development. Because of the belief that first vaginal penetration would usually tear this membrane and cause bleeding, its "intactness" has been considered a guarantor of virginity. However, the hymen is a poor indicator of whether a woman has actually engaged in sexual intercourse because a normal hymen does not completely block

the vaginal opening. The normal hymen is never actually "intact" since there is always an opening in it. Furthermore, there is not always bleeding at first vaginal penetration. The blood that is sometimes, but not always, observed after first penetration can be due to tearing of the hymen, but it can also be from injury to nearby tissues.

A tear to the hymen, medically referred to as a "transection," can be seen in a small percentage of women or girls after first penetration. A transection is caused by penetrating trauma. Masturbation and tampon insertion can, but generally are not forceful enough to cause penetrating trauma to the hymen. Therefore, the appearance of the hymen is not a reliable indicator of virginity or chastity.

**Perineum (Fourchette):** The perineum is the short stretch of skin starting at the bottom of the vulva and extending to the anus. It is a diamond shaped area between the symphysis pubis and the coccyx. This area forms the floor of the pelvis and contains the external sex organs and the anal opening. It can be further divided into the urogenital triangle in front and the anal triangle in back. The perineum in some women may tear during the birth of an infant and this is apparently natural. Some physicians however, may cut the perineum preemptively on the grounds that the "tearing" may be more harmful than a precise cut by a scalpel. If a physician decides the cut is necessary, they will perform it. The cut is called an episiotomy.

- **First degree tear** the fourchette only is torn
- **Second degree tear** beyond the fourchette and not involving the rectum or anus
- **Third degree tear** the anal sphincter is torn, the rectum occasionally

**The Blood Supply**
This comes from the internal and external pudendal arteries. The blood drains through corresponding veins

**Lymphatic Drainage**
This is mainly via the inguinal glands

**Nerve Supply**
This is derived from branches of pudendal nerve. The vaginal nerves supply the erectile tissue of the vestibular bulbs and clitoris and their parasympathetic fibers have a vasodilator effect.

**Female Internal Organs**
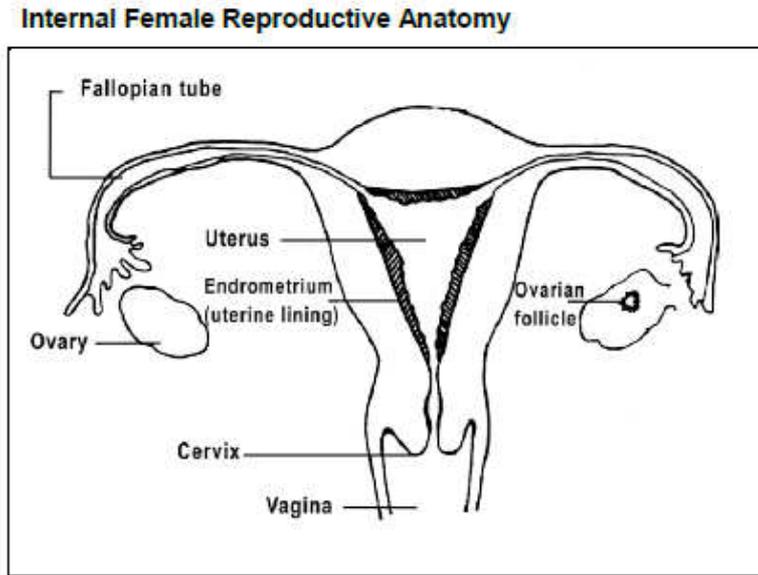


*Figure 5: Internal Female Reproductive Anatomy*

**Vagina:** The vagina is a muscular, hollow tube that extends from the vaginal opening to the cervix of the uterus. It is situated between the urinary bladder and the rectum. It is about three to five inches long in a grown woman. The muscular wall allows the vagina to expand and contract. The muscular walls are lined with mucous membranes, which keep it protected and moist. A thin sheet of tissue with one or more holes in it, called the hymen, partially covers the opening of the vagina. The vagina receives sperm during sexual intercourse from the penis. The sperm that survive the acidic condition of the vagina continue on through to the fallopian tubes where fertilization may occur.

The vagina is made up of three layers, an inner mucosal layer, a middle muscularis layer, and an outer fibrous layer. The inner layer is made of vaginal rugae that stretch and allow penetration to occur. These also help with stimulation of the penis. microscopically the vaginal rugae has glands that secrete an acidic mucus (pH of around 4.0.) that keeps bacterial growth down. The outer muscular layer is especially important with delivery of a fetus and placenta.

**Purposes of the Vagina**
* Receives a male's erect penis and semen during sexual intercourse.
* Pathway through a woman's body for the baby to take during childbirth.
* Provides the route for the menstrual blood (menses) from the uterus, to leave the body.

- May hold forms of birth control, such as a diaphragm, FemCap, Nuva Ring, or female condom.

**Cervix:** The cervix (from Latin "neck") is the lower, narrow portion of the uterus where it joins with the top end of the vagina. Where they join together forms an almost 90 degree curve. It is cylindrical or conical in shape and protrudes through the upper anterior vaginal wall. Approximately half its length is visible with appropriate medical equipment; the remainder lies above the vagina beyond view. It is occasionally called "cervix uteri", or "neck of the uterus". During menstruation, the cervix stretches open slightly to allow the endometrium to be shed. This stretching is believed to be part of the cramping pain that many women experience. Evidence for this is given by the fact that some women's cramps subside or disappear after their first vaginal birth because the cervical opening has widened. The portion projecting into the vagina is referred to as the portio vaginalis or ectocervix. On average, the ectocervix is three cm long and two and a half cm wide. It has a convex, elliptical surface and is divided into anterior and posterior lips. The ectocervix's opening is called the external os. The size and shape of the external os and the ectocervix varies widely with age, hormonal state, and whether the woman has had a vaginal birth. In women who have not had a vaginal birth the external os appears as a small, circular opening. In women who have had a vaginal birth, the ectocervix appears bulkier and the external os appears wider, more slit-like and gaping.

The passageway between the external os and the uterine cavity is referred to as the endocervical canal. It varies widely in length and width, along with the cervix overall. Flattened anterior to posterior, the endocervical canal measures seven to eight mm at its widest in reproductive-aged women. The endocervical canal terminates at the internal os which is the opening of the cervix inside the uterine cavity. During childbirth, contractions of the uterus will dilate the cervix up to 10 cm in diameter to allow the child to pass through. During orgasm, the cervix convulses and the external os dilates.

**Uterus:** The uterus is shaped like an upside-down pear, with a thick lining and muscular walls. Located near the floor of the pelvic cavity, it is hollow to allow a blastocyte, or fertilized egg, to implant and grow. It also allows for the inner lining of the uterus to build up until a fertilized egg is implanted, or it is sloughed off during menses. The uterus contains some of the strongest muscles in the female body. These muscles are able to expand and contract to accommodate a growing fetus and then help push the baby out during labor. These muscles also contract rhythmically during an orgasm in a wave like action. It is

thought that this is to help push or guide the sperm up the uterus to the fallopian tubes where fertilization may be possible. The uterus is only about three inches long and two inches wide, but during pregnancy it changes rapidly and dramatically. The top rim of the uterus is called the fundus and is a landmark for many doctors to track the progress of a pregnancy. The uterine cavity refers to the fundus of the uterus and the body of the uterus. Helping support the uterus are ligaments that attach from the body of the uterus to the pelvic wall and abdominal wall. During pregnancy the ligaments prolapse due to the growing uterus, but retract after childbirth. In some cases after menopause, they may lose elasticity and uterine prolapse may occur. This can be fixed with surgery. Some problems of the uterus include uterine fibroids, pelvic pain (including endometriosis, adenomyosis), pelvic relaxation (or prolapse), heavy or abnormal menstrual bleeding, and cancer. It is only after all alternative options have been considered that surgery is recommended in these cases. This surgery is called hysterectomy. Hysterectomy is the removal of the uterus, and may include the removal of one or both of the ovaries. Once performed it is irreversible. After a hysterectomy, many women begin a form of alternate hormone therapy due to the lack of ovaries and hormone production.

**Supports**
The uterus is supported by the pelvic floor and maintained in position by several ligaments, of which those at the level of the cervix are the most important.

*The Transverse Cervical Ligaments* these fan out from the sides of the cervix to the side walls of the pelvis. They are sometimes known as the 'cardinal ligaments' or 'Mackenrodt's ligaments'
*The uterosacral ligaments* these pass backwards from the cervix to the sacrum
*The pubocervical ligaments* these pass forwards from the cervix, under the bladder, to the pubic bones.
*The broad ligaments* these are formed from the folds of the peritoneum which are draped over the uterine tubes. They hang down like a curtain and spread from the  sides of the uterus to the sides walls of the pelvis
*The round ligaments*. *These* have little value as a support but tend to maintain the anteverted position of the uterus. They arise from the cornua of the uterus in front of and below the insertion of each uterine tube and pass between the folds of the broad ligament, through the inguinal canal, to be inserted into each labium majus.
*The ovarian ligament.* These also begin at the cornua of the uterus but behind the uterine tubes and pass down between the folds of the broad ligament to the ovaries. It is helpful to note that the round ligament, the uterine tube and the ovarian ligament are very similar in appearance and

arise from the same area of the uterus. This makes careful identification important when tubal surgery is undertaken.

**Structure**

The non- pregnant uterus is a hollow muscular pearshaped organ situated in the true pelvis. It is 7.5cm long, 5cm wide and 2.5 cm in depth. The cervix forms the lower one third of the uterus and measures 2.5cm in each direction. The uterus consists of the following parts:

*The Body or Corpus* This makes the upper two thirds of the uterus and is the greater part.

*The Fundus* This is the domed upper wall between the insertions of the uterine tubes.

*The Cornua* These are the upper outer angles of the uterus where the uterine tubes join.

*The Cavity. This* is a potential space between the anterior and posterior walls. It is triangular in shape, the base of the triangle being uppermost

*The Isthmus* this is a narrow area between the cavity and the cervix which is 7cm long. It enlarges during pregnancy and labour to form part of the lower uterine segment

*The Cervix or Neck.* This protrudes into the vagina, the upper half being above the vagina, is known as the supravaginal portion while the lower half is the infravaginal portion.

*The Internal Os (Mouth)* this is the narrow opening between the isthmus and the cervix.

*The External Os.* This is a small round opening at the lower end of the cervix. After childbirth it becomes a transverse slit with an anterior and a posterior lip.

*The Cervical Canal* lies between these two and is a continuation of the uterine cavity. This canal is shaped like a spindle, narrow at each end and wider in the middle.
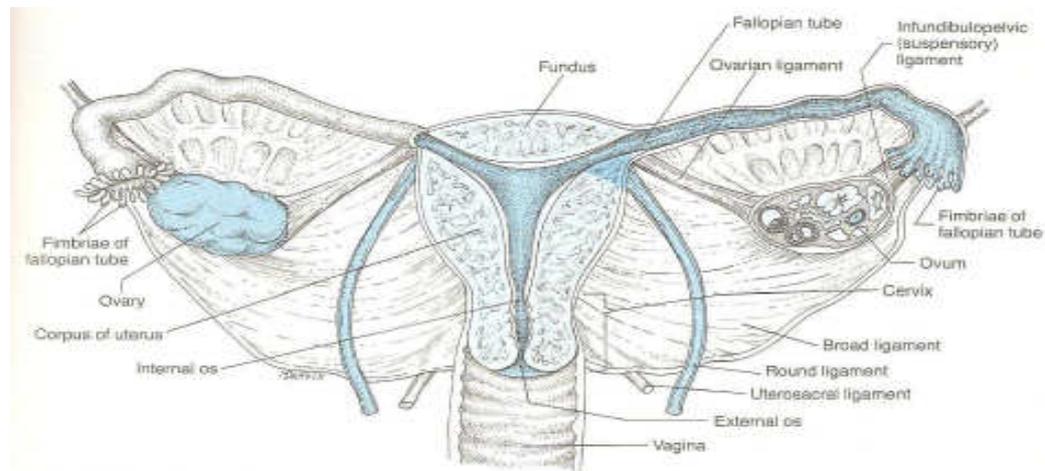


**Figure 6: Microscopic Structure of the Female Internal Reproductive System (Adele Pillitteri, 2010)**

**Ovaries**

The ovaries are approximately 4cm long, 2cm in diameter and approximately 1.5cm thick, or the size and shape of almonds. They are grayish white and appear pitted, or with minute indentations on the surface. An unruptured, glistening, cleared, fluid-filled graafin follicle (an ovum about to be discharged) or a miniature yellow corpus luteum (the structure left behind after the ovum has been discharged) often can be observed on the surface of an ovary.

Ovaries are located close to and on both sides of the uterus in the lower abdomen. The two ovaries (the female gonads) produce, mature and discharge ova (the egg cells) and in the process produces the hormones estrogen and progesterone. The ovaries initiate and regulates the menstrual cycle. If the ovaries are removed before puberty ( or are nonfunctional), the resulting absence of estrogen prevents breasts from maturing at puberty, in addition, pubic hair distribution assumes a more masculine pattern than normal. After menopause, or cessation of ovarian functions, the uterus, breast, ovaries all undergo atrophy or reduction in size because of a lack of estrogen. Ovarian function therefore, is necessary for maturation and maintenance of secondary sex characters in females.

**Support**

The ovary is attached to the broad ligament but is supported from above by the ovarian ligament medially and the infundibulopelvic ligaments laterally.

**Structure:** The ovaries have three principal divisions
1. Protective layer of surface epithelium
2. Cortex, where the immature (primordial) oocytes mature into ova and large amount of estrogen and progesterone are produced
3. Central Medulla, which contains the nerve, blood vessels, lymphatic tissues, and some smooth muscle tissues.

**Blood Supply:** The blood supply is from the ovarian arteries and drains through the ovarian veins. The right ovarian vein joins the inferior vena cava, but the left ovarian vein return its blood to the left renal vein.

**Lymphatic Drainage**: This is to the lumber glands

**Nerve supply**: This is from the ovarian plexus.

**Fallopian Tubes:** At the upper corners of the uterus are the fallopian tubes. There are two fallopian tubes, also called the uterine tubes or the oviducts. Each fallopian tube attaches to a side of the uterus and

connects to an ovary. They are positioned between the ligaments that support the uterus. The fallopian tubes are about four inches long and about as wide as a piece of spaghetti. Within each tube is a tiny passageway no wider than a sewing needle.

The intestinal portion is the passage way (uterine wall) within each fallopian tubes which is about 1mm wide.

The Isthmus is the narrow part 2.5cm long from cornua of the uterus.
The Ampulla is the wider portion 5cm long extending from the isthmus to the infundibulum usually fertilization takes place here.

At the other end of each fallopian tube is a fringed area that looks like a funnel. This fringed area, called the infundibulum, lies close to the ovary, but is not attached. The ovaries alternately release an egg. When an ovary does ovulate, or release an egg, it is swept into the lumen of the fallopian tube by the fimbriae.

**Blood Supply**: from uterine and ovarian arteries by the corresponding vein

**Lymphatic drainage**: is to lumbar glands
**Nerve supply**: from ovarian plexus

**Mammary Glands**
Mammary glands are the organs that produce milk for the sustenance of a baby. These exocrine glands are enlarged and modified sweat glands.
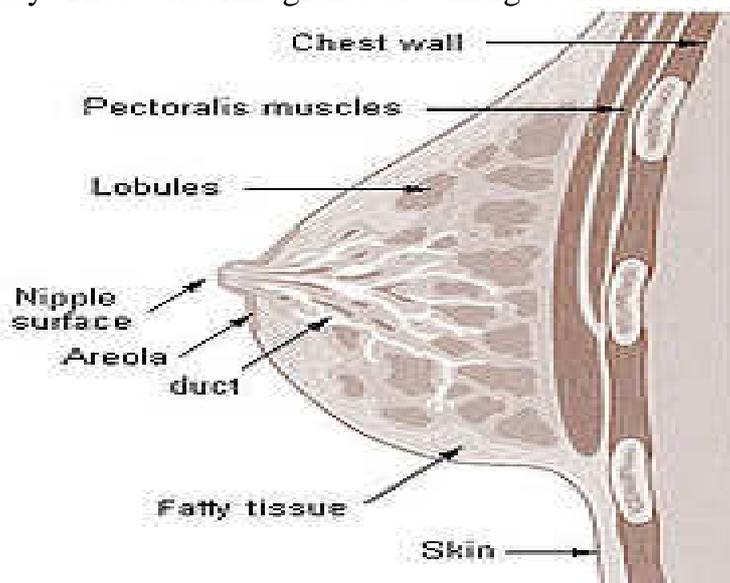


*Figure 7: Cross section of the breast of a human female (*Adele Pillitteri, 2010).

**Structure:** The basic components of the mammary gland are the alveoli (hollow cavities, a few millimetres large) lined with milk-secreting epithelial cells and surrounded by myoepithelial cells. These alveoli join up to form groups known as lobules, and each lobule has a lactiferous duct that drains into openings in the nipple. The myoepithelial cells can contract, similar to muscle cells, and thereby push the milk from the alveoli through the lactiferous ducts towards the nipple, where it collects in widenings (sinuses) of the ducts. A suckling baby essentially squeezes the milk out of these sinuses.

The development of mammary glands is controlled by hormones. The mammary glands exist in both sexes, but they are rudimentary until puberty when - in response to ovarian hormones - they begin to develop in the female. Estrogen promotes formation, while testosterone inhibits it.

At the time of birth, the baby has lactiferous ducts but no alveoli. Little branching occurs before puberty when ovarian estrogens stimulate branching differentiation of the ducts into spherical masses of cells that will become alveoli. True secretory alveoli only develop in pregnancy, where rising levels of estrogen and progesterone cause further branching and differentiation of the duct cells, together with an increase in adipose tissue and a richer blood flow.

Colostrum is secreted in late pregnancy and for the first few days after giving birth. True milk secretion (lactation) begins a few days later due to a reduction in circulating progesterone and the presence of the hormone prolactin. The suckling of the baby causes the release of the hormone oxytocin which stimulates contraction of the myoepithelial cells.

The cells of mammary glands can easily be induced to grow and multiply by hormones. If this growth runs out of control, cancer results. Almost all instances of breast cancer originate in the lobules or ducts of the mammary glands.

**Blood Supply:** from the thoracic branches of the axillary, internal mammary and intercoastal axis.

**The Menstrual Cycle**
The reproductive phase of a woman's life begins at puberty until menopause and is associated with regular menstrual flow. It is the episodic uterine bleeding in response to cyclic hormonal changes. The purpose of this cycle is to bring an ovum to maturity and renew a uterine tissue bed that will be responsible for the ova's growth should it

be fertilized. It is a process that allows for conception and implantation of a new life. Because menarche may occur as early as 9 years of age, it is good to include health teaching information on menstruation to both school age children and their parents as early as early secondary school days.

The length of menstrual cycle differs from woman to woman, but the average length is 28 days ( from the beginning of one menstrual flow to the beginning of  the next). It is not unusual for cycles to be as short as 23days or as long as 35 days. The average length of the menstrual flow (termed menses) is 4 to 6 days, although women may have periods as short as 2 days or as long as 7  days. (MacKay, 2009).
Purpose:

- To bring an ovum to maturity
- To renew a uterine tissue bed that will be responsive to fetal  growth
- To prepare the uterus for pregnancy

**Physiology of Menstration**
Four body structures are involved in the physiology of  the menstrual cycle; the hypothalamus, the pituitary gland, the ovaries, and the uterus. Inactivity of any part results in an incomplete or ineffective cycle.
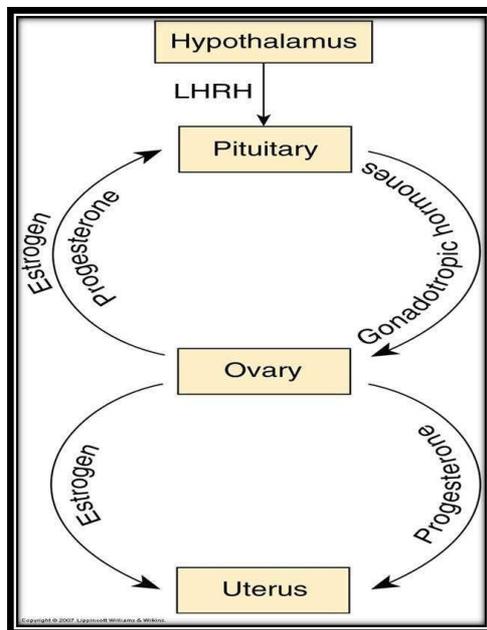


*Figure 8: The interaction of Pituitary-Uterine-Ovarian Functions in a Menstrual Cycle* Adele Pillitteri 2010)

**Phases of Menstrual Cycle**

By definition, the menstrual (or uterine) cycle begins with the first day of bleeding, which is counted as day 1. The cycle ends just before the next menstrual period. Menstrual cycles normally range from about 25 to 36 days. The description of the phases of the menstrual cycle below assumes a cycle length of 28 days. However, only 10% to 15% of women have cycles that are exactly 28 days. The menstrual and ovarian cycles each have 3 phases:

**Menstrual cycle**

**Days 1-5: Menstrual phase**

- This phase is from first day of the menses to last day of bleeding (usually lasts from 3–5 days, up to 7 days).
- Bleeding occurs when there is no fertilization.
- Low levels of both progesterone and oestrogen make the blood vessels of the endometrium constrict, cutting off blood flow to the uterine lining.
- The cells of the uterine lining start to die, and the lining sloughs off and causes bleeding.
- Two-thirds of the endometrial lining sheds during menses.
- During this time the ovaries are beginning the follicular stage (see below).

**Days 6-14: Proliferative phase**

- This phase is from cessation of menses to ovulation.
- Endometrial lining thickens in preparation for implantation of a fertilized ovum. Its thickness doubles to about 4–6 mm.
- Uterine secreting glands increase in size and produce mucus.
- Uterine blood vessels begin to grow.
- Ovulation occurs in the ovaries at the end of this stage, usually around day 14, triggered by a surge in luteinizing hormone (LH) from the anterior pituitary gland.

**Days 15-28: Secretory phase**

- This phase is from ovulation to the start of the next menses.
- Endometrial glands secrete mucus, which prepares the uterus to receive a fertilized ovum.
- The corpus luteum produces oestrogen, while the cells of the ovaries produce Progesterone
- Endometrium continues to thicken.

**Ovarian cycle:**

While the uterus is proceeding through the 3 phases above, the ovaries pass through the following phases:

- **Follicular phase:** (about 14 days): Between 3-30 follicles, each containing 1 ovum (egg), begin to grow, with usually 1 reaching maturity while the others break down.
- **Ovulatory phase** (about 16-32 hours): The ovum is released from the follicle and enters the Fallopian tube.
- **Luteal phase** (about 14 days): The ruptured follicle forms a structure called the corpus luteum. The corpus luteum produces progesterone, which helps prepare the endometrium or a fertilized egg.
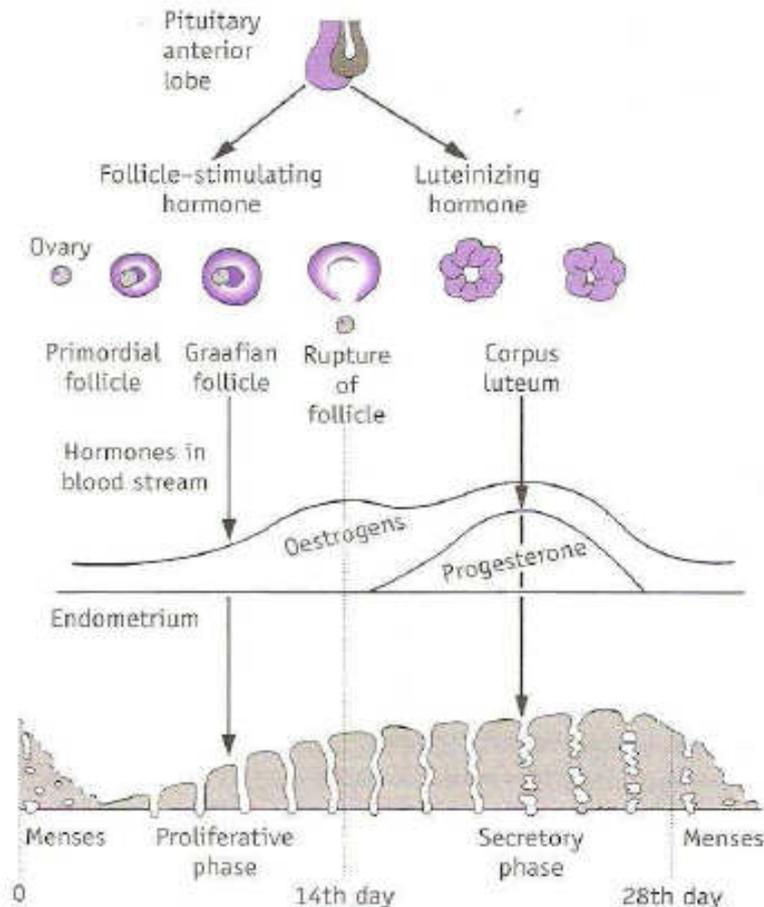
*Figure 9: The Menstrual Cycle (*Adele Pillitteri 2010)

**Menstration**

If the egg is not fertilized, then the corpus luteum dies, the uterus sheds its lining, menses begins and another menstrual cycle ensues. If fertilization and implantation do not occur the corpus luteum degenerates into a corpus albicans, and progesterone levels fall. This fall in progesterone levels cause the endometrium lining to break down and sluff off through the vagina. This is called menstruation, which marks the low point for estrogen activity and is the starting point of a new cycle. Menses or menstrual flow is composed of

- Blood from the ruptured capillaries
- Mucin from the glands
- Fragments of endometrial tissues
- The microscopic, atrophied, and unfertilized ovum.

### Signs of ovulation

The female body produces outward signs that can be easily recognized at the time of ovulation. The two main signs are thinning of the cervical mucus and a slight change in body temperature.

### Thinning of the Cervical Mucus

After menstruation and right before ovulation, a woman will experience an increase of cervical mucus. At first, it will be thick and yellowish in color and will not be very plentiful. Leading up to ovulation, it will become thinner and clearer. On or around the day of ovulation, the cervical mucus will be very thin, clear and stretchy. It can be compared to the consistency of egg whites. This appearance is known as 'spinnbarkeit'.

### Discomforts of Menstruation

1. Breast tenderness and feeling of fullness
2. Tendency towards fatigue
3. Temperament and mood changes – because of hormonal influence and decreased levels of estrogen and progesterone
4. Discomfort in pelvic area, lower back and legs
5. Retained fluids and weight gain.

### Abnormalities of Menstruation

1. Amenorrhea – absence of menstrual flow
2. Dysmenorrhea – painful menstruation
3. Oligomenorrhea – scanty menstruation
4. Polymenorrhea – too frequent menstruation
5. Menorrhagia -excessive menstrual bleeding
6. Metrorrhagia – bleeding between periods of less than 2 weeks
7. Hypomenorrhea – abnormally short menstruation
8. Hypermenorrhea – abnormally long menstruation.

### Reproductive Hormones:

1. Gonodotropin-Releasing Hormone (GnRH) Stimulates release of FSH and LH initiating puberty and sustaining menstrual cycle.
2. Follicle-stimulating Hormone (FSH) secreted by anterior pituitary gland during the 1st half of menstrual cycle stimulate growth and maturation of graafian follicle before ovulation thins the endometrium.

3.    Luteinizing Hormone (LH) secreted by the anterior pituitary gland stimulates final maturation of graafian follicle surge of LH about 14 days before next menstrual period causes ovulation stimulates  transformation of graafian follicle into corpus luteum thickens the endometrium.

4.    Estrogen secreted primarily by the ovaries, corpus luteum, adrenal cortex and placenta in pregnancy considered the Hormone of Women stimulates thickening of the endometrium; causes suppression of FSH secretion responsible for the development of secondary sex characteristics stimulates uterine contractions increases water content of uterus high estrogen concentration inhibits secretion of FSH and Prolactin but stimulates secretion of LH7. Low estrogen concentration after pregnancy stimulates secretion of Prolactin.

5.    Progesterone secreted  by the ovary, corpus luteum and placenta during pregnancy inhibits secretion of LH has thermogenic effect (increases body temperature) relaxes smooth muscles thereby decreases contractions of uterus causes cervical secretion of thick mucus maintain thickness of endometrium allows pregnancy to be maintained = Hormone of Pregnancy prepares breasts for lactation.

6.    Prolactin secreted by the anterior pituitary gland stimulates secretion of milk.

7.    Oxytocin secreted by the posterior pituitary gland stimulates uterine contractions during birth and compress uterine blood vessels and control bleeding stimulates let-down or milk-ejection reflex during breastfeeding.

8.    Prostaglandins fatty acids' categorized as hormones produced by many organs of the body, including the endometrium affects menstrual cycle influences the onset and maintenance of labour.

**Enopause**

Menopause is the physiological cessation of menstrual cycles associated with advancing age.Menopause is sometimes referred to as "the change of life" or climacteric. Menopause occurs as the ovaries stop producing estrogen, causing the reproductive system to gradually shut down. As the body adapts to the changing levels of natural hormones, vasomotor symptoms such as hot flashes and palpitations,  psychological symptoms such as increased depression, anxiety, irritability, mood swings and lack of concentration, and atrophic symptoms such as vaginal dryness and urgency of urination appear. Together with these symptoms, the woman may also have increasingly scanty and erratic menstrual periods.

Technically, menopause refers to the cessation of menses; the gradual process through which this occurs, which typically takes a year but may

last as little as six months or more than five years, is known as climacteric. A natural or physiological menopause is that which occurs as a part of a woman's normal aging process. However, menopause can be surgically induced by such procedures as hysterectomy.

The average onset of menopause is 50.5 years, but some women enter menopause at a younger age, especially if they have suffered from cancer or another serious illness and undergone chemotherapy. Premature menopause is defined as menopause occurring before the age of 40, and occurs in 1% of women. Other causes of premature menopause include autoimmune disorders, thyroid disease, and diabetes mellitus. Premature menopause is diagnosed by measuring the levels of follicle stimulating hormone (FSH) and luteinizing hormone (LH). The levels of these hormones will be higher if menopause has occurred. Rates of premature menopause have been found to be significantly higher in both fraternal and identical twins; approximately 5% of twins reach menopause before the age of 40. The reasons for this are not completely understood. Post-menopausal women are at increased risk of osteoporosis. Perimenopause refers to the time preceding menopause, during which the production of hormones such as estrogen and progesterone diminish and become more irregular. During this period fertility diminishes. Menopause is arbitrarily defined as a minimum of twelve months without menstruation. Perimenopause can begin as early as age 35, although it usually begins much later. It can last for a few months or for several years. The duration of perimenopause cannot be predicted in  advance.

Premenstrual Syndrome (PMS) It is common for women to experience some discomfort in the days leading up to their periods. PMS usually is at its worst the seven days before a period starts and can continue through the end of the period. PMS includes both physical and emotional symptoms: acne, bloating, fatigue, backaches, sore breasts, headaches, constipation, diarrhea, food cravings, depression, irritability, difficulty concentrating or handling stress.

**SELF- ASSESSMENT EXERCISE**

The phases of the menstrual cycle, in the order in which they occur, are _____, _____, and _____.

Label the major organs and structures in these illustrations
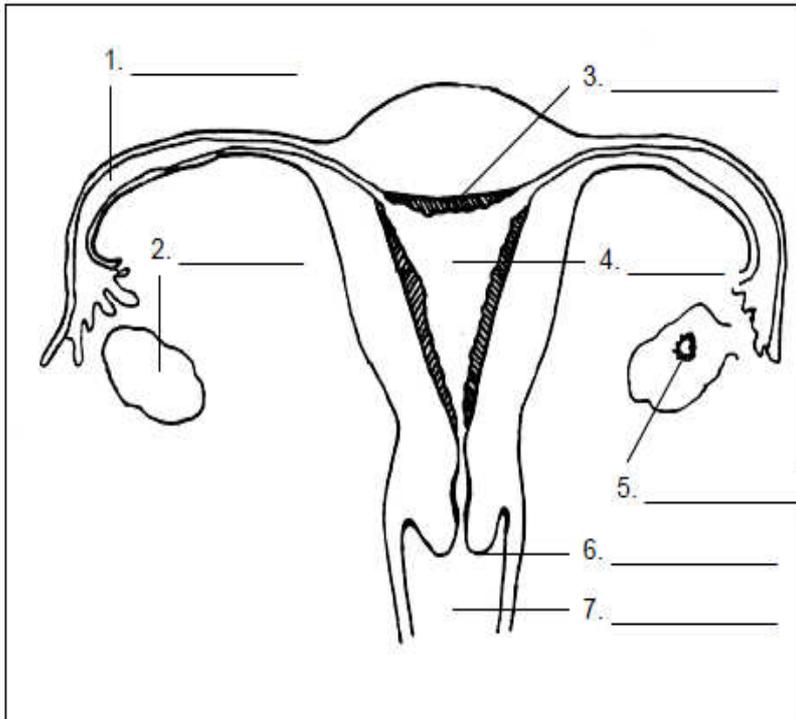
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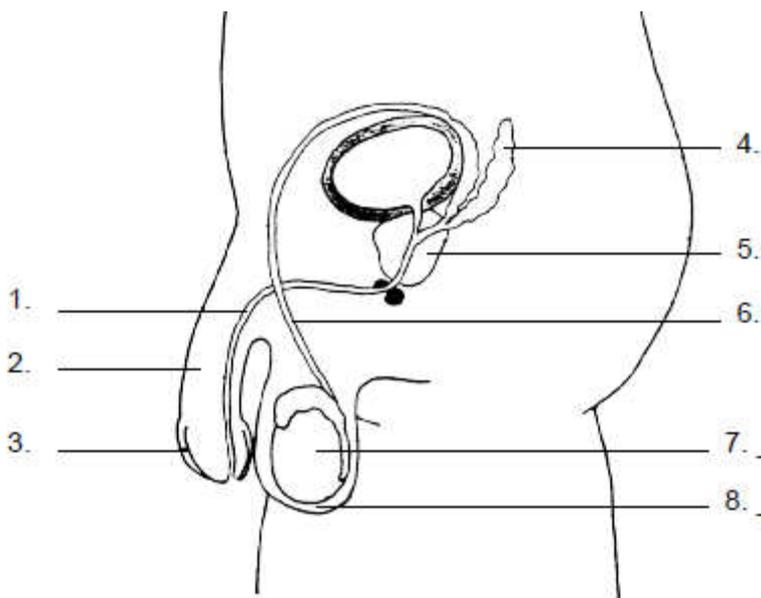
## 4.0     CONCLUSION

Sexuality is a major area of concern for school age children and adolescents. When caring for children of these ages, they may ask you a variety of detailed questions about sexuality or reproductive health.

## 5.0     SUMMARY

The sex of an individual is determined at the moment of conception by the chromosome information supplied by the particular ovum and sperm that joined to create the new life.

## 6.0    TUTOR-MARKED ASSIGNMENT

Working with your preceptors, do vulva toileting for 4 mothers in the Post Natal Unit of the nearest hospital to you. Examine the vulva of each mother and reconcile with the in-text diagram
-are there any difference? If YES, Why?
-Discuss your findings with your group.

## 7.0    REFERENCES/FURTHER READING

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## UNIT 2      THE FEMALE BONY PELVIS

**CONTENTS**

1.0     Introduction
2.0     Objectives
3.0     Main Content
        3.1     The Female Bony Pelvis
        3.2     Bones, ligaments joints, diameters and variations.
        3.3     The Pelvic Floor Muscles
4.0     Conclusion
5.0     Summary
6.0     Self-Assessment Exercise
7.0     References/Further Reading

## 1.0     INTRODUCTION

Having a basic understanding of the female bony pelvis is essential preparation for your practical skills training. In this unit, you will learn to the different types of female pelvis and how they affect the birth process.

## 2.0     OBJECTIVES

At the end of this unit, you should be able to:

•       describe the female bony pelvis
•       explain the pelvic floor muscles.
•       give an overview of bones, ligaments  joints, diameters and variations of the pelvis.

## 3.0     MAIN CONTENT

## 3.1     The Female Bony Pelvis

The pelvis is a hard ring of bone (see Figure 10 below), which supports and protects the pelvic organs and the contents of the abdominal cavity. The muscles of the legs, back and abdomen are attached to the pelvis, and their strength and power keep the body upright and enable it to bend and twist at the waist, and to walk and run. The bony pelvis form the bony canal through which the fetus must pass during the normal birth process. If the canal is of the normal shape, and size, the baby of the normal size will negotiate it without difficulties but, because pelvis vary in size and shape it is important that the midwife recognizes the normal pelvis so as to be able to detect deviation from the normal. One of the

83

ways of estimating the progress of labor is by assessing the relationship of the fetus to certain pelvic landmarks.
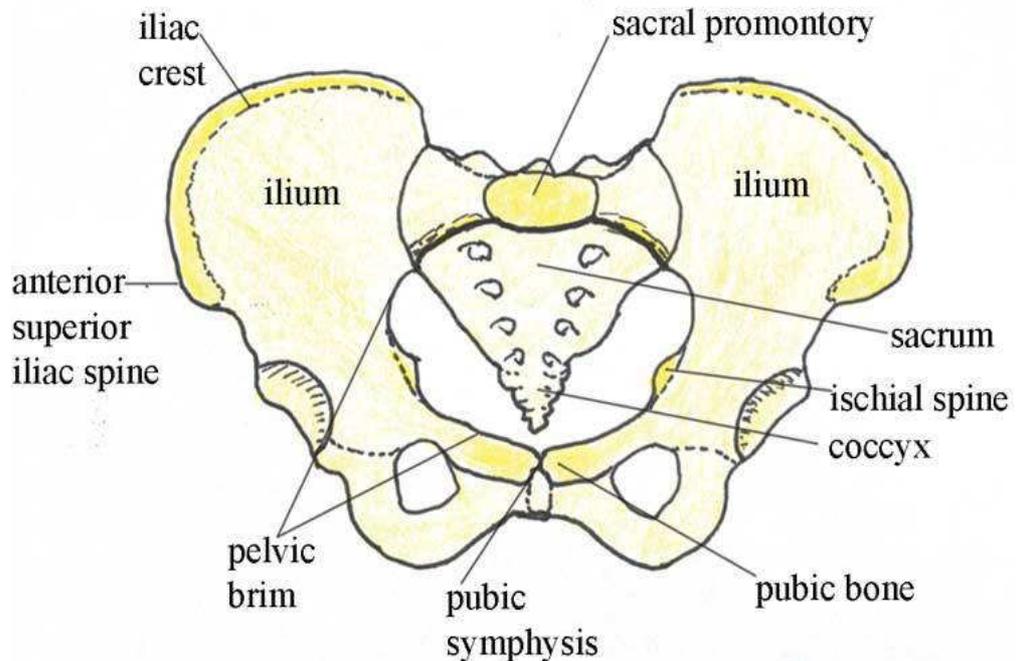


*Figure 10: The bones of the female pelvis. Thresyamma C.P. (2002)*

The woman's pelvis is adapted for child bearing, and is a wider and flatter shape than the male pelvis. The pelvis is composed of pairs of bones, which are fused together so tightly that the joints are difficult to see. We will describe each of the bones in turn, and their major landmarks.

**Functions**

·      It connects the spine to the lower limbs
·      It protects the female reproductive organs, bladder, the urethra ,colon, rectum and anal canal
·      It allows movement of the body especially walking and running
·      It permits sitting and kneeling
·      It forms a bony passage for the fetus during labor
·      It transmits the weight of the trunk to the legs and holds the two femurs
·      Protects the pelvic organs and to a lesser extent the abdominal contents
·      The Sacrum transmits *cauda equina* and distributes nerves to various parts of the pelvis

**3.2     Bones, Ligaments, Joints, Diameters and Variation**

***Pelvic bones****: There* are four bones in the pelvis
- Two innominate bones (hip bones),
- One sacrum and
- One coccyx

**A.** Innominate Bones: each innominate bone is composed of three parts - the ilium, ischium and the pubis

Ilium: The major portion of the pelvis is composed of two bones, each called the **ilium** — one on either side of the backbone (or spinal column) and curving towards the front of the body. When you place your hand on either hip, your hand rests on the *iliac crest*, which is the upper border of the ilium on that side. At the front of the iliac crest, you can feel the bony protuberance called the *anterior superior iliac spine* (a 'protuberance' is something that sticks out, like a little hill or knob).

Ischium**:** The **ischium** is the thick lower part of the pelvis, formed from two fused bones — one on either side. When a woman is in labour, the descent of the fetal head as it moves down the birth canal is estimated in relation to the **ischial spines**, which are inward projections of the ischium on each side. The ischial spines are smaller and rounder in shape in the woman's pelvis than in that of the man.

Pubic bones and the symphysis pubis**:** The **pubic bones** on either side form the front part of the pelvis. The two pubic bones meet in the middle at the **pubic symphysis**. (A *symphysis* is a very strong bony joint.) The pubic symphysis is immediately below the hair-covered pubic mound that protects the woman's external genitalia.

**B.     Sacrum**
The **sacrum** is a tapered, wedge-shaped bone at the back of the pelvis, consisting of five fused vertebrae (the small bones that make up the spinal column or backbone). At the bottom of the sacrum is a tail-like bony projection called the *coccyx*. The upper border of the first vertebra in the sacrum sticks out, and points towards the front of the body; this protuberance is the **sacral promontory** — an important landmark for labour and delivery.

***Pelvic Joints -*** there are four pelvic joints

- One symphysis pubis – formed at the joint of two pubic bones, united by a pad of cartilage known as the symphysis pubis
- Two (right and left) sacroiliac joints – is the strongest joint in the body articulates sacrum to ilium. Normally there are little or no

movements in these joints, but during pregnancy especially towards the end there is a certain degree of movement due to the relaxation of the ligaments of the joints. This may give rise to difficulties in walking and backache, especially the multiparous women. There is little widening during labour , commonly referred to as "give" of the pelvis.

- One sacrococcygeal joint – join the base of the coccyx to the tip of the sacrum

*Pelvic Ligaments*: ligaments bind the joints

- Inter pubic ligaments at the symphysis pubis
- Sacroiliac ligaments.
- Sacrotuberous ligament
- Sacrococcygeal ligaments.
- Inguinal ligament
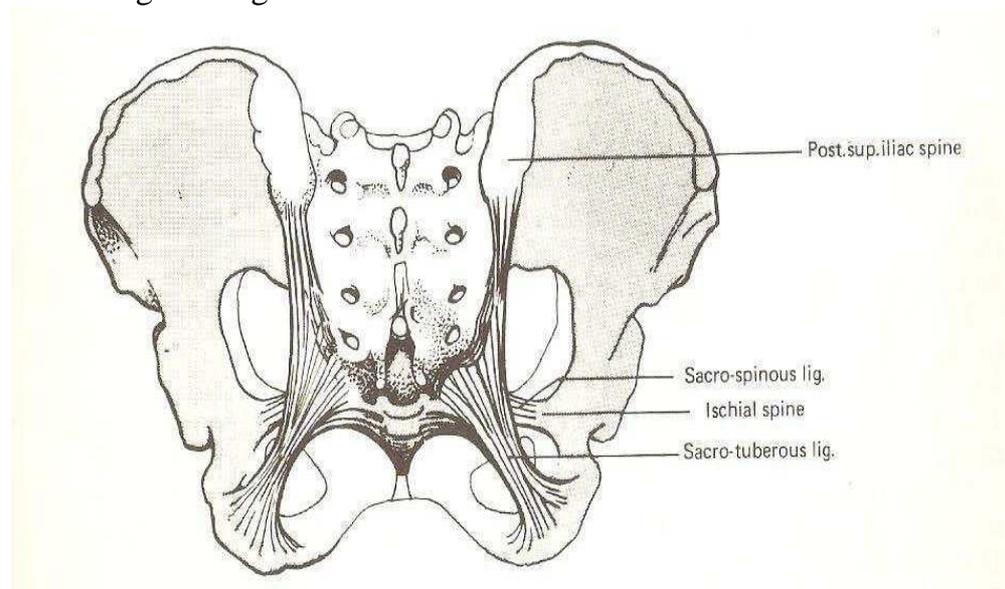


*Figure 11: Posterior view of the pelvis. Thresyamma C.P. (2002)*

### Division of the Pelvis
The pelvis is divided into two parts, the true and the false pelvis. The false is the part above the brim. It as little importance in obstetrics.

*The true pelvis* is the bony canal through which fetus must pass during birth. It consists of brim, cavity and outlet. Brim is round except where sacral promontory projects into it. Commencing posteriorly the pelvic brim includes the following important landmarks.

1. Sacral promontory
2. Sacral ala or wing
3. Sacroiliac joints
4. Iliopectineal line
5. Iliopectineal eminence
6. Superior ramus of the pubic bone
7. Upper inner border of the body of the pubic bone
8. Upper inner border of the symphysis pubis

*Diameters of the pelvis*
*Diameters of the brim*

- Antero-posterior diameter – from sacral promontory to upper most border of symphysis pubis 12cm. A measurement to the posterior border of the upper surface to a point 1.25cm lower is called the obstetrical conjugate, 11cm. It is the available space for the passage of the fetus hence it is called the true conjugate

- Diagonal conjugate is anteroposterior diameter from the lower border of the symphysis pubis to the centre of the sacral promontory measured vaginally for pelvic assessment 12-13 cm

- Oblique diameter – from sacroiliac joint to the iliopectineal eminence on the opposite side (right and left). It measures 12cm

- Transverse diameter – it is between the points furthest apart on iliopectineal lines and measures 13cm. The fetal head commonly enters in transverse diameter of the pelvic brim

- Sacrocotyloid diameter – from sacral promontory to the iliopectineal eminence on each side, measures 9 – 9.5 cm

- The pelvic cavity extends from the pelvic brim above to the outlet below. Anterior wall is formed by pubic bones and symphysis pubis - depth is 4cm. The cavity is circular in shape and is considered to be 12cm all round.

*Diameter of the outlet*:
There are two Pelvic outlets: described as

- *Anatomical Outlet* and *Obstetrical Outlet*. The anteroposterior diameter of outlet – from the lower border of the symphysis pubis to the sacrococcygeal joints 13cm

- *The oblique diameter of outlet* - from the oburator foramen to the sacrospinous ligament 12cm

- *The transverse diameter of outlet* - is taken between two ischial spines 10 -11 cm which is the narrowest diameter of the pelvis

- *Pelvic inclination* there is difference in the inclination of the pelvis when the woman is standing, sitting and recumbent position. The inclination of the outlet is 11O, cavity 30O, brim 60O, almost 90O in Negro woman

- *Pelvic planes* these are imaginary flat surfaces at the brim, cavity and outlet of the pelvic canal. The fetus will enter at right angle to the plane according to the inclination.
- *Axis of the pelvic canal* a line drawn exactly half way between anterior wall and posterior wall of the pelvic canal to the plan of the outlet, cavity and the brim the curve it makes is known as the curve of Carus, the path which the fetus takes as it travels trough the birth canal.

| | Antero-posterior | Oblique | Transverse |
|---|---|---|---|
| Brim | 11 | 12 | 13 |
| Cavity | 12 | 12 | 12 |
| Outlet | 13 | 12 | 11 |
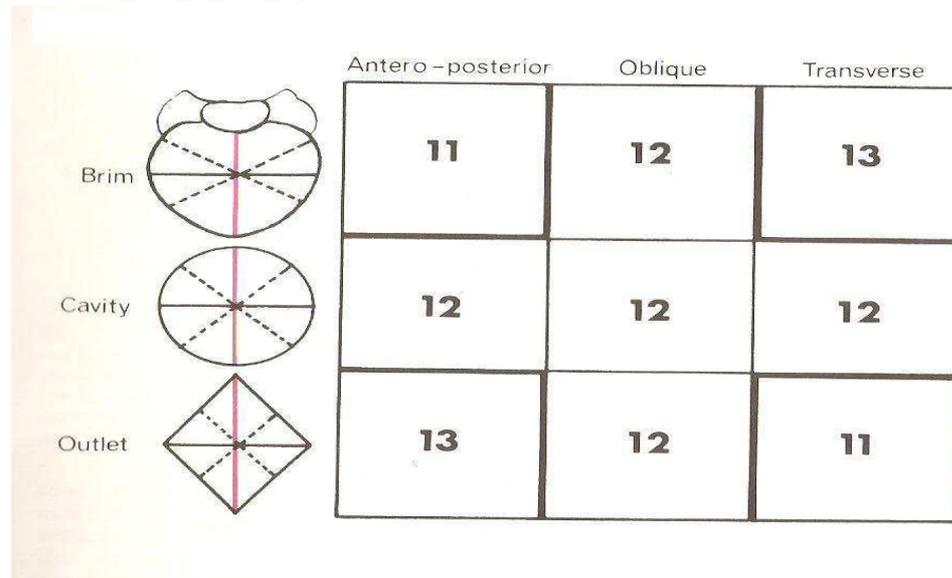
*Figure 12: Diameter of the Pelvis Thresyamma C.P. (2002)*

**Types of Pelvis**
- Gynaecoid pelvis – ideal pelvis for child bearing
- Android pelvis – resembles a male pelvis
- Anthropoid pelvis – has long oval brim in which anteroposterior diameter is longer than transverse diameters. Labor does not present any difficulties but favors occipitoanterior or occipitoposterior positions
- Platypelloid pelvis - flat with kidney shaped brim
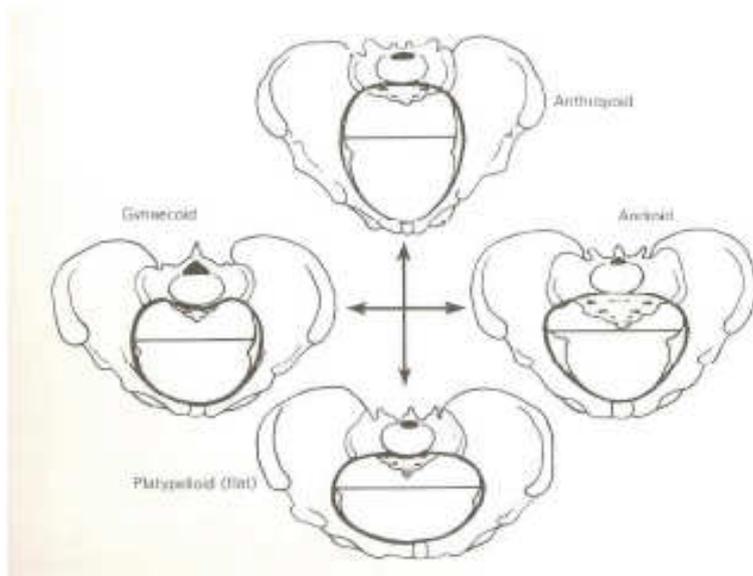
*Figure 13: Types of Pelvis Thresyamma C.P. (2002)*

| Comparison of Male and Female Pelvis | |
|---|---|
| **Female pelvis** | **Male pelvis** |
| 1. Bones are light and smooth, side walls straight, fore-pelvis generous | 1. Heavy rough and not so wide and broad |
| 2. Wide iliac crest | 2. Narrow iliac crest |
| 3. Brim almost round | 3. Brim is heart shaped |
| 4. Cavity is shallow | 4. Cavity deep and funnel shaped |
| 5. Symphysis pubis wide | 5. Symphysis pubis is deep |
| 6. Wide transverse outlet | 6. Narrow outlet |
| 7. Sub-pubic arch is 85° to 90° | 7. 65° to75° |
| 8. Joints movable | 8. less movable |
| 9. Sciatic notch wide | 9. Sciatic notch narrow |
| 10. Ischial spines blunt | 10.Ischial Spines shaped |

The pelvic floor is formed by the soft tissues that fill the outlet of the pelvis. It forms a strong diaphragm of muscle sling from the walls of the pelvis. The pelvic floor is made up of:

1.      The Skin
2.      Subcutaneous Fat
3.      Superficial Muscles
4.      Deep Muscles
5.      Pelvic Fascia
6.      Peritoneum
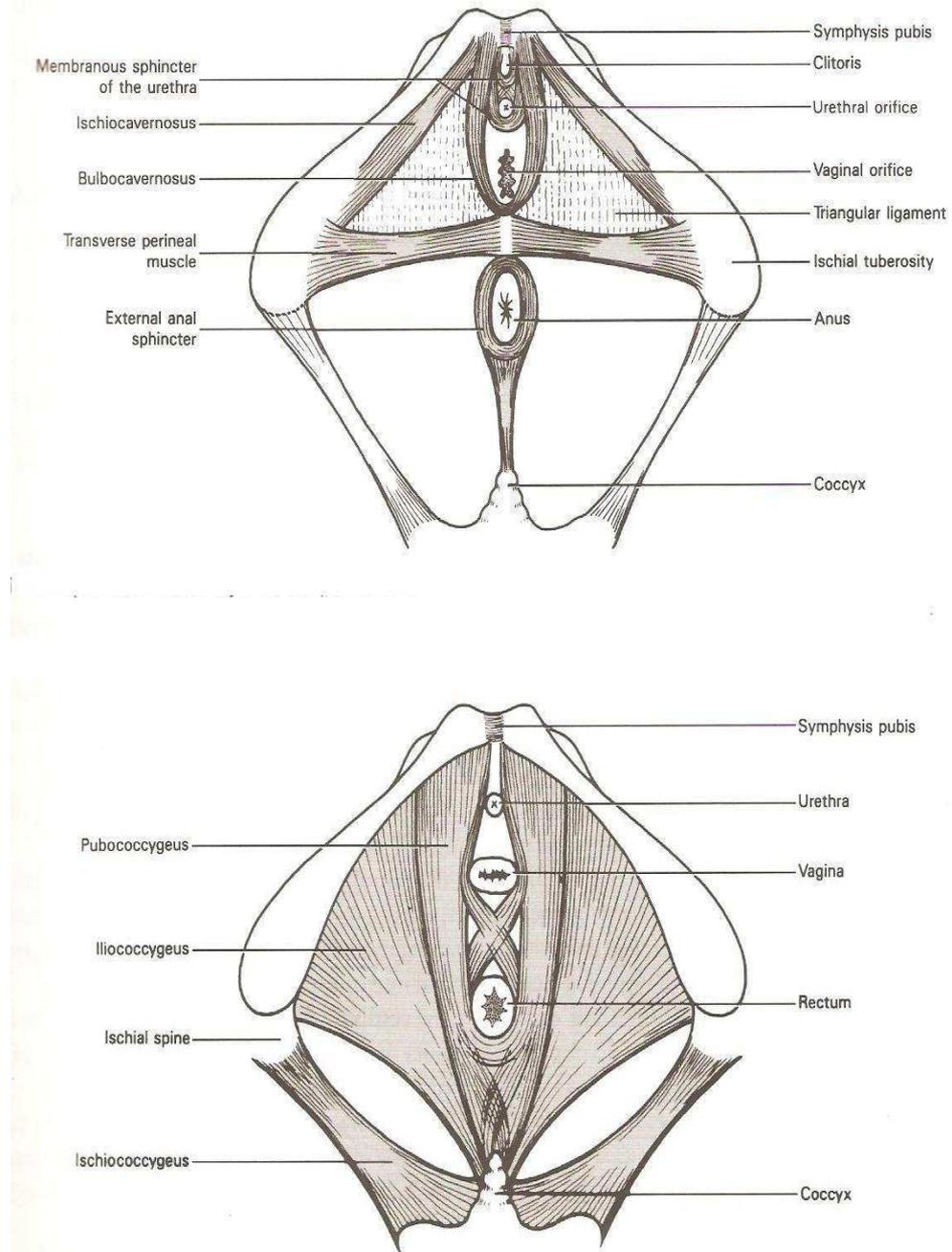
*Figure 14: Pelvic Floors (Anterior and Posterior View) Thresyamma C.P. (2002)*

**Functions**:
- Supports the weight of the abdominal and pelvic organs
- Responsible for the function of the menstruation and defecation and plays an important part in sexual intercourse
- Influence passive movement of the fetus during childbirth

**Muscle Layers**

*Superficial Layers* consists of five muscles:
1.      The external and sphincter muscle
2.      The transverse perineal muscle
3.      The bulbocavernous muscle
4.      The ichiocavernous muscle
5.      The membrane sphincter of urethra

*The Deep Layer* is composed of three parts of muscle which together are known as the *Levator Ani Muscles* (left and right):
1.      Pubococcygeal muscle
2.      Iliococcygeal muscle
3.      Ischiococcygeal muscle

**Perineal body** is a pyramid of muscles and fibrous tissue between vagina and rectum. Perineal body measures 4cm in each direction

*Injury to the pelvic floor*
•       Overstretching of the muscles
•       Laceration –1st 2nd &3rd degree tears
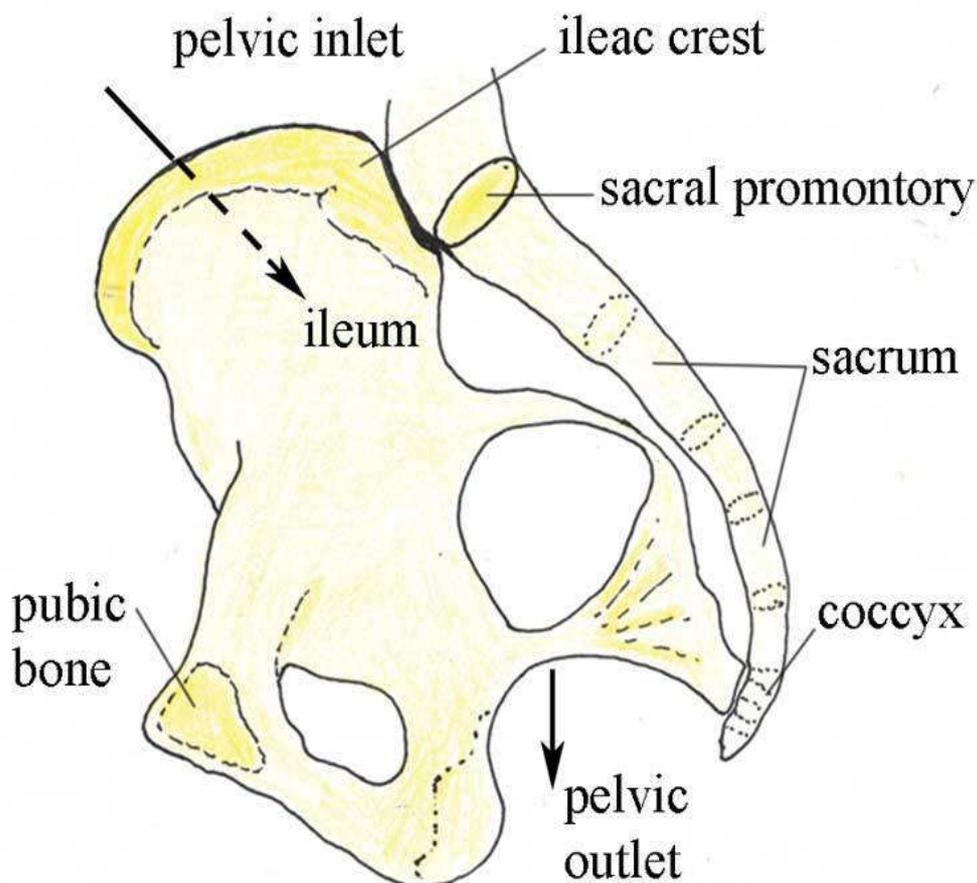


*Figure 15:The pelvic canal seen from the side, with the body facing to the left. Thresyamma C.P. (2002)*
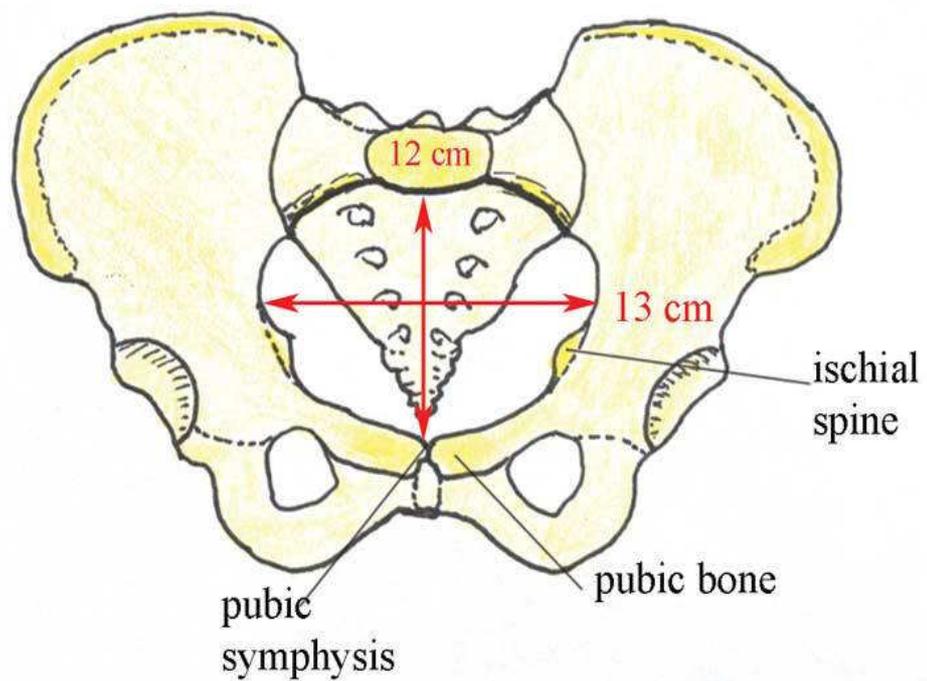
*Figure 16: Diameters of the pelvic inlet, viewed from above Thresyamma C.P. (2002)*
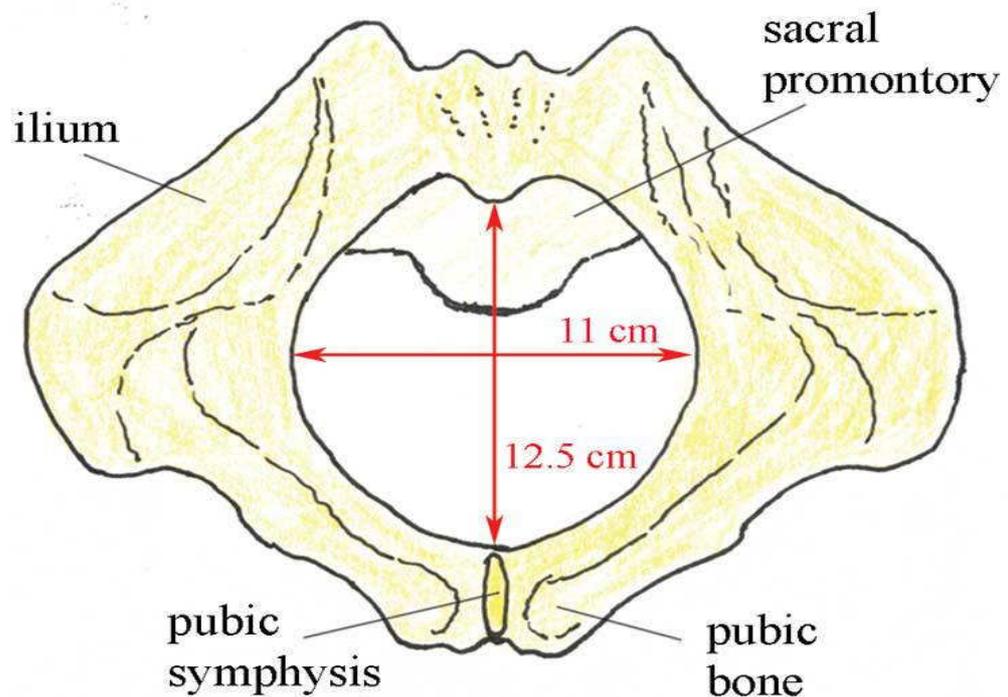


*Figure 17: Diameters of the pelvic outlet, viewed from below. Thresyamma C.P. (2002)*

**SELF-ASSESSMENT EXERCISE**

i.       The female bony pelvis is broader and flatter than the male pelvis.
ii.     The pelvic inlet is narrower than the pelvic outlet.
iii.    List four possible features of the maternal bony pelvis and/or the fetal skull that may result in a difficult labour and delivery.

## 4.0    CONCLUSION

The pelvis is divided into two parts, the true and the false pelvis. The pelvic floor is formed by the soft tissues that fill the outlet of the pelvis. It forms a strong diaphragm of muscle sling from the walls of the pelvis.

## 5.0    SUMMARY

The pelvis is a hard ring of bone (see Figure 10 below), which supports and protects the pelvic organs and the contents of the abdominal cavity. The muscles of the legs, back and abdomen are attached to the pelvis, and their strength and power keep the body upright and enable it to bend and twist at the waist, and to walk and run.

## 6.0    TUTOR-MARKED ASSIGNMENT

## 7.0    REFERENCES/FURTHER READING

Adele Pillitteri (2010) Maternal and Child Health Nursing : Care of the Child Bearing and Child Rearing Family. Lippincot Williams & Wilkins, New York.

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## UNIT 3    THE FETAL SKULL

**CONTENTS**

## 1.0    INTRODUCTION

The fetal skull is the most difficult part of the baby to pass through the mother's pelvic canal, due to the hard bony nature of the skull. Understanding the anatomy of the fetal skull and its diameter will help you recognise how a labour is progressing, and whether the baby's head is 'presenting' correctly as it comes down the birth canal. This will give you a better understanding of whether a normal vaginal delivery is likely, or if the mother needs referral because the descent of the baby's head is not making sufficient progress.

## 2.0    OBJECTIVES

At the end of this unit, you should be able to:

- describe the fetal skull
- describe the internal structures of the fetal skull
- explain moulding

**THE FETAL SKULL**
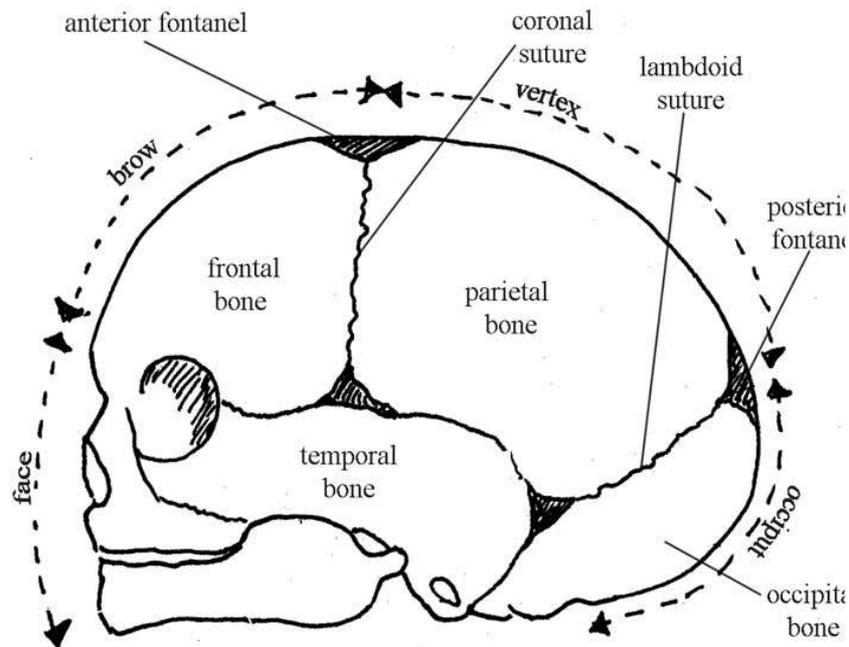


*Figure 18: Fetal Skull **Thresyamma C.P. (2002)***

## 3.0    MAIN CONTENT

## 3.1    The External Structures of the Fetal Skull

**Fetal skull bones (Vault)**
The skull bones encase and protect the brain, which is very delicate and subjected to pressure when the fetal head passes down the birth canal. Correct presentation of the smallest diameter of the fetal skull to the largest diameter of the mother's bony pelvis is essential if delivery is to proceed normally. But if the presenting diameter of the fetal skull is larger than the maternal pelvic diameter, it needs very close attention for the baby to go through a normal vaginal delivery.

The fetal skull bones are as follows:
- The *frontal bone*, which forms the forehead. In the fetus, the frontal bone is in two halves, which fuse (join) into a single bone after the age of eight years.
- The two *parietal bones*, which lie on either side of the skull and occupy most of the skull.

- The *occipital bone*, which forms the back of the skull and part of its base. It joins with the cervical vertebrae (neck bones in the spinal column, or backbone).
- The two *temporal bones,* one on each side of the head, closest to the ear.

**The face:** This area extends from the orbital ridge to the junction of the neck with the chin. It is composed of 14 fused bones.

**The base:** These bones are also firmly united and help to protect the brain.
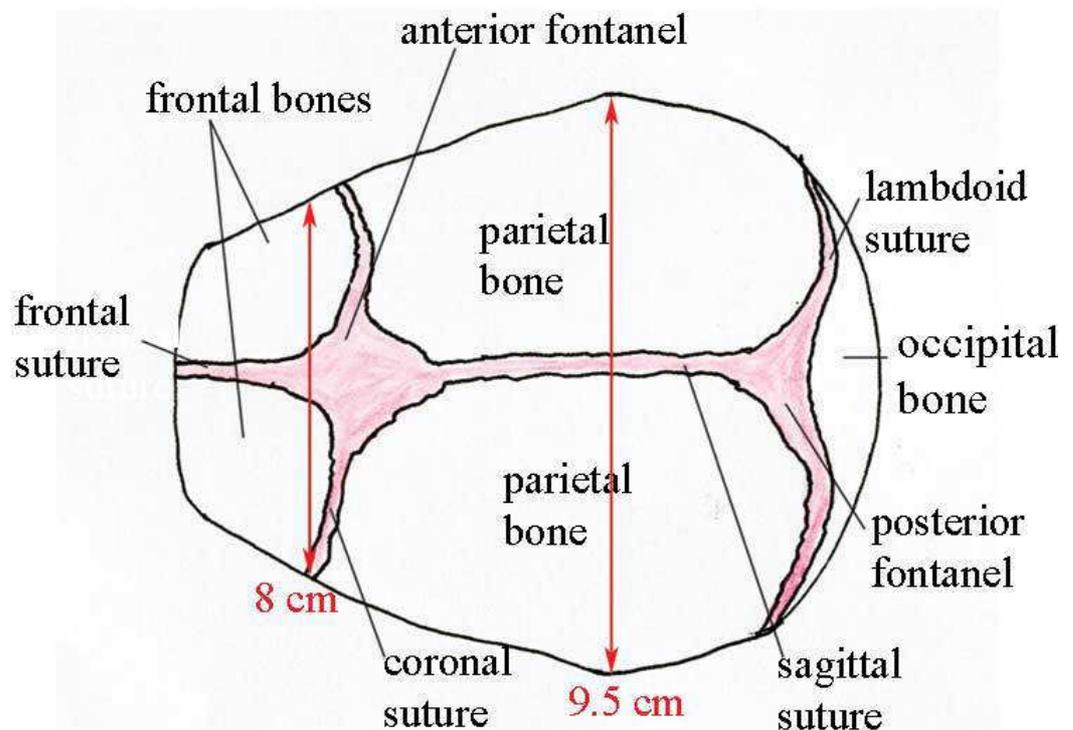


*Figure 18. Regions and landmarks in the fetal skull facing to the left, as seen from above.*

**Sutures:** are joints between the bones of the skull. In the fetus they can 'give' a little under the pressure on the baby's head as it passes down the birth canal. During early childhood, these sutures harden and the skull bones can no longer move relative to one another, as they can to a small extent in the fetus and newborn.

- The *lambdoid suture* forms the junction between the occipital and the frontal bone.
- The *sagittal suture* joins the two parietal bones together.

- The *coronal suture* joins the frontal bone to the two parietal bones.
- The *frontal suture* joins the two frontal bones together.

Others are the sutures that separate the parietal bones from the temporal bones.

**The Fontanelles:** Fontanelles are formed where two or more sutures meet between the bones. There are 6 sutures on the vault but only two are of importance. These are:

1.    Anterior Fontanelle (or bregma): Formed at the junction of the Sagittal, Fontal, and coronal sutures. It is a diamond-shaped membranous space. It has four angles which correspond with the entry of each suture. It is about 3-4cm long and 1.5cm wide. It is a valuable aid in vaginal examination to determining the position. Cerebral pulsation can be felt through it and it is a guide to baby's health – It bulges in brain infection or increase pressure and depressed in dehydration. Closes 18-24months after birth.
2.    The Posterior fontanell – (lambda): Formed at the junction of the sagittal and lambdoidal sutures. It is a small triangular membranous space. It is felt on vaginal examination during labour in a well flexed head. It closes at 6 weeks after birth.

**Regions and landmarks in the fetal skull**
Figures 17 and 18 allow you to identify certain regions and landmarks in the fetal skull, which have particular importance for obstetric care because they may form the so-called **presenting part** of the fetus — that is, the part leading the way down the birth canal.
- The **vertex** is the area midway between the anterior fontanel, the two parietal bones and the posterior fontanel. A **vertex presentation** occurs when this part of the fetal skull is leading the way. This is the normal and the safest presentation for a vaginal delivery.
- The **brow** is the area of skull which extends from the anterior fontanel to the upper border of the eye. A brow presentation is a significant risk for the mother and the baby.
- The **face** extends from the upper ridge of the eye to the nose and chin (lower jaw). A face presentation is also a significant risk for the mother and baby.
- The **occiput** is the area between the base of the skull and the posterior fontanel. It is unusual and very risky for the occiput to be the presenting part.

Other regions are:

- Glabella – is the bridge of the nose, between the eyebrows.
- Bregma – anterior fontanelle
- Lambda – Posterior fontanelle
- Mentum – Chin

**Measurements of the fetal skull- Diameter of the fetal skull**
These are the diameter the birth canal must stretch to allow the head to pass during labour. The largest being mento vertical 13.5cm.

1. Sub-Occipito Bregmatic (9.5cm)
2. Sub-Occipito Frontal (10cm)
3. Occipito Frontal (11.5m)
4. Mento Vertical (13.5cm)
5. Sub Mento Vertical(11.5)
6. Sub-mento Bregmatic (9.5cm)
7. Biparieta (9.5cm)
8. Bitemporal (8.2cm).

**Circumferences**
1. Sub-ocicpito bregmatic: is measurement taken round the occipital protuberance, parietal eminences and the bregma. Itis the circumference which passes through the pelvis in a well flexed head 33cm.
2. Occipito Frontal: It is measured through posterior fontanel, parietal eminence and the orbital ridge. It is found in an erect head-military attitude 33-36 cm.
3. Sub-occipito frontal: It is taken round the perimeter of suboccipito frontal 35cm.
4. Mento vertical: It is measured round the chin up to the vertex. It is found in partly extended head (Brow). It is the largest diameter of the fetal skull 38 cm.

**Attitude of the head**
This determines diameter that pass through the pelvis.

1. Vertex Presentation: A well flexed head. It is the most favourable. engaging diameters are sub-occipito bregmatic of 9.5cm, biparieta 9.5 cm and the circumference entering the brim is sub-occipito bregmatic 33cm.
2. Military attitude – deflexed head. The head is more erect. Engaging diameters are occipito frontal 11.5cm Biparietal 9.5cm bitemporal 8.2cm. and circumference occipito frontal 35cm.

3.    Face Presentation: Extended head. The head is completely extended. The engaging diameter is sub-mento bregmatic 9.5cm, Bitemporal 8.2cm. sub-mento vertical of 11.5cm will descent the vaginal orifice.

4.    Brow presentation: Partially extended head most unfavourable presentation. Normal delivery is rarely possible if it does not change the attitude. The engaging diameter is mento vertical 13.5cm, Bitemporal 8.2cm and circumference is mento vertical 38cm.

**Importance of the fetal skull to the midwife**

1.    It contains the delicate brain and about 95% of babies present by head.

2.    Sound knowledge of fetal diameter and measurement cause least problems during labour and delivery through diagnosis of abnormalities presentation and position, also disproportion between the fetal head and the pelvis can be easily recognized.

3.    Delivery can be conducted with minimal injuries to the mother and baby.

4.    It is large in comparison with the fetal body and true pelvis; some adaptation has to be made between the head and the pelvis.

5.    The head is the most difficult part to be delivered either it comes first or last.

**The scalp**

1.    The scalp of the fetus consists of five layers.

2.    The skin

3.    A subcutaneous tissue: Contains blood vessels and hair follicles. Is the part where caput succedaneum is formed.

4.    A layer of Tendon – Galea

5.    A loose layer of alveolar tissue. Limits movement of the

6.    scalp over the skull.

7.    The pericranium – is the periosteum of the cranial bones which covers the outer surface, and is adherent to their edge.

8.    Cephalhaematoma is limited to the layer over the bones where it lays because it is attached to the edge of the bone.

**Internal Structure of the Fetal Skull**
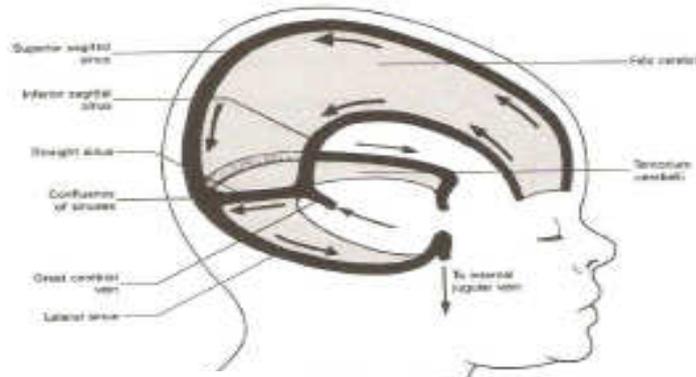


Figure 1-7 Cross 19: n of the fetal skull intracranial membranes and sinuses
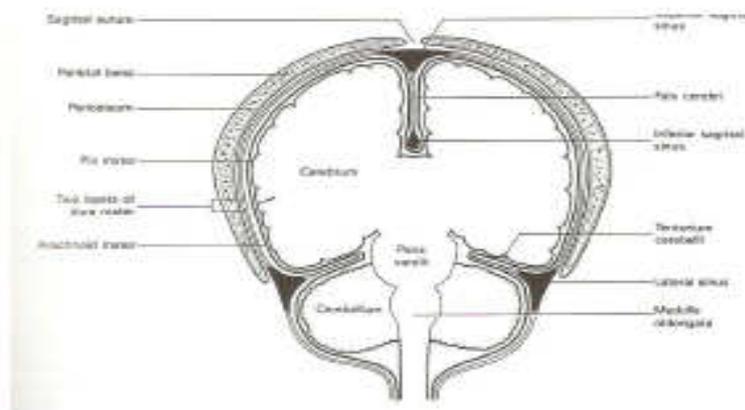


Figure 1-8 Cor 20 ection of the fetal skull showing intracranial membranes and sinuses

The skull contains delicate membranous structure which is liable to damage during delivery especially if subjected to abnormal molding. Structures include:

i.      Folds of Dura matter and
ii.     Venous sinuses associated with them.

The membrane is in two layers, an outer periosteal layer which is adherent to the skull bones and the inner meningeal layer which covers the outer surface of the brain. The membrane does not only cover the brain but send fibrous partition to divide the brain into compartments.

1.      **The Falx Cerebri:** It is a sickle-shaped fold of membrane which dip down between the two cerebral hemispheres. It runs beneath the frontal and sagittal sutures – (From root of the nose to the internal occipital protuberance).
2.      **Tentorium Cerebelli:** This is a horizontal fold of dura matter situated at the posterior part of the cranial cavity. It lies at right

angle to the falx cerebri. It has a horse – shoe shape and forms a tent-like layer between the cerebrum and the cerebellum. It contains large blood vessels or sinus which drains blood from the brain on their way to become the jugular vein of the neck.

3. **The superior Longitudinal(Sagittal) Sinus:** it runs along the upper part of the falx corebri from front to the back (from root of the nose to the internal occipital protuberance).

4. **Inferior Longitudinal (sagittal) Sinus:** Runs along the lower part in the same direction.

5. **The straight sinus:** Is a continuation of the inferior sagittal sinus and drains blood from the great cerebral vain and the inferior sagittal sinus along the junction of falx and the tentorium. The point where it reaches the skull and receives blood from the superior sagittal sinus is known as the confluence of sinus.

6. **The Great Cerebral vein of Galen:** meet the inferior Sagittal Sinus at the inner end of the junction and where the falx joins the tentorium

7. **Lateral Sinuses:** These are two in number they pass from the onfluence of the sinuses along the outer edge of the tentorum cerebelli and carries blood to the internal jugular veins. During moulding the falx and the tentorium are stretched. The tentorium is most vulnerable to tear near its attachment to the falx – (Tentorial Tears), this leads to bleeding from the great cerebral vain giving rise to intracranial hemorrhage.

**Moulding**

This is the term applied to the change in shape of the fetal head which takes place as it passes through the birth canal. It is brought about by pressure between the fetal skull and the maternal pelvis. It results in compression of the movable bones and elongation of those which are not compressed. Moulding brings about a considerable reduction in the size of the presenting diameters while the diameter at right angle to them elongates. This is possible because of the sutures and fontanelles on the vault which allows slight degree of movement and the bones to override each other. In normal vertex presentation, the biperiatal diameter, sub occipito bregmatic reduce while the mentovertical lengthens. During moulding the anterior parietal bone override the posterior one, the frontal and occipital bones go under the parietal bones. The advantage of moulding is that it is a protective mechanism and prevents compression of the fetal brain, once it is not excessive, too rapid or unfavourable direction. The skull of a preterm baby may mould excessively while that of post mature does not mould which tend to make labour more difficult. In certain types of moulding the internal structure maybe damage given rise to oedema or haemorrhage and congestion may give rise to mild

cerebral irritation. This can lead to death or permanent brain damage. These dangerous moulding includes:

1.  Excessive moulding: In cases of prolonged labour, due to cephalo pelvic disproportion, prematurity.
2.  Upward moulding: Occipito posterior position resulting in "face to Pubis" and after coming head of the breech.
3.  Rapid moulding: Precipitate labour Rapid compression and decompression result in rupture of cerebral membranes.

**SELF- ASSESSMENT EXERCISE**

Which of the following statements is *false*? In each case, say why it is incorrect.

i.   The iliac crest is an important landmark in measuring the progress of the fetus down the birth canal.
ii.  The sutures in the fetal skull are strong hard joints that hold the skull bones rigidly in place.
iii. A newborn baby's pulse can be seen beating in the anterior fontanel.

## 4.0    CONCLUSION

The skull bones encase and protect the brain, which is very delicate and subjected to pressure when the fetal head passes down the birth canal. Correct presentation of the smallest diameter of the fetal skull to the largest diameter of the mother's bony pelvis is essential if delivery is to proceed normally.

## 5.0    SUMMARY

The female reproductive system can be divided into two parts, the external genitalia known as the vulva which comprises of the vaginal, uterus, uterine tubes and the ovary. Each of these structures plays different roles but their focus is to bring about process of fertilization and delivery at the end of pregnancy. Menstruation is the discharge of blood from the uterus as a response to progesterone hormonal level in the blood stream. Every month the uterus is prepared ready to receive fertilized ovum. In the absence of pregnancy the corpus lueteum degenerates and menses occurs 14 days before the next one.

The male reproductive system is divided into 2 parts, the external and the internal. The external comprises the penis and scrotum. The internal structure lies within the body. The scrotum houses the testes while testes houses seminiferous tubules and gonads. Seminiferous cells contain the sperm cells in various stages of developments. The epididymis provides

area for maturation of the sperm and acts as a reservoir for matured spermatozoa. Seminal fluids provide nutrition that aids motility and fertility ability of the sperm. Cowper's glands secrete alkaline fluid which neutralizes acidic vaginal secretions. For effective performance of its function the testes has to be at lower temperature than that of the body.

The pelvis consists of four bones, two innominate bones, one sacrum and one coccyx, joined together by very strong fibrous band known as the ligament. The pelvis is divided into the false pelvis, which is of no significance to midwifery practice, and the true pelvis made up of important land marks. The most favourable type of pelvis for delivery is the gynaecoid. The pelvic floor is filled with muscles which hang down like a sling. It forms a good support for the pelvic and abdominal organs. The fetal skull develops from membranes. At birth the bones are separated by membranous lines known as sutures. Where the sutures meet forms the fontanelles which are important landmarks in midwifery.

## 6.0    TUTOR-MARKED ASSIGNMENT

Working with your preceptors, examine the head of five new born in the nearest maternity center to you.

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## MODULE 3    THE GROWING FETUS

Unit 1       **Fetal and Placental Development**
Unit 2       **Fetal Circulation and Assessment of Fetal Growth and Development**

## UNIT 1     FETAL AND PLACENTAL DEVELOPMENT

## CONTENTS

## 1.0    INTRODUCTION

Scenario 1
*Miss Lara James, an 18-year-old, is 20 weeks pregnant. Although she says she knows she should stop smoking during pregnancy, she has not been able to do this. Twice during the pregnancy (at the 6th and 10th week), she followed her boyfriend to a birthday party she drank alcohol. Today, at a clinic visit, she tells you that she has felt her foetus move. She state, "Feeling the baby move made me realize there's someone inside me, you know what I mean? I didn't think of this as having a baby before, just being pregnant. It makes me know it's time I started being more careful with what I do.*

*Feeling a foetus move this way is often the trigger that makes having a baby "real" for many women. The more women know about foetal development, the easier it is for them to begin to think of the pregnancy not as something interesting happening to them, but as something that is producing a separate life. This scenario introduced us to the topic of this course.*

In just 38 weeks, a fertilized egg matures from a single cell carrying all the necessary genetic material to a fully developed foetus ready to be born.

Foetal growth and development is typically divided into three periods: pre-embryonic (first 2 weeks, beginning with fertilization), embryonic (weeks 3 through 8), and fetal (from week 8 through birth).

Fertilization is the beginning of pregnancy and it is the union of the ovum and spermatozoa. Once fertilization is complete the zygote implant in the body of the uterus, mitotic cell division begins at this point and the zygote is known as Morula at this stage.

The endometrium is termed Decidua, it is divided into decidua basalis, decidua capsularis and decidua vera. The fetus continue to grow steadly until full maturity the detail of growth is further discussed.

Throughout history, different societies have held a variety of beliefs and superstitions about the way the **foetus** (the infant during intrauterine life) grows. Medieval artists depicted the child in utero completely formed as miniature man. Leonardo da Vinci, in hid notebooks of 1510 to 1512, made several sketches of unborn infants that indicated he believed the foetus was immobile and essentially a part of the mother, sharing her blood and internal organs. During the 17th and 18th centuries, a baby was thought to form to a miniature size in the mother's ovaries; when male cells were introduced, the baby expanded to birth size.

A second theory was that the child existed in the head of the sperm cell as a fully formed being, the uterus serving only as an incubator in which it grew. It was not until 1758 that Kaspar Wolff proposed that both parents contribute equally to the structure of the baby. Thanks to the work of modern medical researchers and photographers who have been able to capture the process of fertilization and foetal development using enhanced, high-tech photography, there is now a clear idea of what the foetus looks like from the moment of conception until birth.

Surveillance of the foetus by ultrasound documents this growth process. The foetus grows and develops steadily during this time.

## 2.0 OBJECTIVES

At the end of this unit, you should be able to:

- describe the growth and development of the foetus by gestation week.
- assess foetal growth and development through maternal and pregnancy landmarks.
- formulate nursing diagnosis related to the needs of the pregnant woman and the foetus.
- establish outcome criteria that meet the needs of the pregnant woman and foetus.
- plan nursing care that promotes healthy foetal growth.
- implement nursing care to help ensure a safe pregnancy outcome and a safe foetal environment.
- discuss in detail, how to ensure fetal health.
- describe in detail, the development of the foetus and the placenta with emphasis on gestational weeks.
- systemic review during the intrauterine life.

## 3.0 MAIN CONTENT

## 3.1 Nursing Process Approach

You should be able to adopt the nursing process approach to ensure fetal health is maintained throughout pregnancy and the steps are as follows.

*Assessment*
The predictable stages of foetal development provide a guide for determining the well-being of an individual foetus. Health care providers can also use these stages as guidelines to predict more accurately the expected date of birth. For the expectant family, knowledge about fetal growth and development can provide an important frame of reference, helping the mother to understand some of the changes going on in her body and allowing all family members to begin thinking about and accepting the newest member of their family before the baby actually arrives. Conveying the findings gained from foetal assessment in as much detail as parents request is an important nursing role.

*Nursing Diagnosis*
Common nursing diagnosis related to growth and development of the foetus on the mother and family as well as the foetus. Examples include:

❖    Health-seeking behaviours related to knowledge of normal foetal development.
❖    Anxiety related to lack of foetal movement.
❖    Deficient knowledge related to need for good prenatal care for healthy foetal development.

*Outcome Identification and Planning*
Goals and outcome criteria established for teaching about foetal growth should be realistic and based on the parents' knowledge and desire for information. When additional assessment measures are necessary, such as amniocentesis or an ultrasound examination, it is important to include this material in the teaching plan, explaining why further assessment is necessary and what the parents can expect.

*Implementation*
Teaching parents about foetal growth and development helps them to visualize the foetus at each stage of development. This, in turn, helps them to understand the importance of implementing healthy behaviour, such as eating well and avoiding substances that may be dangerous to the foetus. Viewing a sonogram may help initiate bonding between the parents and the infant.

*Outcome Evaluation*
Outcome evaluation related to foetal growth and development usually focuses on determining whether the mother or family has made any changes in lifestyle to ensure foetal growth and whether the mother voices confidence that her baby is healthy and growing normally. Examples of expected outcomes are:

•    Parents describe alcohol-free living at next prenatal visit.
•    Client records number of movements of foetus for 1 hour daily.
•    Couple attends prenatal care regularly.

## 3.2     Stages of Fetal Development
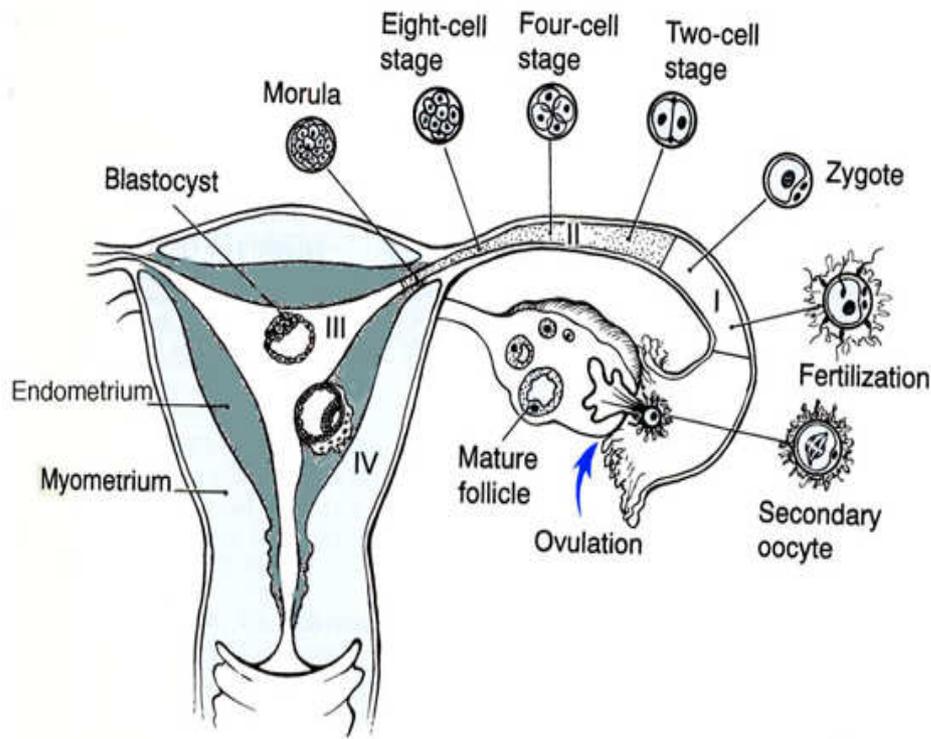


*Diagram: pre-embryonic stage. Source: maryourmother.net*
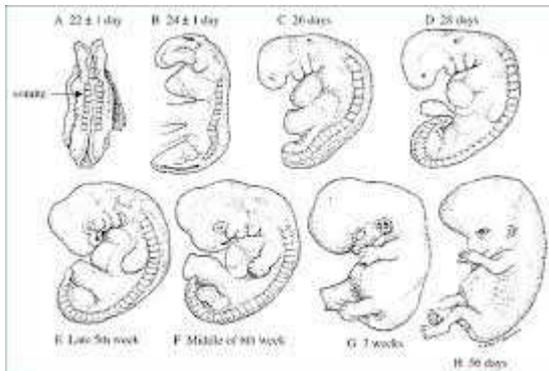


*Diagram: embryonic stage.*           *Souce:med-stud.narod.ru*



*Diagram: fetal stage.*        *Source: awinsjclarke.com*

In just 38 weeks, a fertilized egg matures from a single cell carrying all the necessary genetic material to a fully developed foetus ready to be born.

Foetal growth and development is typically divided into three periods: pre-embryonic (first 2 weeks, beginning with fertilization), embryonic (weeks 3 through 8), and fetal (from week 8 through birth).

### *Fertilization: The Beginning of Pregnancy*

**Fertilization** is the union of the ovum and a spermatozoon. Other terms used to describe this phenomenon are conception, impregnation, or fecundation. Fertilization usually occurs in the outer third of a fallopian tube, the ampullar portion. Because the functional life of a spermatozoon is about 48 hours, possibly as long as 72hours, the total critical time span during which fertilization may occur is about 72 hours(48 hours before ovulation plus 24 hours afterwards).

After ovulation, as the ovum is extrude from the grafian follicle, it is surrounded by a ring of mucopolysaccharide fluid (the **zona pellucid**) and a circle of cells (the **corona radiata**). These structures increase the bulk of the ovum, facilitating its migration to the uterus. They probably also serve as protection from injury. The ovum and surrounding cells are propelled into the near fallopian tube by currents initiated by the fimbriae, the fine, hair like structures that line the openings of the fallopian tubes. Peristaltic action of the tube and movement of the tube cilia help propel the ovum along the length of the tube. Usually only one ovum reaches maturity each month. Once released, fertilization must occur fairly quickly because an ovum is capable of fertilization for only 24 hours (48 hours at the most). After that time, it atrophies and becomes non-functional.

Normally, an ejaculation of semen averages 2.5 mL of fluid containing 50 to 200 million spermatozoon per millilitre, or an average of 400 million per ejaculation. At the time of ovulation, there in a reduction in the viscosity (thickness) of the cervical mucus, making it easier for spermatozoa to penetrate it. Sperm transport is so efficient close to ovulation that spermatozoa deposited in the vagina during intercourse generally reach the cervix within 80 seconds and the outer end of a fallopian tube within 5 minutes after deposition. This is one reason why douching is not an effective contraceptive measure.
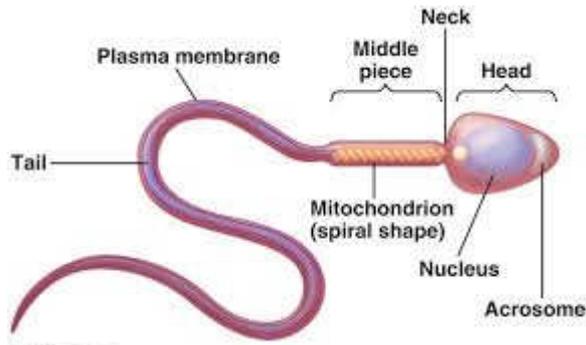
Source: biology.lifeeasy.org
Diagram: spermatozoa.

Spermatozoa move by means of their flagella (tails) and uterine contractions through the cervix and the body of the uterus and into the fallopian tubes toward the waiting ovum. The mechanism whereby spermatozoa are drawn toward an ovum is probably a species-specific reaction, similar to an antibody-antigen reaction. Capacitation is a final process, which happens as the sperm move toward the ovum, consists of changes in the plasm membrane of the sperm head, which reveals the sperm-binding receptor sites.

All the spermatozoa that achieve capacitation reach the ovum and cluster around the protective layer of corona cells. Hyaluronidase (a proteolytic enzyme) is apparently released by the spermatozoa and acts to dissolve the layer numbers of sperm contained in an ejaculation provide enough enzymes to dissolve the corona cells. Under ordinary circumstances, only one spermatozoon is able to penetrate the cell membrane of the ovum. Once it penetrate the zona pellucid, the membrane becomes impervious to other spermatozoa. An exception to this is the formation of hydatidiform mole, in which multiple sperm enter; this leads to abnormal growth.

Immediately after penetration of the ovum, the chromosomal material of the ovum and spermatozoon fuse. The resulting structure is called a **zygote**. Because the spermatozoon and ovum each carried 23 chromosomes (22 autosomes and 1 sex chromosome), a fertilized ovum has 46 chromosomes. If an X-carrying spermatozoon enters the ovum, the resulting child will have two X chromosomes and will be female (XX). If Y-carrying spermatozoon fertilizes the ovum, the resulting child will have an X and a Y chromosome and will be male (XY).

Fertilization is never a certain occurrence because it depends on at least three separate factors: maturation of both sperm and ovum, the ability of sperm to reach the ovum, and the ability of the sperm to penetrate the zona pellucid and cell membrane and achieve fertilization.

From the fertilization ovum (the zygote), the future child and also the accessory structure needed for support during intrauterine life, such as the placenta, foetal membranes, amniotic fluid, and umbilical cord, are formed.

*Implantation*

Once fertilization is complete, the zygote migrates toward the body of the uterus, aided by the current initiated by the muscular contractions of the fallopian tubes. It takes three or four days for the zygote to reach the body of the uterus. During this time, mitotic cell division, or cleavage, begins. The first cleavage occurs at about 24 hours; cleavage divisions continue to occur at a rate of one about every 22 hours. By the time the zygote reaches the body of the uterus, it consists of 16 to 50 cells. At this stage, because of its bumpy outward appearance, it is termed a **morula** (from the Latin word *morus*, meaning mulberry).
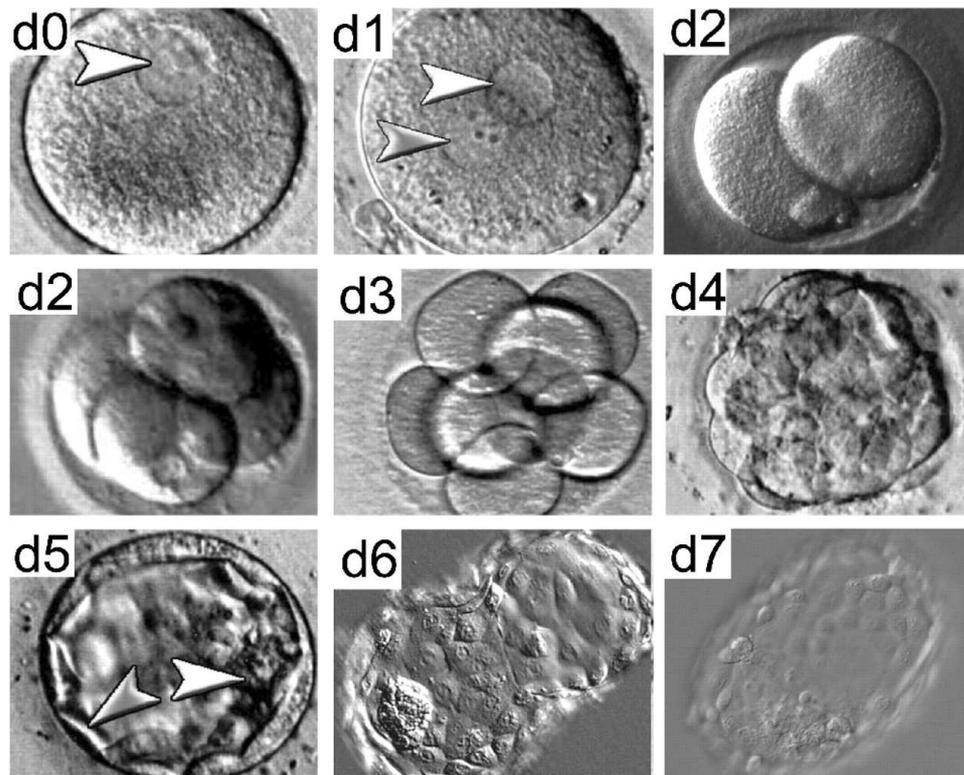


Morula stages
Sources: rrc.com

The morula continues to multiply as it floats free in the uterine cavity for 3 or 4 more days. Large cells tend to collect at the periphery of the ball, leaving a fluid space surrounding an inner cell mass. At this stage, the structure is termed a **blastocyst**. It is this structure that attaches to the uterine endometrium. The cells in the outer ring are known as **trophoblast** cells. They are the part of the structure that will later form

the placenta and membranes. The inner cell mass (embryoblast cells) is the portion of the structure that will later form the embryo.

 **Implantation**, or contact between the growing structure and the uterine endometrium,   occurs approximately 8 to 10 days after fertilization. After the third or fourth day of free floating (about 8 days from ovulation), the last residues of the corona and zona pellucid are shed by the growing structure. The blastocyst brushes against the rich uterine endometrium (in the second [secretory] phase of the menstrual cycle), a process termed apposition. It attaches to the surface of the endometrium (adhesion) and settles down into its soft folds (invasion).

The blastocyst is able to invade the endometrium because as the trophoblast cells on the outside of the structure touch the endometrium, they produce protiolitic enzymes that dissolve the tissue they touch. This action allows the blastocyst to burrow deeply into the endometrium and receive some basic nourishment of glycogen and mucoprotein from the endometrial glands. As invasion continues, the structure establishes an effective communication network with the blood system of the endometrium. The touching or implantation point is usually high in the uterus, on the posterior surface. If the point of implantation is low in the uterus, the growing placenta may occlude the cervix and make birth of the child difficult (placenta previa).

Implantation is an important step in pregnancy because as many as 50% of zygote never achieve it. In these instances, a pregnancy ends as early as 8 to 10 days after conception, often before the woman is even aware it had begun. Occasionally, a small amount vaginal spotting appears with implantation because capillaries are ruptured by the implanting trophoblast cells. A woman who normally has a particularly scant menstrual flow may mistake implantation bleeding for her menstrual period. If this happens, the predicted date of birth of her baby (based on the time of her last menstrual period) will then be calculated 4 weeks later. Once implanted, the zygote is called an **embryo.**

**Embryonic and Fetal Structure**
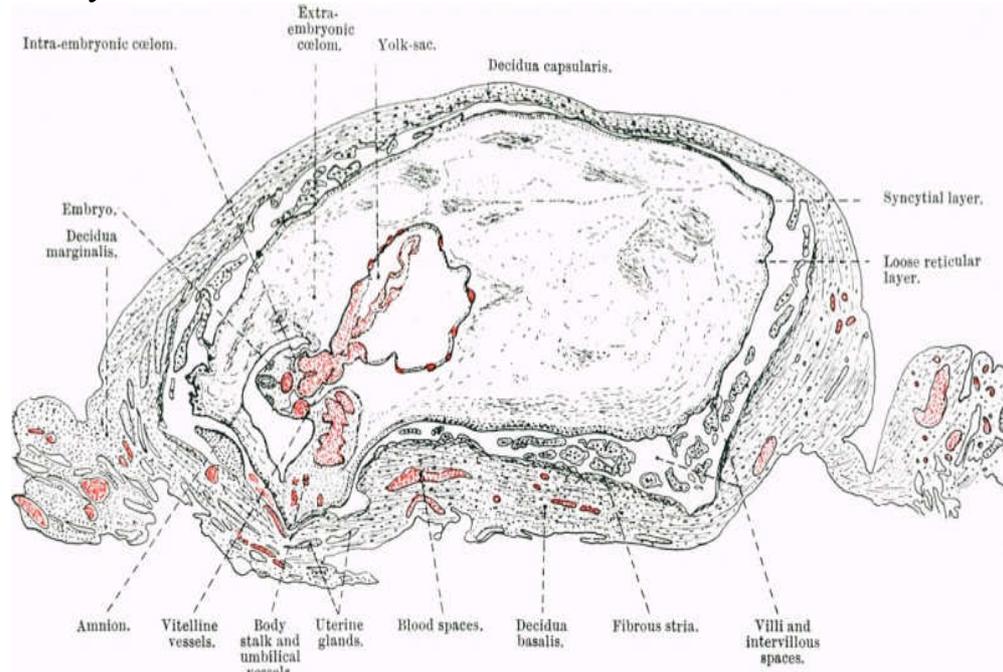


**The Decidua**          *Source: php.med.unsw.edu.*

After fertilization, the corpus luteum in the ovary continues to function rather than to atrophy because of the influence of human chorionic gonadotropin (HCG) hormone secreted by the trophoblast cells. Thus, the uterine endometrium, instead of sloughing off as in a normal menstrual cycle, continues to grow in thickness and vascularity. The endometrium is now termed decidua (the Latin word for falling off) because it will be discarded after the birth of the child. The decidua has three separate areas:

1.    **Deciduabasalis,** the part of the endometrium lying directly under the embryo (or the portion where the trophoblast cells are establishing communication with maternal blood vessels)
2.    **Decidua capsularis,** the portion of the endometrium that stretches or encapsulates the surface of the trophoblast.
3.    **Deciduas Vera,** the remaining portion of the uterine lining.

As the embryo continues to grow, it pushes the deciduascapsularis before it like a blanket. Eventually, enlargement brings the structure into contact with the opposite uterine wall. Here, the deciduascapsularis fuses with the endometrium of the opposite wall. This is why at birth, the entire inner surface of the uterus is stripped away, leaving the organ highly susceptible to haemorrhage and infection (Seifer et al., 2001).

**Chorionic Villi**
Once implantation is achieved, the trophoblastic layer of cells of the blastosis begins to mature rapidly. As early as the 11th or 12th day, miniature villi, or probing "fingers", termed **chorionic villi,** reach out from the single layer of cells into the uterine endometrium. At term, nearly 200 such villi will have formed.

Chorionic villi have a central core of loose connective tissue surrounded by a double layer of trophoblast cells. The central core of connective tissue contains foetal capillaries. The outer of the two covering layer is termed the syncytiotrophoblast, or syncytial. This layer of cells is instrumental in the production of various placental hormones, such as HCG, Somatomammotropin (human placental lactogen [HPL]), estrogen and progesteron. The inner layer, known as the cytotrophoblast or langhans' layer, is present as early as 12 days' gestation. It appears to function early in pregnancy to protect the growing foetus from certain infectious organisms such as the spirochete of syphilis. However, this layer of cells disappears between the 20th and 24th week. This is why syphilis is considered to have a high potential for foetal damage late in pregnancy, when cytotrophoblast cells are no longer present. Unfortunately, the layer appears to offer little protection against viral invasion at any point.

*The Placenta*
The placenta, Latin for pancake, which is descriptive of its size and appearance at term, arises out of trophoblast tissue. It serves as the fetal lungs, kidneys, and gastro-intestinal tract and as a separate endocrine organ throughout pregnancy. Its growth parallels that of the foetus growing from a few identifiable cells at the beginning of pregnancy to an organ 15 to 20 cm in diameter and 2 to 3 cm in dept at term. It covers about half the surface area of the internal uterus.

*Placenta Circulation*
As early as the 12th day of pregnancy, maternal blood begins to collect in the intervillous spaces of the uterine endometrium surrounding the chorionic villi. By the 3rd week, oxygen and other nutrients, such as glucose, amino acids, fatty acids, minerals, vitamins, and water, diffuse from the maternal blood through the cell layers of the chorionic villi to the villi capillaries. From there, nutrients are transported back to the developing embryo.

For practical purposes, there is no direct exchange of blood between the embryo and the mother during pregnancy. The exchange is carried out only by selective osmosis through the chorionic villi. However, because the chorionic villi layer is only one cell thick, minute breaks allow

occasional cells to cross. Placenta osmosis is so effective that all but a few substances are able to cross the placenta into the foetal circulation. Because almost all drugs are able to cross into a foetal circulation, it is important that a woman take no drugs (including alcohol and nicoten) other than those prescribed for her during pregnancy. Specific mechanism allows nutrients to cross the placenta. All these processes are affected by maternal blood pressure and the PH of the foetal and maternal plasma.

As the number of chorionic villi increases with pregnancy, the villi form an increasingly complex communication network with the maternal blood. Intervillus spaces grow larger and larger, becoming separated by series of partitions or cepta. In a mature placenta, there are as many as 30 separate segments called **cotyledon.** These compartments are what make the maternal side of the placenta at term look rough and uneven.
About 100 maternal uterine arteries supply the mature placenta. To provide enough for exchange, the rate of uteroplacental blood flow in pregnancy increases from 50ml/min at 10 weeks to 500 to 600ml/min at term. No additional maternal arteries appear after the first 3 months of pregnancy. However, to accommodate the increased blood flow, the arteries increases in size. Systemically, the mother's heart rate, total cadiac output, and blood volume increase to supply the placenta (Uckan and Townsend, 1999).

In the intervillus spaces, maternal blood jets from the coil or spiral arteries in streams or spout and then its propelled from compartment to compartment by the currents initiated. As the blood circulates around the villi and nutrients osmose from maternal blood into the villi, the maternal blood gradually loses its momentum and settles to the floor of the cotyledon. From there, it enters the orifices of maternal veins located in the cotyledon and is returned to the maternal circulation. Braxton Hicks contractions, the barely noticeable uterine contractions that are present from about 12th week of pregnancy, aid in maintaining pressure in the intervillus spaces by closing off the uterine veins momentarily with each contraction.

Uterine perfusion and thus placental circulation, is most efficient when the mother lies on her left side. The position lifts the uterus away from the inferior venal cava, preventing blood from being trapped in the lower extremities. If the mother lies on her back and the weight of the uterus compresses the venal cava, placental circulation can be so sharply reduced that supine hypotension occurs.

At term, the placental circulatory network is so extensive that a placenta weighs 400 to 600g (1 lb) and is one-sixth the weight of the baby. If a

placenta is smaller than this, it suggests that circulation to the foetus was threatened because the placenta was forced to spread out in an unusual manner to maintain a sufficient blood supply. The foetus of a woman with diabetes may develop a larger-than-usual placenta, probably from excess fluid collected between cells.

### Endocrine Function

Aside from serving as the source of oxygen and nutrient for the foetus, the syncytial (outer) layer of the chorionic villi develops into a separate, important hormone-producing system.

**Human Chorionic Gonadotropin.** The first hormone to be produced is HCG. This hormone can be found in maternal blood and urine as early as the first missed menstrual period (shortly after implantation has occurred) through about the 100th day of pregnancy. Because this is the hormone analysed by pregnancy test a false-negative result from a pregnancy test may be reported before or after this period. A mother's serum will be completely negative for HCG within 1 to 2 weeks after delivery. Testing for HCG after delivery can be used as proof that all the placental tissue has been delivered.

HCG acts as a fail-save measure to ensure that the corpus luteum of the ovary continues to produce projesteron and estrogen. If the corpus luteum should fail and the level of progesterone should fall, this will cause endometrial sloughing, with lose of the pregnancy followed by a rise of pituitary gonadotropins to induce a new menstrual cycle. HCG also may play a role in suppressing the maternal immunology response so placental tissue is no rejected. Because the structure of HCG is similar to luteinizing hormone of the pituitary gland, if the foetus is male, it exacts an effect on the foetal testis to begin testosterone production. The presence of testosterone forces the maturation of the male reproductive tracts.

At about the 8th week of pregnancy, the outer layer of cells of the developing placenta begins to produce progesterone. At this point, the corpus luteum is no longer needed so the production of HCG, which sustained it, begins to decrease.

**Estrogen.** Estrogen (primarily estroid) is produced as a second product of a syncytial cells of the placenta. Estrogen contributes to the mother's mammary gland development in preparation for lactation and stimulates uterine growth to accommodate the developing foetus. Accessing the amount of estroid in maternal serum was used in the past to test foetal well-being.

**Progesteron.** Estrogen is often referred to as the "hormone of women", progesteron as the "hormone of mothers" progesterone is necessary to maintain the endometrial lining of the uterus during pregnancy. It is present in serum as early as the 4th week of pregnancy as a result of the continuation of the corpus luteum. When the placental synthesis begins (at around the 12th week), the level rises progressively during the remainder of the pregnancy. This hormone also appears to reduce the contractivity of the uterine musculature during pregnancy which prevents premature labour. Such reduced contractivity is probably produced by change in electrolytes (notably potassium and calcium) which decreases the action potential of the uterus.

**Human Placental Lactogen (Human Chorionic Somatomammotropin).** Human placental lactogen (HPL) is a hormone with both growth-promoting and lactogenic (milk-producing) properties. It is produced by the placental beginning as early as the 6th week of pregnancy, increasing to a peak level at term. It can be assayed in both maternal serum and urine. It promotes mammary gland (breast) growth in preparation for lactation in the mother. It also serves important role of regulating maternal glucose, protein and fat levels so adequate amount of this are always available to the foetus.

### The Umbilical cord

The **umbilical cord** is formed from the amnion and chorion and provides a circulatory pathway connecting the embryo to the chorionic villi. The function of the cord is to transport oxygen and nutrients to the foetus from the placenta and to return waste products from the foetus to the placenta. The umbilical cord is about 53cm (3/4 in) thick. It contains one vein (carrying blood from the placental villi to the foetus) and two arteries (carrying blood from the foetus back to the placental villi). The remnant of the yolk sac may be found in the fetal end of the cord as a white fibrous streak at term. The bulk of the cord is gelatinous mucopolysaccharidecalled **Wharton's jelly,** which gives the cord body and prevents pressures on the vein and arteries. The outer surface is covered with amniotic membrane.

The number of veins and arteries in the cord is always assessed at birth. Normally, there are two umbilical arteries and one umbilical vein. About 1% of all infants are born with a cord that contains only a single vein and artery. About 15% of these infants are found to have accompanying congenital anomalies, particularly of the kidney and heart.

Blood can be withdrawn from the umbilical vein or transfused into the vein during intrauterine life for foetal assessment of treatment (termed percutaneous umbilical sampling). The rate of blood flow through an

umbilical cord is rapid (350 mL/min at term). Whether an adequate blood flow (blood velocity0 is present in the cord can be determined by ultrasound. Both systolic and diastolic pressure can be determined by this method.

The rapid rate of blood flow through the cord makes it unlikely that a cord will twist or knot enough to interfere with the foetal oxygen supply. In about 20% of all births, a loose loop of cord is found around the foetal neck (a nuchal cord). If this loop of cord is removed before the newborn's shoulders are extruded, so there is no traction on it, the oxygen supply to the foetus remains umimpaired.

Smooth muscle is abundant in the arteries of the cord. Constriction of these muscles after birth contributes to hemostasis and helps prevent hemorrhage of the newborn through the cord. Because the umbilical cord contains no nerve supply, it can be cut at birth without discomfort to the child or mother.

### The Membranes and Amniotic Fluid
The chorionic villi on the medial surface of the trophoblast (those that are not involved in implantation because they do not touch the endometrium) gradually thin and leave the medial surface of the structure smooth (the chorion leave, or smooth chorion). The smooth chorion eventually becomes the **chorionic membrane,** the outermost foetal membrane. Once it becomes smooth, it offers support to the sac that contains the amniotic fluid. A second membrane lining the chorionic membrane, the **amniotic membrane** or amnion, forms beneath the chorion. Early in pregnancy, these membranes becomes adherent that they seem as one at term. These membranes cover the foetal surface of the placenta and give that surface its typically shiny appearance. Like the umbilical cord, they have no nerve supply. Thus, when they rupture at term, neither mother nor child experiences any pain.

Unlike the chorionic membrane, the amniotic membrane not only offers support to amniotic fluid but also actually produces the fluid. In addition, it produces a phospholipid that initiates the formation of prostaglandins, which causes uterine contractions and may trigger that initiates labour.

Amniotic fluid is constantly being newly formed and reabsorbed, so it is never stagnant within the membranes. Because the foetus continually swallows the fluid, it is absorbed across the foetal intestine into the foetal blood-stream. From there, the umbilical arteries exchange it across the placenta. Some fluid is probably absorbed by direct contact

with the foetal surface of the placenta. At term, the amount of amniotic fluid ranges from 800 to 1,200 ml. if for any reason the foetus is unable to swallow(esophageal atresia or anencephaly are the two most common reasons), excessive amniotic fluid or **hydramnios** (more than 2,000mL total or pockets of fluid larger than 8 cm on ultrasound)will result. Hydramnios also tends to occur in women with diabetes because hyperglycemia causes excessive fluid shift into the amniotic space. Early in foetal life, as soon as the foetal kidneys become active, foetal urine adds to the quantity of the amniotic fluid. A disturbance of the kidney function may cause **oligohydramnios,** or a reduction in the amount of amniotic fluid (less than 300mL total or no pocket on ultrasound larger than 1 cm).

Amniotic fluid is an important protective mechanism for the foetus. It shields against pressure or a blow to the mother's abdomen. It protects the foetus from changes in temperature more slowly than air. It probably aids in muscular development, because it allows the foetus freedom to move. Finally, it protects the umbilical cord from pressure, protecting foetal oxygenation.

Even if the membranes rupture before birth and the bulk of the amniotic fluid is lost, some will always surround the foetus in utero because new fluid is constantly being formed. Amniotic fluid is slightly alkaline, with a pH of about 7.2. Checking the pH of the fluid at the time of rupture helps to differentiate it from urine, which is acidic.

**Origin and development of organ systems**
From the beginning of fetal growth, development proceeds in a **cephalocaudal** (head-to-tail) direction; that is, head development occurs first and is followed by development of the middle and, finally, lower body parts. This pattern of development continues after birth evidenced by newborns lifting up their head approximately a year before walking. As a fetus grows, body organ systems develop from specific tissue layers called germ layers.

*Primary Germ Layers*
At the time of implantation, the blastocyst already has differentiated to a point at which two separate cavities appear in the inner structure (1) a large one, the **amniotic cavity,** and (2) a smaller cavity, the **yolk sac,** which is lined with **endoderm** cells.

In chicks, the yolk sac serves as a supply of nourishment for the embryo throughout its development. In humans, the yolk sac appears to supply nourishment only until implantation. After that, it provides a source of red blood cells until the embryos hematopoietic system is mature

enough to perform the function (at about the 12th week of intrauterine life). The yolk sac atrophies after the hematopoietic function is complete and remains only as a thin white streak discernible in the cord at birth.

Between the amniotic cavity and the yolk sac, a third layer of primary cells, the **mesoderm,** forms. The embryo will begin to develop (from an embryonic shield) at the point where the three cell layers (ectoderm, endoderm, mesoderm) meet. Each germ layer of primary tissue develops into specific body systems. Knowing which structures arise from each germ layer is important because coexisting congenital defects found in newborns usually arise from the same layer. For example, a fistula between the trachea and the oesophagus (both organs arising from the endoderm) is a common birth anomaly. Heart and kidney defects (both organs arising from the mesoderm) are also commonly seen together. It is rare, however, to see a newborn with a heart malfunction (arises from mesoderm) and a lower urinary malformation (bladder and urethra arise from endoderm). One reason rubella infection is always serious in pregnancy is because this virus is capable of affecting all the germ layers,  thereby causing congenital anomalies in a myriad of body systems, regardless of the primary germ layer of origin.

**Origin of Body Tissues**

| Germ Layer | Body Portions Formed |
|---|---|
| Ectoderm | Central nervous system (brain and spinal cord) <br> Peripheral nervous system <br> Skin, hair and nails <br> Sebaceous glands <br> Sense organs <br> Mucus membranes of the anus, mouth and nose <br> Tooth enamel <br> Mammary gland |
| Mesoderm | Supporting structures of the body (connective tissues, bone, cartilage, muscle, ligaments and tendons). <br> Dentin of teeth <br> Upper portion of the urinary system (kidneys and ureters). <br> Reproductive system <br> Heart <br> Circulatory system <br> Blood cells <br> Lymph vessels |
| Endoderm | Lining of pericardial, pleura and peritoneal cavities <br> Lining of the gastrointestinal tract, respiratory tract and tonsils, parathyroid, thyroid, thymus glands. <br> Lower urinary system (bladder and urethra). |

Knowing the origins of body structures also helps to explain why certain screening procedures are ordered for newborns with congenital malformations. A kidney x-ray examination, for example, may be ordered for a child born with a heart defect, a child with a malformation of the urinary tract is often investigated for reproductive abnormalities as well (freedman et al., 2000).

All organ systems are complete, at least in a rudimentary form, at 8 weeks, gestation (the end of the embryonic per term). During the early time of **organogenesis** (organ forrion), the growing structure is most vulnerable to invasion by teratogens (any factor that affects the fertilized ovum embryo, or foetus adversely, such as alcohol or a chemotherapy drug). Women need to know how to minimize their exposure to these teratogens.

**Systemic Review During the intrauterine Life**
*Cardiovascular System:* The cardiovascular system is one of the first systems to become functional in intrauterine life. Simple blood cells joined to the wall of the yolk sac progress to a network of blood vessels and to a single heart tube forming as early the 6th day of life, beating as early as the 24th day. The septum that divides the heart into chambers develops in the 7th week. The heartbeat may be heard with a dopper as early as the 10th to 12th week of pregnancy. An electrocardiogram (ECG) may be recorded on a foetus as early as the 11th week, although the accuracy of such ECGs is in doubt until about the 20th week of pregnancy, when conduction is more regulated.

The heart rate of a foetus is affected by foetal oxygen level, body activity, and circulation volume, just as in adult life. After the 28th week of pregnancy, when the sympathetic nervous system has matured, the heart rate begins to show a baseline variability of about 5 beats per minute on a foetal heart rate rhythm strip.

*Foetal Haemoglobin-* Foetal haemoglobin differs from adult haemoglobin in several ways. It has a different composition (two alpha and two gamma chains, compared with two alpha and two beta chains of adult haemoglobin). Fetal haemoglobin has greater oxygen affinity, which increases its efficiency, and is more concentrated. At birth, a newborn's haemoglobin level is about 17.1 g/100mL, compared with an adult's normal level of 11 g/100mL; a new-born's haematocrit is about 53% compared with an adult's normal level of 45%.

The change from foetal to adult haemoglobin levels begins before birth and accelerates after birth. The major blood dyscrasias, such as sickle cell anaemia, are defects of beta haemoglobin chain. Therefore, clinical

symptoms do not become apparent until bulk of foetal haemoglobin has matured to adult haemoglobin composition at about 6 months of age.

***Respiratory System:*** After the 3rd week of intrauterine life, the respiratory and digestive tract exist as a single tube. Like all body tubes, initially it is a solid structure which then canalizes (hollows out). By the end of the 4th week, a septum begins to divide the oesophagus from the trachea. At the same time, lung buds appear on the trachea.

Until the 7th week of life, the diaphragm does not completely divide the thoracic cavity from the abdomen. During the 6th week of life, lungs buds may extend down into the abdomen, re-entering the chest only as the chest's longitudinal dimension increases and the diaphragm becomes complete (at the end of the 7th week). If the diaphragm fails to close completely, the stomach, the spleen, liver, or intestines may enter the thoracic cavity. The child may be born with a diaphragmatic hernia, compromising the lungs and perhaps displacing the heart.

**Important respiratory development milestones include:**
- Alveoli and capillaries begin to form between the 24th and 28th weeks. Both capillary and alveoli development must be complete before gas exchange can occur in the foetal lungs.
- Spontaneous respirator movements begin as early as 3 months of pregnancy, continuing throughout pregnancy.
- Specific lung fluid with a low surface tension and low viscosity forms in alveoli to aid in expansion of alveoli at birth; it rapidly absorbed after birth.
- **Surfactant,** a phospholipid substance, is formed and excreted by the alveolar cells at about the 24th week of pregnancy. This decreases alveolar surface tension on expiration, preventing alveolar collapse and improving the infant's ability to maintain respirations in the outside environment.

Surfactant has two components: lecithin and sphingomyelin. Early in formation of surfactant, sphingomyelin is chief component. At about 35weeks, there is a surge in production of lecithin. This then becomes the chief component by a ratio of 2:1. With foetal lung movements, surfactant mixes with amniotic fluid. Analysis of the lecithin/sphingomyelin(L/S) ratio by an amniocentesis technique is one of the primary tests of foetal maturity. Lack of surfactant is a factor associated with the development of respiratory distress syndrome. Any interference with blood supply to the foetus, such as occurs with placental insufficiency from hypertension, appears to enhance surfactant development. This type of stress probably increases steroid levels in the foetus. Increased steroids levels are associated with alveolar maturation (Ling & Duff, 2001).

*Nervous System:* Like the circulatory system, the nervous system begins to develop extremely early in pregnancy. During the 3rd and 4th weeks of life, possibly before the woman even realizes that she is pregnant, active formation of the nervous system and sense organs has already begun.

- A **neutral plate** (a thickened portion of the ectoderm) is apparent by the 3rd week of gestation. Its top portion differentiates into the neutral tube, which will form the central nervous system (brain and spinal cord), and the neutral crest, which will develop into the peripheral nervous system.
- Brain waves can be detected on an electroencephalogram (EEG) by the 8th week.
- All parts of the brain (cerebrum, cerebellum, pons, and medulla oblongata) form in utero, although they are not completely mature at birth. Growth continues to occur rapidly during the 1st year and continues at high levels until 5 to 6 years of age.
- Eye and inner ear develop as projections of the original neutral tube.
- By 24 weeks, the ear is capable of responding to sound; the eyes exhibit a papillary reaction, indicating sight is present.

The neurologic system seems particularly prone to insult during the early weeks of the embryonic period. All during pregnancy and at birth, the system is vulnerable to damage from anoxia.

*Endocrine System:* As soon as endocrine organs mature in intrauterine life, function begins, including:

- The foetal adrenal glands supply a precursor for oestrogen synthesis by the placenta.
- The foetal pancreas produces the insulin needed by the foetus (insulin does not cross the placenta from the mother to the foetus).
- The thyroid and parathyroid glands play vital roles in metabolic function and calcium balance.

*Digestive System:* The digestive tract is separated from the respiratory tract at about the 4th week. After this time, the intestinal tract grows extremely rapidly. Initially solid, the tubes canalizes (hollow out) to become patent. Later, the endothelial cells of the gastrointestinal tract proliferate extensively, occluding the lumens once more, and they must canalize again. Atresia or stenosis can develop if either the first or second canalization does not occur. The proliferation of cells shed in the second re-canalization forms the basis for meconium.

 Because the abdomen becomes too small to contain the intestine, a portion of the intestine, guided by the vitelline membrane (a part of the

yolk sac), enters the base of umbilical cord during the 6th week of intrauterine life. Intestine remains in the base of the cord until about 10th week. At this time, the foetal trunk has extended and enlarged the abdominal cavity so it is large enough to accommodate all the intestinal mass. As the intestine returns to the abdominal cavity, it must rotate 180 degrees. Failure to do so can result in inadequate mesentery attachments, possibly leading to volvulus of the intestine. If any intestinal coils remain outside the abdomen, in the base of the cord, a congenital anomaly, omphalocele, develops. A similar defect, gastroschisis, occurs when the original midline fusion that occurred at the early cell stage is incomplete. If the vitelline duct does not atrophy after return of the intestines, a Meckel's diverticulum (apouch of intestinal tissue) or an opening between the intestine and the umbilicus can result.

Meconium forms in the intestines as early as the 16th week. It consists of cellular wastes, bile, fats, mucoproteins, muccopolysaccharides, and portions of the vernixcaseosa, the lubricating substance that forms on the foetal skin. Meconium is black or dark green (obtaining its colour from bile pigment) and sticky.

The gastrointestinal tract is sterile before birth. Because vitamin K is synthesized by the action of bacteria in the intestines, this can cause vitamin **K** levels to be low in newborn. Sucking and swallowing reflexes are not mature until the foetus is about 32 weeks or the foetus weighs 1,500g.

The ability of the gastrointestinal tract to secrete enzymes essential to carbohydrate and protein digestion is mature at 36 weeks. However, amylase, an enzyme found in saliva and necessary for digestion of complex starches, is not mature until 3 months after birth. Many newborns have not yet developed lipase, an enzyme needed for fat digestion.

The liver is active throughout gestation, functioning as a filter between the incoming blood and the foetal circulation and as a deposit for foetal stores such as iron and glycogen. However, it is still immature at birth, possibly leading to hypoglycaemia and hyperbilirubinema, two serious problems in the first 24 hours after birth.

*Musculoskeletal System:* The foetus can be seen to move on ultrasound as early as the 11th week, although the mother usually does not feel this movement (**quickening**) until nearly 20 weeks. In the first 2 weeks of foetal life, cartilage prototypes provide position and support. Ossification of bone tissue begins about the 12th week. The ossification process continues all through fetal life and actually until adulthood.

Carpals, tarsals, and sterna bones generally do not ossify until birth is imminent.

*Reproductive system:* A child's sex is determined at the moment of conception by a spermatozoon carrying an X or a Y chromosome and can be determined as early as 8 weeks by chromosomal analysis. At about the 6th week of life, the gonads (ovaries or testes) form. If tests form, testosterone is secreted, apparently influencing the sexually neutral genital duct to form other male organs (maturity of the wolffian or mesonephric, duct). In the absence of testosterone secretion, female organs will form (maturation of the mullerian, or parmesonephric, duct). This is an important phenomenon, because if the mother should take an androgen or androgen-like substance during this stage of pregnancy, the child, although chromosomally female, would appear more male than female at birth. If deficient testosterone is secreted by testes, both the mullarian (female) duct and male (wolffian) duct could develop (pseudo-hermaphroditism).

Normally, the testes descend from the pelvic cavity, where they first form in to the scrotal sack late in intrauterine life, at the 34th to 38th week. Thus, many male preterm infants are born with undescended testes. These children should be followed closely to see that the testes descend when the child reaches what would have been the 34th to 38th week of gestation age, because testicular descends does not occur as readily in extra-uterine life as it would in utero.

*Urinary System:* Although rudimentary kidneys are present as early as the end of the 4th week, they do not appear to be essential for life before birth. Urine is formed by the 12th week and is excreted into the amniotic fluid by the 16th week of gestation. At term, foetal urine is being excreted at the rate of 500mL/ day. An amount of amniotic fluid that is less than normal (oligohydramnios) suggests that foetal kidneys are not secreting adequate urine.

The complex structure of the kidneys is gradually developed during pregnancy and for months afterwards. The loop of Henle, for example, is not fully differentiated until the child is born. Glomerular filtration and concentration of urine in the new born are not efficient because the kidneys are not fully mature even by birth.

Early in the embryonic stage of urinary system development, the bladder extends to the umbilical region.  On rare occasions, an open lumen between the urinary bladder and the umbilicus fails to close. Termed a patent urachus, this is discovered at birth by the persistent drainage of a clear, acid-pH fluid (urine) from the umbilicus.

***Integumentary System:*** The skin of a foetus appears thin and almost translucent until subcutaneous fat begins to be deposited at about 36 weeks. Skin is covered by soft downy hairs (lanugo) and a cream cheese-like substance, vernixcaseosa, which is important for lubrication and keeping the skin from macerating.

***Immune System:*** IgG maternal antibodies cross the placental in to the foetus primarily during the third trimester of pregnancy, giving a foetus temporary passive immunity against diseases for which the mother has antibodies. These often include poliomyelitis, rubella (German measles), rubella (regular measles), diphtheria, tetanus, infectious parotitis (mumps), and pertussis(whooping cough). Little or no immunity to the herpes virus (the virus of cold sores and genital herpes) is transfer to foetus; thus, the average new born is potentially susceptible to these diseases.

The level of passive IgG immunoglobulin peaks at birth and then decreases over the next 8 months while infants begin to build up their own store of IgG as well as IgA and IgM. Because the passive immunity received by the new born has already declined substantially by about 2 months, immunisation against diphtheria, tetanus, and pertussis, polio-myelitis, and *H.influenza* is typically started. Passive antibodies to measles have been demonstrated to last over a year. Consequently, the immunization for measles is not given until an extra-uterine age of 15 months.

It has been shown that a foetus is capable of active antibody production late in a pregnancy. Generally, this is not necessary, however, because antibodies are manufactured only when stimulated by an invading antigen, and antigens rarely invade the intrauterine space. However, infants whose mothers have had an infection such as rubella during pregnancy typically have IgM antibodies to rubella in their blood serum at birth. Because IgA and IgM antibodies cannot cross the placental, their presence in the new born is proof that the foetus has been exposed to the disease.

### *Milestones of Foetal Growth and Development*
During pregnancy, couples ask many questions about their baby's appearance and age. To answer this question effectively and to plan care that safeguards foetal growth, it is helpful to be able to describe the developmental milestones by weeks of intrauterine life.
This can be confusing because the life of the foetus is generally measured from the time of ovulation or fertilization (ovulation age), but the length of the pregnancy is generally measured from the first day of the last menstrual period (gestational age). Because ovulation and

fertilisation takes p[lace3 about 2weeks after the last menstrual period, the ovulation age of the foetus is always 2 weeks less than the length of the pregnancy or gestational age.

Both ovulation and gestational age are also sometimes measured in lunar months(4 week periods) or in trimesters(3 month periods) rather than in weeks. In lunar months, a pregnancy is 10 months (40 weeks or 280 days) long; a foetus grows in utero 9.5 lunar months or 3 full trimesters (38 weeks or 266 days).

The following discussion of foetal developmental milestones is based on gestation weeks because, it is helpful when talking to expectant parents to be able to correlate foetal development to the way they measure pregnancy: from the first day of last menstrual period.
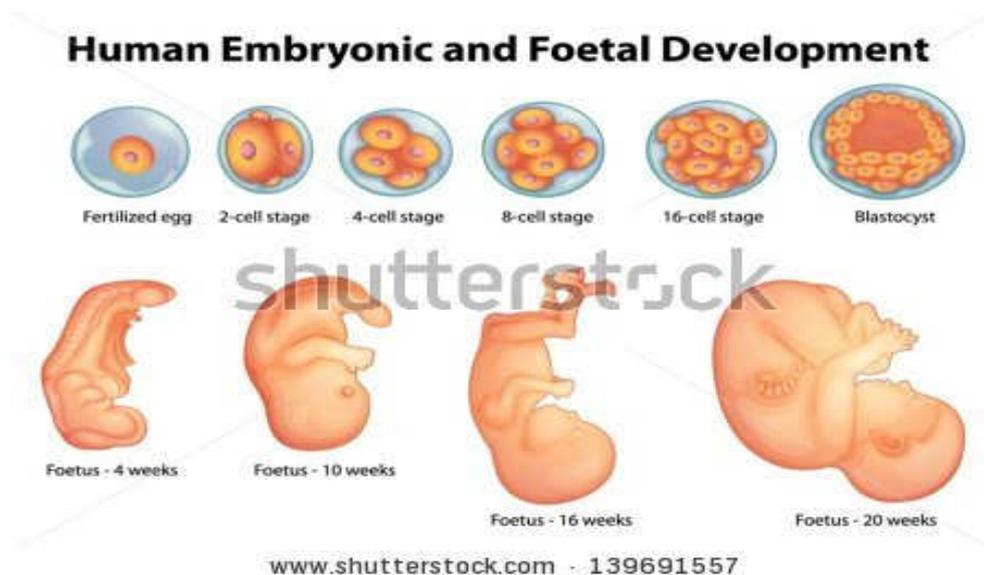


Source: shutterstock.com
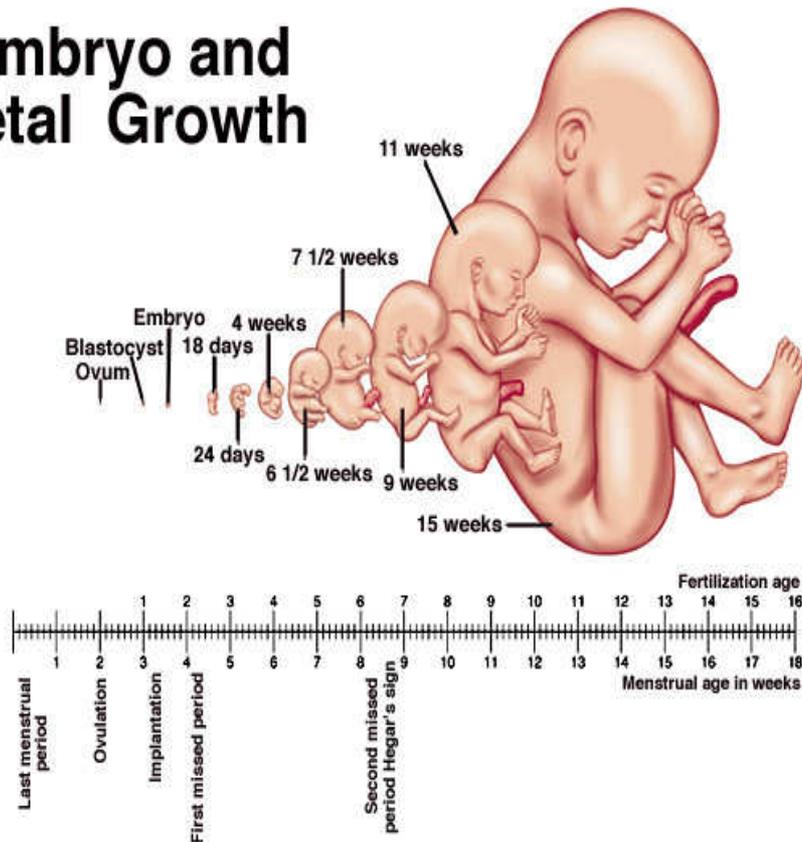
Source: thepregancyzone.com

Fetal Development in Gestational Weeks

### *End of 4 Gestation Weeks*
At the end of the 4th week of gestation, the human embryo is a rapidly growing formation of cells but does not resemble a human being yet.

- Length: 0.75 to 1cm.
- Weight: 400mg.
- The spinal cord is formed and fussed at the midpoint.
- Lateral wings that will form the body are folded forward to fuse at the midline.
- Head fold forward, becoming prominent, representing about one third of the entire structure.
- The back is bent so the head almost the tip of the tail.
- The rudimentary heart appears as a prominent bulge on the anterior surface.
- Arms and legs are budlike structures.
- Rudimentary eyes, ears, and nose are discernible.

### End of 8 Gestation Weeks

- Length: 2.5 cm (1 in).
- Weight: 20g.
- Organogenesis is complete.
- The heart, with a septum and valves, is beating rhythmically.
- Facial features are definitely discernible.
- Extremities have developed.
- External genitalia are present, but sex is not distinguishable by simple observation.
- The primitive tail is regressing.
- Abdomen appears large as the fetal intestine is growing rapidly.
- Sonogram shows a gestational sac, diagnostic of pregnancy.

### End of 12 Gestation Weeks (First Trimester)

- Length: 7 to 8 cm.
- Weight: 45 g.
- Nail beds are forming on fingers and toes.
- Spontaneous movements are possible, although usually too faint to be felt by the mother.
- Some reflexes, such as Babinski reflex, are present.
- Bone ossification centers are forming.
- Tooth buds are present.
- Sex is distinguishable by outward appearance.
- Kidney secretion has begun, although urine may no yet be evident in amniotic fluid.
- Heartbeat is audible by a Doppler.

### End of 16 Gestation Weeks.

- Length: 10 to 17 cm.
- Weight: 55 to 120 g.
- Foetal heart sounds are audible with an ordinary stethoscope.
- Lanugo (the fine, downy hair on the back and arms of newborns, apparently serving as a source of insulation for body heat) is well formed. Liver and pancreas are functioning.
- Foetus actively swallows amniotic fluid, demonstrating an instant but uncoordinated swallowing reflex; urine is present in amniotic fluid.
- Sex can be determined by ultrasound.

### End of 20 Gestation Weeks

- Length: 25 cm.
- Weight: 223 g.
- Spontaneous foetal movements can be sensed by the mother.
- Antibody production is possible.
- Hair forms, extending to include eyebrows and hair on the head.
- Meconium is present in the upper intestine.

- Brown fat, a special fat that will aid in temperature regulation at birth, begins to be formed behind the kidneys, sternum, and posterior neck.
- Foetal heartbeat is strong enough to be audible through the abdomen with an ordinary stethoscope.
- Vernixcaseosa, a cream cheese-like substance produced by the sebaceous glands that serves as a protective skin covering during intrauterine life, begins to form.
- Definite sleeping and activity patterns are distinguishable (the foetus has developed bio-rhythms that will guide sleep/wake patterns throughout life).

*End of 24 Gestation Weeks (Second Trimester)*
- Length: 28 to 36 cm.
- Weight: 550 g.
- Passive antibody transfer from mother to foetus probably begins as early as the 20th week of gestation, certainly by the 24th week of gestation. Infants born before antibody transfer has taken place have no natural immunity and need more than the usual protection against infectious disease in the newborn period until the infant's own store of immunoglobulin can build up.
- Meconium is present as far as the rectum.
- Active production of lung surfactant begins.
- Eyebrows and eyelashes are well defined.
- Eyelids, previously fused since the 12th week, are now open.
- Pupils are capable of reacting to light.
- When foetuses reach 24th weeks, or 601 g, they have achieved a practical low-end of viability if they are cared for after birth in a modern intensive care facility.
- Hearing can be demonstrated by response to sudden sound.

*End of Gestation Weeks*
- Length: 35 to 38 cm.
- Weight: 1,200 g.
- Lung alveoli begin to mature, and surfactant can be demonstrated in amniotic fluid.
- Testes begin to descend into the scrotal sac from the lower abdominal cavity.
- The blood vessels of the retina are extremely susceptible to damage from high oxygen concentrations (an important consideration when caring for preterm infants who need oxygen).
- The eyes open.

*End of 32 Gestation Weeks*
- Length: 38 to 43 cm.
- Weight: 1,600 g.

- Subcutaneous fat begins to be deposited (the former stringy, "little old man" appearance is lost).
- Foetus is aware of sounds outside the mother's body.
- Active Moro-reflex is present.
- Birth position (vertex or breech) may be assumed.
- Iron stores that provide iron for the time during which the neonatal will ingest only milk after birth are beginning to be developed.
- Fingernails grow to reach the end of fingertips.

### End of 36 Gestation Weeks

- Length: 42 to 48 cm.
- Weight: 1,800 to 2,700 g (5 to 6 Ib).
- Body stores of glycogen, iron, carbohydrate, and calcium are augmented.
- Additional amounts of subcutaneous fat are deposited.
- Sole of the foot has only one or two crisscross creases compared with the full crisscross pattern that will be evident at term.
- Amount of lanugo begins to diminish.
- Most babies turn into vertex or head-down presentation during this month.

### End of 40 Gestation Weeks (Third Trimester).

- Length: 48 to 52 cm (crown to rump, 35 to 37 cm).
- Weight: 3,000 g (7 to 7.5 Ib).
- Foetus kicks actively, hard enough to cause the mother considerable discomfort.
- Foetal haemoglobin begins its conversion to adult haemoglobin. The conversion is so rapid that, at birth, about 20% of haemoglobin will be adult in character.
- Vernixcaseosa is fully formed.
- Fingernails extend over the fingertips.
- Creases on the sole of the feet cover at least two thirds of the surface.

In primiparas (women having their first baby), the foetus often sinks into birth canal during the last 2 weeks, giving the mother a feeling that her load is being lightened. This event is termed **lightening**. It is foetal announcement that the third trimester of pregnancy has ended and birth is at hand.

### Determination of Estimated Birth Date

It is impossible to predict the day of birth with a high degree of accuracy. Traditionally, this date has been referred to as the EDC, for estimated date of confinement. Because women are no longer

"confined" after childbirth, EDB (**estimated date of birth**) or EDD (estimated date of delivery) is more commonly used today.

Fewer than 5% of pregnancies end exactly 280 days from the last menstrual period; fewer than half end within 1 week of the 280th day. Nagele's rule is the standard method used to predict the length of a pregnancy. Gestation age wheels or birth date calculators, which can be used to predict a birth date, are also available.

If fertilization occurs early in a menstrual cycle, the pregnancy will probably end "early"; if ovulation and fertilization occur later in the cycle, the pregnancy will end "late". Because of these normal variations, a pregnancy ending 2 weeks before or 2 weeks after the estimated calculated date of birth is considered well within the normal limit (a pregnancy of 38 to 42 weeks in length).

**SELF-ASSESSMENT EXERCISE**

i.      Describe in detail, the development of the foetus and the placenta with emphasis on gestational weeks.
ii.     What structures in the blastocyst goes on to develop into placenta?
iii.    How many arteries and veins are usually found in the umbilical cord?
iv.     At 26 weeks gestation, what would you expect a fundal height measurement to be?
v.      When does surfactant excretion by alveolar cells begin?
vi      What common condition may occur within the first 24 hours after birth because of the infant immature liver?
vii.    Which immunoglobin crosses the placenta?
viii.   List the body tissues that are developed from the germ layers

**4.0    CONCLUSION**
A foetus is capable of active antibody production late in a pregnancy. Generally, this is not necessary, however, because antibodies are manufactured only when stimulated by an invading antigen, and antigens rarely invade the intrauterine space.

**5.0    SUMMARY**

Ensuring fetal health is an all-encompassing task to the nurse and it involve a thorough knowledge of the nursing process which is inclusive of:
-       Assessment
-       Nursing diagnosis

- Outcome identification and planning.
- Implementation
- Outcome evaluation.

Furthermore, in just 38 weeks a fertilized egg matures from a single cell carrying all the necessary genetic material to a fully developed foetus ready to be born.

Fetal growth and development is divided into pre-embryonic (first 2 weeks, beginning with fertization), embryonic ( week 3 through 8), and fetal ( from week 8 through birth). Various anatomical structures developed from primary germ cells; Endoderm, mesoderm and ectoderm.

Furthermore, systematic review during intrauterine life summarizes how the foetus copes with life in utero. Conclusively, fetal developmental milestones are based on gestational weeks which is helpful, and a good correlate when measuring fetal development in the uterus.

## 6.0    TUTOR-MARKED ASSIGNMENT

Working with your preceptor, perform preliminary assessment of 4 new antenatal clients.

## 7.0    REFERENCES/FURTHER READING

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## UNIT 2     FETAL CIRCULATION AND ASSESSMENT OF FETAL GROWTH AND DEVELOPMENT

**CONTENTS**

1.0     Introduction
2.0     Objectives
3.0     Main Contents
        3.1     Fetal Circulation
        3.2     Methods of assessment of fetal growth and development
                Assessment of fetal growth and development
4.0     Conclusion
5.0     Summary
6.0     Tutor Marked Assignment
7.0     References/Further Reading

## 1.0    INTRODUCTION

Fetal survival in the uterus is dependent on exchange of nutrients, oxygen, carbon dioxide and this start as early as the $3^{rd}$ week. The foetus achieved this through specialized structures and by its own circulation. A number of temporary structures are equally involved in these activities in uterus.

In the same vein fetal growth and development are assessed through some specific test and means all these are the focus of discuss of this unit.

## 2.0    OBJECTIVES

At the end of this unit, you should be able to:

- discuss in detail, the fetal circulation
- describe in detail, the various methods of assessment of fetal growth and development.

**Foetal Circulation**
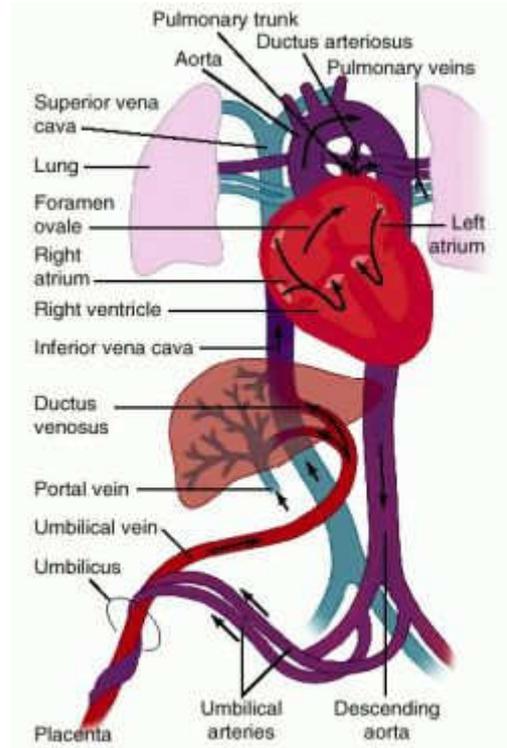


**Source :** medical-dictionary.thefreedictionary.com

As early as the 3rd week of intrauterine life, foetal blood has begun to exchange nutrients with the maternal circulation across the chorionicvilli. Foetal circulation differs from extra-uterine circulation in several respects. During intrauterine life, the foetus derives oxygen and excretes carbon dioxide not from oxygen exchange in the lungs but from the placenta. Blood does not enter the lungs while the child is in utero, but this blood flow is to supply the cells of the lungs themselves, not for oxygen exchange. Specialized structures present in the foetus shunt blood flow to supply the most important organs: the brain, liver, heart, and kidneys.

Blood arriving at the foetus from the placenta is highly oxygenated. The blood enters the foetus through the umbilical vein (called a vein even though it carries oxygenated blood, because the direction of the blood is toward the foetal heart). The umbilical vein carries the blood to the inferior vena cava through an accessory structure, the **ductusvenosus.** The ductusvenosus receives most of the oxygenated blood from the umbilical vein to supply the foetal liver. It then empties into the inferior vena cava. From the inferior vena cava, blood is carried to the right side of the heart. As the blood enters the right atrium, the bulk of it is shunted into the left atrium through an opening in the atrial septum, the **foramen ovale.** From the left atrium, it follows the course of normal circulation into the left ventricle and into the aorta.

Deoxygenated blood from the body is returned to the heart by the vena cava. The blood enters the right atrium and leaves it by the normal circulatory route; that is, through the tricuspid valve into the right ventricle, then into the pulmonary artery in the normal manner. A small portion of this blood flow services the lung tissue. However, the larger portion is shunted away from the lungs through an additional structure, the **ductusarteriosus,** directly into the aorta and then into the descending aorta.

Most blood flow from the descending aorta is transported by the umbilical arteries (called arteries, even though they are now transporting deoxygenated blood, because they are carrying blood away from the foetal heart) back through the umbilical cord to the placental villi, where new oxygen exchange takes place.

The blood oxygen saturation level of the foetus is about 80% of the newborn's saturation level. The rapid foetal heart rate during pregnancy (120 to 160 beats per minute) is necessary to supply oxygen to cells when red blood cells are never fully saturated. Despite a low blood oxygen saturation level, carbon dioxide does not accumulate in the foetal system because of its rapid diffusion into maternal blood across a favourable placental gradient.



Source : justbambinos.blogspot.com

**Methods of Assessment of Foetal Growth and Development**

Much information about the size and health of the unborn child can be gathered through a variety of assessment techniques. Nursing responsibility for these assessment procedures includes seeing that a signed consent form has been obtained as needed, scheduling the procedure, explaining the procedure to the woman and her support person, preparing the woman physically and psychologically, providing support during the procedure, assessing both foetal and maternal responses to the procedure, providing follow-up care to the woman, and managing equipment and specimens.

Additional consent to perform a procedure is necessary if the procedure poses any risk to the mother or foetus that would not otherwise be present. Information must be provided about what the procedure entails and what the possible risks are.

*Estimating Foetal Growth*
**McDonald's rule** is a method of determining, during mid-pregnancy, that the foetus is growing in utero by measuring fundal (uterine) height. Typically, the distance from the fundus to the symphysis in centimetres is equal to the week of gestation between the 20th and 31st weeks of pregnancy. The measurement is made from the notch of the symphysis pubis to over the top of the uterine fundus as the woman lies supine. McDonald's rule becomes inaccurate during the third trimester of pregnancy because the foetus is growing more in weight than height during this time. Until then, a fundal height greater than this standard, suggests multiple pregnancy, a miscalculated due date, a large for-gestational-age infant, hydramnios (increased amniotic fluid volume), or hydatidiform mole. A fundal measurement much less than this suggests that either pregnancy length is miscalculated, or an anomally, such as anencephaly, is developing.

Recording that the fundus reaches typical milestone measurements, such as over the symphysis  pubis at 12 weeks, at the umbilicus at 20 weeks, and at the xiphoid process at 36 weeks, is also a helpful determination.

*Assessing Foetal Well-Being*
A number of actions or procedures are helpful in detecting and documenting foetal well-being.

*Foetal Movement*
Foetal movement can be felt by the mother (quickening) begins at approximately 18 to 20 weeks of pregnancy and peaks at 28 to 38 weeks. A healthy foetus moves with a degree of consistency, but a

foetus affected by placenta insufficiency will show greatly decreased movements. Asking the mother to observe and record the number of movements the foetus makes daily offers a gross assessment of foetal well-being. A healthy foetus moves at least 10 times a day.

Because of variations in movements among normal, healthy foetuses as well as variations in different health care provider's level of confidence in the technique, a variety of protocols have been developed by different institutions. There also is great variety in what is accepted as normal in different areas of the country. One popular way to approach this assessment is to ask the mother to lie in a left recumbent position after a meal and record how many foetal movements she feels over the next hour (the Sandovsky method). A foetus normally moves a minimum of twice every 10 minutes or an average of 10 to 12 times an hour. The mother is instructed to telephone her health care provider if she has felt fewer than five (half the normal number) during the chosen hour. Another protocol is "count-to-ten" (the Cardiff method). For this, the mother records the time interval it takes for her to feel ten foetal movements. Usually, this occurs within 60 minutes. Make sure to instruct the client that foetal movements do vary, especially in relation to sleep cycles of the foetus and the mother's activity during the observation time. Otherwise, she can become unduly anxious that the foetus may be in jeopardy.

### Foetal Heart Rate

The foetal heart rate should be 120 to 160 beats per minute throughout pregnancy. Foetal heart sounds can be heard and counted as early as the 10th to 11th week of pregnancy by the use of an ultrasonic Doppler technique.

***Rhythmic Strip Testing.*** The term "rhythm strip testing" has come to mean assessment of the foetal heart rate in terms of baseline and long-and-short-term variability. For the test, the woman is placed in a semi-Fowler's position (either in a comfortable lounge chair or on an examining table or bed with an elevated backrest) to prevent supine hypotension syndrome during the test. External foetal heart rate and uterine contraction monitors are attached abdominally and record the foetal heart for 20 minutes. The baseline reading refers to the average rate of the foetal heartbeat per minute. Short-term variability (also called beat-to-beat variability) denotes the small changes in rate that occur from second to second if the foetal parasympathetic nervous system is receiving adequate oxygen and nutrients. For example, the baseline (average) of the foetal heartbeat would be 130 beats per minute. Beat-to-beat variability is present.

Long-term variability denotes the differences in heart rate that occur over the 20-minute time period. Because the average foetus moves about twice every 10 minutes, and movement causes the heart rate to increase, there will typically be two or more instances of foetal heart rate acceleration in a 20-minuute rhythm strip. Long-term variability this way reflects the state of the foetal sympathetic nervous system.

Rhythm strip testing requires the mother to remain I a fairly fixed position for 20minutes. Keep her well informed of the purpose of the test, how it is interpreted, and the meaning of results. The more she understands about the process, the better she can cooperate to make it successful.

*Nonstress Testing*. A **non-stress test** measures the response of the foetal heart rate to foetal movement. The woman is positioned and the foetal heart rate and uterine contraction monitors are attached as for obtaining a rhythm strip. The woman pushes a button attached to the monitor (similar to a call bell) whenever she feels the foetus move. The paper tracing is marked by a dark line at these points.

When the foetus moves, the foetal heart rate should increase about 15 beats per minute and remain elevated for 15seconds. It should decrease to its average rate again as the foetus quiets. If no increase in beats per minute is noticeable on foetal movement, poor oxygen perfusion of the foetus is suggested.

A non-stress test usually is done for 10 to 20 minutes. The test is reactive if two acceleration of foetal heart rate (15 beats or more) lasting for 15 seconds occur after movement within the chosen time period. The test is nonreactive if no accelerations occur with the foetal movements. The results can also be interpreted as nonreactive if no foetal movement occurs or there is low short-term foetal heart rate variability (less than 6 beats per minute) throughout the testing period (Devoe, 1999).

If a 20-minute period passes without any foetal movement, it may mean only that the foetus is sleeping. If the mother is given an oral carbohydrate snack, such as orange juice, her blood glucose level may increase enough to cause foetal movement. The foetus may be stimulated by a loud sound.

Because both rhythm strip and non-stress testing are non-invasive procedures and cause no risk to either mother or foetus, they can be used as screening procedures in all pregnancies. They can be done at home daily as part of a home monitoring program for the mother who is having a complication of pregnancy.

If a non-stress test is nonreactive, additional foetal assessment, such as a contraction stress test or biophysical profile test, will be scheduled.

***Vibroacoustic stimulation.*** In acoustic (sound) stimulation, an instrument such as an artificial larynx or a specially designed acoustic stimulator is applied to the mother's abdomen to produce a sharp sound, startling and waking the foetus. The instrument emits a sound level of approximately 80 dB at a frequency of 80 Hz.

During a standard non-stress test, if a spontaneous acceleration has not occurred within 5 minutes, a single 1-to-2-second sound stimulation is applied to the lower abdomen. This could be repeated again at the end of 10 minutes if no further spontaneous movement occurs, so two movements within the 10-minute window can be evaluated (Mandeville &Troiano, 1999).

***Contraction Stress Testing.*** With contraction stress testing, the foetal heart rate is analysed in conjunction with contractions were initiated by the intravenous infusion of oxytocin. However, once started, contractions begun this way were sometimes difficult to stop and led to preterm labour. For this reason, a source of oxytocin for current contraction stress testing is achieved by nipple stimulation. Gentle stimulation of the nipples release oxytocin in the same way as happens with breast-feeding.

With external uterine contraction and foetal heart rate monitors in place, the baseline foetal heart rate is obtained. Next, the mother rolls a nipple between her finger and thumb until uterine contractions begin, which are recorded by a uterine monitor. Three contractions with a duration of 40 seconds or more must be present in a 10-minute window before the test can be interpreted. The test is negative (normal) when no foetal heart rate decelerations are present with contractions. It is positive (abnormal) when 50% or more of contractions cause a late deceleration (a dip in foetal heart rate that occurs toward the end of a contraction and continues after contraction).

After a contraction stress test, encourage the woman to remain in the health care facility for about 30 minutes to be certain that contractions have quieted and preterm labour is not a risk.

***Ultrasound***
Ultrasound, or the response of sound waves against objects, is a much-used tool in modern obstetrics, although the recommendations for its use are changing because of unproven benefits in the face of added expense. it can be used to:

- Diagnose pregnancy as early as 6 weeks' gestation.
- Confirm the presence, size, and location of the placenta and amniotic fluid,
- Establish that the foetus is growing and has no gross defects, such as hydrocephalus, anencephaly, or spinal cord, heart, kidney, and bladder defects.
- Establish the presentation and position of the foetus (sex can be diagnosed if a penis is revealed).
- Predict maturity by measurement of the biparietal diameter.

Ultrasound is also used to discover complications of pregnancy, such as the presence of an intrauterine device, hydramnios or oligohydramnios, ectopic pregnancy, missed miscarriage, abdominal pregnancy, placenta previa, premature separation of the placenta, coexisting uterine tumors, multiple pregnancy, or genetic abnormalities such as Down syndrome. Foetal anomalies such as nueral tube defects, diaphragmatic hernia, or urethral stenosis also can be diagnosed. Foetal death can be revealed by a lack of heartbeat and respiratory movement. After birth, a sonogram may be used to detect a retained placenta or poor uterine involution.

With ultrasound, intermittent sound waves of high frequency (above the audible range) are projected toward the uterus by a transducer placed on the abdomen or in the vagina. The sound frequencies that bounce back can be displayed on an oscilloscope screen as a visual image. The frequencies returning from tissues of various thicknesses and properties present distinct appearances. A permanent record can be made of the scan.

The intricacy of the image obtained depends on the type or mode of process used. B-mode scanning is the process most frequently used and generally what people refer to as a sonogram. This mode allows pattern to merge and form a picture similar to a black-and-white television picture (called gray-scale imaging). Real-time mode involves the use of multiple waves that allow the screen picture to move. On this type of sonogram, the foetal heart can be seen to move, and even movement of extremities, such as the foetus bringing a hand to the mouth to suck a thumb, can be seen. A parent who is in doubt that her foetus is well or whole can be reassured by viewing a real-time sonogram image.

Before an ultrasound, the woman needs a good explanation of what will happen and reassurance that the process does not involve x-ray. This means it is also safe for the father of the child to remain in the room during the test.

For the sound waves to reflect best and the uterus to be held stable, it is helpful if the mother has a full bladder at the time of the procedure. To ensure this, she should drink a full glass of water every 15 minutes beginning an hour and half before the procedure and then not void before the procedure.

For the actual procedure, the mother lies on an examining table and is draped for privacy, but with her abdomen exposed. (To prevent supine hypotension syndrome, place a towel under her right buttock to tip her body slightly so the uterus will roll away from the vena cava). A gel is applied to her abdomen to improve the contact of the transducer. (Be certain the gel is room temperature or even slightly warmer or it can cause uncomfortable uterine cramping). Thetransducer is then applied to her abdomen and moves both horizontally and vertically until the uterus and its contents are fully scanned. Ultrasound also may be done using an intravaginal technique.

Although the long-term effects of ultrasound are not yet known, the technique appears to be safe for both mother and foetus. It appears to involve no discomfort for the foetus. Usually, the only discomfort for the mother is that the contact lubricant may be messy and she may experience a strong desire to void before the scan is completed. Taking home a photograph of the sonogram image can enhance bonding because it is proof that pregnancy exists and the foetus appears well.

**Biparietal Diameter**
Ultrasound may be used to predict fetal maturity by measuring the biparietal diameter (side-to-side measurement) of the fetal head. In 80% of pregnancies, when the biparietal diameter of the fetal head is 8.5cm or more, the infant will weigh more than 2,500g (5.5ib). biparietal diameter of 8.5cm indicates a fetal age of 40 weeks.

Two other measurements commonly made by sonography are head circumference (34.5cm is a 40weeks foetus) and femoral length.

**Electrocardiography**
Fetal EGGs may be recorded as early as the 11th week of pregnancy. The EGG is inaccurate before the 20th week, however, because until this time fetal electrical conduction is so weak that is easily masked by the mother's EGG tracing. It is rarely used unless a specific heart anomaly is suspected.

**Doppler Umbilical Velocimetry.** Dopplerultra stenography measures the velocity at which red blood cells in the Uterine and fetal vessels are travelling. Assessment of the blood flow through uterine blood vessels

in this way is helpful in determining the vascular resistance present in women with diabetes or hypertension of pregnancy and the resultant placental insufficiency that may occur. Decreased velocity is an important predictor of poor neonatal outcome

**Placental Grading.**Based particularly on the amount of calcium deposits in the base of the placenta, placentas can be graded by ultrasound as 0 (a placenta 12 to 24 weeks), 1 (30 to 32 weeks), 2 (36 weeks), and 3 (38 weeks). Because fetal lungs are apt to be mature at 38 weeks, a grade 3 placenta suggests that the fetus is mature.

**Amniotic Fluid Volume Assessment.** The amount of amniotic fluid present is an important fetal assessment measure because a portion of the fluid is formed by fetal kidney output. If a foetus is becoming stressed in utero so that circulatory and kidney functions are failing, urine output and, consequently, the volume of amniotic fluid also will decrease. A decrease in amniotic fluid volume puts the foetus at risk for compression of the umbilical cord and interference with nutrition (Magann *et al.,* 2000).

For gestation of less than 20 weeks, the uterus is hypothetically divided along the lineanigra into two vertical halves. The vertical diameter of the largest pocket of the amniotic volume index (total) is the sum of the two measurements.

For gestation of 20 weeks or more, the uterus is divided into four quadrants, using the lineanigra again as the vertical dividing line and the level of the umbilicus as the horizontal dividing line. The vertical diameter of the largest of the largest pocket of fluid in each quadrant is obtained, and the four values are then added to produce the amniotic fluid index. The average index is approximately 15cm between 28 and 40 weeks. An index greater than 20 to 24cm indicates hydramnios (excessive fluid, perhaps caused by inability of the foetus to swallow); an index less than 5 to 6cm indicates oligohydramnios (decreased amniotic fluid, perhaps caused by poor perfusion and kidney failure).

**Maternal Serum Alpha-Fetoprotein**
Alpha-fetoprotein is a substance produced by the fetal liver that is present in amniotic fluid and maternal serum if the foetus has an open spinal or abdominal defect, because the open defects allows more alpha-fetoprotein to appear. The level is low if the foetus has a chromosomal defect, such as Down syndrome; the reasons is unknown. Alpha-fetoprotein levels begin to rise at 11 weeks' gestation and then steadily increase until term. Traditionally assessed at the 15th week of pregnancy, due to new analysis techniques it is now feasible to analyze this as early

as the 11<sup>th</sup> week of pregnancy. Between 85% and 90% of neural tube defects and 20% of Down syndrome babies can be detected by this method.

### Triple Screening

Triple screening, or analysis of three indicators (maternal serum for alpha-fetoprotein, unconjugated estroil, and hcG), may be performed in place of alpha-fetoprotein testing alone to yield more reliable results (60% to 70% of Down syndrome babies). Like measuring maternal serum for alpha-fetoprotein, it requires only a simple venipuncture.

### Chorionic villi sampling

Chorionic villi sampling (CVS) is a biopsy and analysis of chorionic villi for chromosomal analysis done at 10 to 12 weeks of pregnancy. Because this is used almost exclusively for chromosomal analysis. **Coelocentesis** (transvaginal aspiration of fluid from the extraembryonic cavity) is an alternative method to remove cells for foetal analysis.

### Amniocentesis

**Amniocentesis** (from the Greek amnion for sac and kentesis for puncture) is the aspiration of amniotic fluid from the pregnant uterus for examination. The procedure can be done in a physician's office or an ambulatory clinic as early as the 12th to 13th week of pregnancy. Formerly, the procedure was delayed until the 14th to 16th weeks to allow for a generous amount of amniotic fluid to form. Refined analysis requires only 1 mL of fluid for analysis, so earlier intervention is possible. Amniocentesis also is used late in pregnancy to test for foetal maturity.

Amniocentesis is a technically easy procedure, but it can be frightening to a woman. Because it involves penetrating the integrity of the amniotic sac, there also is a risk to the foetus, although this is low. It can lead to complications such as haemorrhage from penetration of the placenta, infection of the amniotic fluid, and puncture of the foetus. There is some suggestion the procedure is associated with decreases lung function in the newborn. It can lead to irritation of the uterus, causing premature labour.

In preparation for amniocentesis, ask the woman to void (to reduce the size of the bladder, thus preventing advertent puncture). Place her in a supine position on the examining table and drape her appropriately, exposing only her abdomen. Place a folded towel under her right buttock to tip her body slightly to the left and move the uterus off the vena cava to prevent supine hypotension syndrome. Attach foetal heart rate and

uterine contraction monitors. Take the maternal blood pressure and the foetal heart rate for baseline levels.

Explain that a sonogram will be done to determine the position of the foetus, a pocket of amniotic fluid, and the placenta. Then her abdomen will be washed with an antiseptic solution, and a local anaesthetic will be given. Warn the client that she may feel a sensation of pressure as the needle used for aspiration, a 3-or-4-in, 20-to22-gauge spinal needle, is introduced. Do not suggest that she takes a deep breath and hold it as distraction against discomfort: this lowers the diaphragm against the uterus and shifts intrauterine contents.

The needle is inserted into the amniotic cavity over a pool of amniotic fluid, carefully avoiding the foetus and the placenta. A syringe is attached, and a chosen amount of amniotic fluid is withdrawn. The needle is then removed, and the woman rests quietly for about 30 minutes. During the procedure and for the 30 minutes afterward, assess the foetal heart rate monitor and uterine contraction monitor to be certain the foetal heart rate remains normal and no uterine contractions are occurring.

If the woman has Rh-negative blood, Rho(D) immune globulin (RhIG; RhoGAM) may be administered after the procedure to prevent foetal isoimmunisation. This is to ensure that maternal antibodies will not form against any placenta red blood cells that accidentally were released during the procedure.

Amniocentesis can provide information in a number of areas, described below.

**Colour.** Normal amniotic fluid is the colour of water; late in pregnancy, it may have a slightly yellow tinge. A strong yellow colour suggests a blood incompatibility (the yellow results from the presence of bilirubin released with the hemolysis of red blood cells). A green colour suggests meconium staining, a phenomenon associated with foetal distress.

**Lecithin/Sphingomyelin Ratio.** Lecithin and sphingomyelin are the protein components of the lung enzyme surfactant that the alveoli begin to form about the 22nd to 24th weeks of pregnancy. After amniocentesis, the lecithin/sphingomyelin ration may be determined quickly by a shake test or sent for laboratory analysis. A ratio of 2 to 1 is traditionally accepted as lung maturity.

Infants of mothers with severe diabetes may have false-mature readings of lecithin because the stress to the infant in utero tends to mature

lecithin pathways early. Foetal values must be considered in light of the presence of maternal diabetes, or the infant may be born with mature lung function but be immature overall (fragile giants) and thus may not do well in postnatal life. Some laboratories interprete a ratio of 2.5: or 3:1 as a mature indicator in these infants.

**Phosphatidyl Glycerol and DesaturatedPhosphatidylcholine.** These are other compounds, in addition to lecithin and sphingomyelin, that are found in surfactant. Pathways for these compounds mature at 35 to 36 weeks. Because they are present only mature lung function, when they are present in the sample of amniotic fluid obtained by amniocentesis, it can be predicted that respiratory distress syndrome will not occur.

**Bilirubin Determination.** The presence of bilirubin may be analysed if a blood incompatibility is suspected. If bilirubin is going to be analysed, the specimen must be blood-free or false-postive reading will occur.

**Chromosome Analysis.** A few foetal skin cells are always present in amniotic fluid. These cells may be cultured and stained for karyotyping.

**Foetal Fibronectin.** Fibronectin is a glycoprotein that plays a part in helping the placenta attach to the uterine deciduas. It can be found in abundant amounts in the amniotic fluid. Early in pregnancy, it can be assessed in the woman's cervical mucus, but the amount then fades until after 20 weeks of pregnancy, it is no longer present. As labour approaches and cervical or vaginal fluid. Damage to foetal membranes releases a great deal of the substance, so detection of fibronectin in the woman's vagina can serve as an announcement that preterm labour may be beginning (Miller & Paul, 2000).

**Inborn Errors of Metabolism.** Some inherited diseases caused by inborn errors of metabolism can be detected by amniocentesis. For a condition to be identified this way, the enzyme defect must be present in the amniotic fluid as early as the time of the procedure. Examples of illnesses that can be detected this way are cystinosis and maple syrup urine disease (amino acid disorders).

**Alpha-fetoprotein.** If the foetus has an open body defect, such as anencephaly, myelomeningocele, or omphalocele, increased levels of alpha-fetoprotein will be present in the amniotic fluid because of leakage of alpha-fetoprotein into the amniotic fluid. The level will be decreased in the fluid of foetuses with chromosomal defects such as Down syndrome. Acetylcholinesterase is a similar compound obtained from amniotic fluid in high levels if a neural tube defect is present.

### *Percutaneous Umbilical Blood Sampling*
Percutaneous umbilical blood sampling (also called cordocentesis or funicentesis) is the aspiration of blood from the umbilical vein for analysis. After locating the umbilical cord by sonography, a thin needle is inserted by amniocentesis technique into the uterus and is guided by ultrasound until it pierces the umbilical vein. A sample of blood is then removed for blood studies, such as a complete blood count, direct Coombs' test, blood gases, and karyotyping. To ensure that the blood obtained is foetal blood, it is submitted to a Kleihauer-Betke test. If a foetus is found to be anaemic, blood may be transfused using this same technique. Because the umbilical vein continues to ooze for a moment after the procedure, foetal blood could enter the maternal circulation, so RhIG is given to Rh-negative women to prevent sensitization. The foetus is monitored by a nonstress test before and after the procedure to be certain uterine contractions are not present and by ultrasound to see that no bleeding is evident. This procedure carries little additional risk to the foetus or mother over amniocentesis and can yield information not available by any other means, especially about blood dyscrasis.

### *Amnioscopy*
Amnioscopy is the visual inspection of the amniotic fluid through the cervix and membranes with an amnioscope (a small fetoscope). The main use of the technique is to detect meconium staining. It carries some risk of membrane rupture.

### *Fetoscopy*
**Fetoscopy,** visualizing the foetus by inspection through a fetoscope (an extremely narrow, hollow tube inserted by amniocentesis technique), is sometimes helpful in assessing foetal well-being. A photograph can be taken through the fetoscope to assure the parents that their infant is well and perfectly formed. The procedure may be used to:

- Confirm the intactness of the spiral column
- Obtain biopsy samples of foetal tissue and foetal blood samples
- Perform elementary surgery, such as inserting a polyethlyene shunt into foetal ventricles to relieve hydrocephalus or anteriorly into the foetal bladder to relieve a stenosed urethra.

The 16th or 17th week of pregnancy is about the earliest time in pregnancy that fetoscoppy can be performed. For the procedure, the mother is prepared and draped as for amniocentesis. A local anaesthetic is injected into the abdominal skin. The fetoscope is then inserted after a minor abdominalincision. If the foetus is very active, meperidine (Demerol) may be administered to the mother to avoid foetal injury by

the scope and to allow better observation. This drug crosses the placenta and sedates the foetus.

Fetoscopy carries a small risk of premature labour. Amnionitis (infection of amniotic fluid0 may occur. To avoid this, the mother may be prescribed 10 days of antibiotic therapy after the procedure. The number of procedures performed by fetoscopy is limited because of the manipulation involved and the ethical quandary of the mother's autonomy being compromised by the foetal needs if further procedures are necessary (e.g., asking the mother to undergo general anaesthesia so the foetus can have surgery).

### *Biophysical Profile*

A biophysical profile combines four to six parameters (foetal breathing movement, foetal tone, amniotic fluid volume, placental grading, foetal heart reactivity) into one assessment. By this system, each item has the potential for scoring a 2, so 12 would be the highest score possible. If only four parameters are used, 8 is a perfect score. A biophysical profile is more accurate in predicting foetal well-being than any single assessment. Because the scoring system is similar to that of the Apgar score determined at birth on infants, it is popularly called a foetal Apgar.

Biophysical profiles may be done as often as daily during a high risk pregnancy. If the foetus score on a complete profile is 8 to10, the foetus is considered to be doing well. A score of 4 to 6 denotes a foetus in jeopardy. More recently, some centers use only two assessments (the amniotic fluid index and nonstress test) for assessment. Referred to as a modified biophysical profile, it predicts short-term viability by the nonstress test and long term viability by the amniotic fluid index. Nurses play a large role in obtaining the information for both the modified and full biophysical profile by obtaining either the nonstress test or the sonogram reading (Manning, 1990; Tongsong et al., 1999).

**SELF-ASSESSMENT EXERCISE**

1.      When is a non-stress test considered non-reactive (abnormal)?
2.      With the aid of well labelled diagram, give a detailed description of the fetal circulation.(20marks)
a.      Diagram (2mrks)
b.      Labelling (5mrks)
c.      Description (10mrks)
d.      List the temporary structures of fetal circulation (3mrks)
3.      List various procedures for assessment of fetal growth and development (10mrks)

## 4.0    CONCLUSION

Fetal survival in the uterus is dependent on exchange of nutrients, oxygen, carbon dioxide and this start as early as the 3<sup>rd</sup> week. The foetus achieved this through specialized structures and by its own circulation. A number of temporary structures are equally involved in these activities in uterus.

## 5.0    SUMMARY

The union of a single sperm and egg (fertilization) signals the beginning of pregnancy. The fertilized ovum (zygote) travels by way of a fallopian tube to the uterus, where implantation takes place in about 8 days. From implantation to 5 to 8 weeks, the growing structure is called an embryo. The period following this until birth is the foetal period.

- Growth of the umbilical cord, amniotic fluid, and amniotic membranes proceeds in concert with foetal growth. The placenta produces a number of important hormones: oestrogen, progesterone, chorionic somatomammotropin, and human chorionic gonadotropin.
- Various methods to assess foetal growth and development include fundal height, foetal movement, foetal heart tones, ultrasound, magnetic resonance imaging, alpha-fetoprotein, analysis, amniocentesis, percutaneous umbilical blood sampling, amnioscopy, and fetoscopy.
- A biophysical profile is a combination of foetal assessment that better predicts foetal we-being than single parameters.

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## MODULE 4        PHYSICAL AND PSYCHOLOGICAL CHANGES OF PREGNANCY

Unit 1        Physiological changes in Pregnancy
Unit 2        Psychological changes in Pregnancy

## UNIT 1        PHYSIOLOGICAL CHANGES IN PREGNANCY

## CONTENTS

1.0    Introduction
2.0    Objectives
3.0    Main Content
       3.1    Anatomy and Physiology of Pregnancy
       3.2    Physiological changes in different systems
4.0    Conclusion
5.0    Summary
6.0    Tutor Marked Assignment
7.0    References/Further Reading

## 1.0    INTRODUCTION

Can you recognize early pregnancy signs in a woman even before pregnancy tests are carried out? Are your guesses always right at the long run? For mothers amidst us, we know physiological adaptation to pregnancy is dramatic, but the timing and intensity of changes vary between systems. These are however designed to enable the pregnant woman to nurture the baby in utero and prepare the woman for labour and lactation.

Mothers in this class will attest to the fact that pregnancy bring with it all round changes; both physiologically and psychologically. This changes will be felt, not only by the mother, but by the whole family. It is therefore important for you to know, identify and assess these changes in order to guide pregnant mothers and their family through all the stages of pregnancy, in order to ensure safe delivery. In this module, you will learn about the anatomy and physiology of pregnancy, the physiological and psychological changes in pregnancy.

## 2.0    OBJECTIVES

At the end of this unit, you should be able to:
•     identify physical changes in pregnancy
•     explain the psychological changes seen in pregnancy

- explain the anatomy and physiology of pregnancy
- list and differentiate the diagnosis and signs of pregnancy

## 3.0 MAIN CONTENT

## 3.1 Anatomy and Physiology of Pregnancy

Fertilization occurs as a result of the male (sperm) and female (ovum) gamete to form the zygote. This occurs at the ampulla of the fallopian tube. Cell division takes place as the zygote moves into the uterus, the initial stage of cell division morula is formed, a fluid cavity blastocele appears in the morula to form blastocyst. Outside the blastocyst, a single layer of cell formed known as the trophoblast, the remaining cells clump together at one end forming the inner cell mass, the trophoblast latter develops into the placenta and chorion. The trophoblast becomes sticky and adheres to the endometrium, this embedment is usually complete by the 11$^{th}$ day after ovulation.

The endometrium is known as decidua during pregnancy. Oestrogen causes the endometrim to grow four times its non-pregnant thickness. Corpus luteum produces progesterone in large quantity amount which stimulates secretory activity of the endometrial glands and increase its blood supply, this makes the endometrium soft, vascular and spongy for the fertilized ovum to implant.
The deciduas underneath the blastocyst are the basal, the one that covers it is the capsular deciduas, and the remaining is called the parietal or decidua. Embryo grows and fills the uterine cavity.

Trophoblast- Small projections appear all over the blastocyst. These cells differnciate into three layers;

- The outer synctiotrophoblast,
- The Inner cytotrophoblast, and
- The layer mesoderm.
- The outer synctiotrophoblast: Is a layer of nucleated protoplasm, it erodes the walls of the blood vessels of the deciduas.
- The Inner cytotrophoblast: Is a well defined layer of cells that produces human chorionic gonadotropin.
- The layer mesoderm: Is a layer of loose connective tissue.
- Inner cell mass: Develops to form the fetus itself, the cell differentiates into;
- Ectoderm; Forms the skin and nervous system
- Mesoderm; Forms bones, muscles, heart, and blood vessels.
- Endoderm; Forms mucous membranes and glands. These layers are known as the embryonic plate.

-       Amoniotic Cavity; Lies on the side of the endoderm filled with fluid which gradually enlarges to enclose the embryo.
-       The yolk sac lies on the side of the endoderm and provides nourishment for the embryo until the trophoblast takes over.

## 3.2    Physiological changes in different systems

**Myometrium**- Grows by hyperplasia (increase in size). It increases in weight from 50 to 60 grams prior pregnancy to1000grams. The size increases from 7.5×5×2.5cm to 30×22.5×20cm at term, the walls increases and becomes thicker and less firm from 1cm to 2.5cm by 4 months. The myometrium is both contractile and elastic to accommodate the growing fetus allow involuntion following the birth. Uterine activity occur every 20-30 minutes, this facilitate uterine blood flow through promoting oxygen delivery to the fetus actively contracting upper uterine segment becomes thicker and shorter in length and pulls the relatively fixed cervix causing the cervical stretching and ripening known as effacement.

**The perimetrium** become longer and wider there is considerable hypertrophy and stretching which may cause discomfort.
Blood Supply: As a result of increased cardiac output, uterine blood flow increases from 50ml/min at 10 weeks of pregnancy to 450-700ml/minute at term. The coursing of blood through enlarged and increasingly coiled arteries produces uterine soufflé.
At 12th week, the uterus rotates to the right so that the left margin of the uterus anteriorly electro-rotate.

16th week; isthmus and cervix develops into the lower uterine segment which is thinner and contain less muscle and blood vessels.
20th week; fundus of the uterus can be palpated at the level of the umbilicus uterus becomes cylindrical or ovoid in shape.
30th week, fundus may be palpated midway between the umbilicus and the xiphisternum.
38th week, uterus now reaches the xiphisternum upper segment muscle contractions increase in frequency and strength, lower uterine.

**The Cervix**
Remains firmly closed providing a seal against external contamination and holding the content of the uterus. It becomes softer and swollen under the influence of oestradiol and progesterone, increase vascularity makes it bluish in colour increase in complexity result in secretion of thick, viscous mucoid discharge which forms the cervical plug (perculum). Taking up of the cervix effacement occurs in the

primigravida during the last two (2) weeks of pregnancy and in the multigravida when labour begins.

**The Vagina**
There is hypertrophy oestrogen causes the epithelium to become thicker and more vascular epithelial cells release more glycogen which is acted on by Doderlein's bacilli to produce lactic acid and hydrogen peroxide. This leads to increased and more acidic white vaginal discharge which provides extra protection against ascending infection but <u>Candida Albicans</u> can easily establish themselves resulting in vaginitis.

**The Heart**
The heart enlarges by 12% in pregnancy. Growing uterus elevates the diaphragm great vessels are unfolded and the heart is displaced upward with the apex moved laterally to the left.
Cardiac output increases from 35 to 50% from an average of 5L/min to 7L/min by the 20th week. The uterus receives 3% of cardiac output in early pregnancy and 17% at term. Increase in heart rate begins in the 7th week and is increased by 10-20% by the third trimester heart rate increases from 75 to 90 beats per minutes.

**Blood**
Blood pressure: Cardiac output is raised but arterial pressure is reduced by 10% decreased in peripheral vascular resistance begins at 5 weeks of gestation. In early pregnancy, there is marked decrease in diastolic blood pressure but little change in systolic pressure with reduced peripheral vascular resistance. The systolic blood pressure falls by an average of 5-10 mmHg below baseline levels and the diastolic pressure falls 10-15 mmHg by 24 weeks gestation, thereafter blood pressure gradually rises returning to the pregravid levels at term. Supine position decreases cardiac output by 25%.

Compression of the inferior vena cava by growing uterus in the late second and third trimesters resulting in reduced venous return which decreases stroke volume and cardiac output, if the paravertebral vessels and other vena caval collaterals are not well developed and perfused pregnant woman may suffer from supine hypotensive syndrome, (which consists of headedness, nausea and syncope.
Blood Flow

Is slow in late pregnancy poor venous return and increased venous pressure in the legs contribute to increased distensibility and pressure in the veins of the legs vulva return and pelvis leading to dependent oedema, varicose veins of the legs and vulva and haemorrhoids.

Blood Volume

The total maternal volume increases 30-50% in single ton pregnancies. In the first pregnancy, it may increases by 50% over the course of the pregnancy in first pregnancy blood volume but the subsequent pregnancies; it may increase by about 1500ml. Red cells in calculation increases during pregnancy in response to extra oxygen requirements of maternal and placental tissue. Iron demand increases from 2 to 4mg daily coagulation factors vii, viii and x are increased. Total white cell count rises and reaches its peak at 30 weeks. Serum levels of immunoglobulins IgA, IgG, and Igm decrease steadily from $10^{th}$ week of pregnancy and reach the lowest level at 30 weeks until term.

**Respiratory System**

Blood volume expansion and vasodilation of pregnancy results in hyperaemia and oedema of the upper respiratory mucosa which is predispose the woman to nasal congestion, epistaxis and voice changes. Anteroposterior and transverse diameters by 2cm resulting in 5-7cm expansion of the chest circumference, lung capacity are reduced by 5% due to diaphragm elevation. Tidal volume increases from 30 to 40%, expiratory reserve volume and residual volume are decreased by 20%.

Alveolar oxygen partial pressure and arterial oxygen partial pressure ($PaO_2$) increases from 98-100mmHg to 101-104mmHg. Hyperventilation of pregnancy causes 15-20% decrease in maternal arterial carbondioxide partial pressure ($PaCO_2$) from 5kg in non-pregnant woman to 6kpaas fetal carbondioxide gradient increases (campbell and less 2000).

**Urinary System**

Renal blood flow increases by as much as 70-80 percent by the second trimester and decreases slowly after 30 weeks. The kidney enlarge, glomerular filtration increases plasma levels of urea, uric acid and creatinine falls, protein and amino acids are less efficiently absorbed glucose excretion increases due to increased glomerular filtration urinary output diminishes urine of pregnant women is more alkaline in early pregnancy increases production of urine causes frequent micturition in later stage pressure of the growing uterus on the bladder ureters become relaxed and elevated, elongated and curved above the brim of the pelvis due to influence of progesterone , the ureters may compressed against the pelvis brim resulting into stasis of urine and urinary tract infection. Bladder vascularity increases and its capacity reduced (Cunningham et al., 1989).

**Gastrointestinal System**

The mouth and gum become oedematous, soft and spongy. There is increased salivation around 4-8 weeks nausea and vomiting may be

experienced due to relaxation of smooth muscles of the stomach and hypomotility, change in the sense of taste can occur craving for bizarre substances such as coal may be experienced, there is increase inthrust due to fall in plasma osmolarirty and rising levels of prolactin enlarging uterus displace the stomach and intestines. Heartburn is quite common due to reflux.

Constipation which is caused by mechanical obstruction by the uterus and relaxing effect of progesterone on smooth muscles occur. Gall bladder increases in size and empties more slowly serum albumin levels fall progressively throughout pregnancy, serum alkaline phosphate level rise. Progressively, serum cholesteronl levels and liver proteins are raised fibrinogen levels are increased by 50% by the end of the second trimester, (Jacob, 2008).

**Metabolic**
Fasting plasma glucose concentration falls during the first trimester rises between 16 and 32 weeks, then fall again towards term. Insulin secretion corresponding rises in the second trimester and then fall again towards to non-pregnant levels towards term. Nutritional demands of the fetus increases in the second half of pregnancy and insulin resistance increases, mobilization of fat store laid down in the first half of pregnancy occurs proving the mother with extra energy.

Plasma calcium concentration falls as a result of both fetal needs and normal haemodilation of pregnancy.

**Maternal Weight Changes**
In a primigravida the expected increase in weight is,
- 4.0 kg in first 20 weeks,
- 8.5kg in second 20 weeks, (0.4kg per week in the last trimester)
- The appropriate total is 12.5kg
- The average weight gain in multigravida is approximately 1kg lessthan in the primigravida.

**Skeletal Changes**
Relaxation of pelvic ligaments and muscles occurs because of the influence of oestrogen and relaxin. The symphysis pubis widens by about 4mm by 32 week gestation and the sacrococcygeal joint loosens, allowing the coccyx to be displaced backwards teeth are prone to decay due to calcium deficiency as a result of increased demand for calcium by the growing fetus.

**Skin Changes**

Increase activity of the melanin stimulating hormone from the pituitary causes various degrees of pigmentation in pregnant woman from the end of second month until term, depth of pigmentation varies according to skin colour and race, areas mostly affected are the areolae of the breasts, the abdominal midline the perineum and the axillae, irregular brownish discolouration of the fore head, nose, cheeks and neck knowns the mask of pregnancy or chloasma.

## Breast Changes

Breast increase in size and sensitiveness bluish discolouration appears in the form of streaks nipple becomes more erectile with the areola more deeply pigmented prominent tubercles, montgomery's follicles appear in the primary areola.

## Changes in the Endocrine System

Placental Hormones - Human Placental Lactogen stimulates the growth of breasts, has effect on metabolism, raised oestrogen levels increase production of globulins that bind thyroxine and corticosteroids and the sex steroids.

Posterior Pituitary Gland (OXYTOCIN):

Posterior pituitary gland releases oxytocin. In low frequency, the secretion of prolactin, adrenocorticotrophic hormone and melanocyte-stimulating hormone increases. Follicle stimulating hormone and luteinizing hormone secretion is greatly inhibited by placental progesterone and oestrogen, (Jacob, 2008).

## Diagnosis and Signs of Pregnancy

Diagnosis of pregnancy in the first trimester and early second trimester is based on a combination of presumptive and probable signs of pregnancy and self-evident later in gestation when the positive signs of pregnancy are readily observed.

## Presumptive signs

These are maternal physiological changes which indicates she is pregnant such as;
- Abrupt cessation of menstruation (amenorrhea) at $4^{th}$ week.
- Nausea and vomiting (morning sickness) from $4^{th}$-$14^{th}$ weeks.
- Tingling tenseness, enlargement of the breasts and nipples.
- Frequency of micturition around $6^{th}$-$12^{th}$ weeks.
- Fatigue.
- Appearance of montgomery's tubercle.
- Colour changes of breast; darkening of the nipples primary and secondary areolar.

- Continued elevation of basal body temperature in the absent of infection.
- Skin pigmentation and conditions such as chloasma, breast and abdominal striae linea nigra and palmar erythema.
- Quickening (first movement felt by the mother around $18^{th}$ – $20^{th}$ weeks.

**Probable Signs:**
These are maternal physiological changes other than presumption signs which are elevated upon examination and documented by the examiner such as;

- Enlargement of the uterus.
- Change in shape of the uterus.
- Presence of human chorionic gonadotrophic hormone in the blood at $4^{th}$ -$12^{th}$ week and in the urine $6^{th}$- $12^{th}$ week.
- Jacquemier's sign/Chadwick's sign; There is violet blue discolouration of the vulva and vaginal mucosa due to increased vascularity evident by 6 weeks gestation.
- Osiander's sign; pulsation in the lateral fornices at $8^{th}$ week.
- Goodell's sign; softening of the cervix from a non-pregnant state of firmness similar to the tip of a nose to the softness of lips in the pregnant state.
- Presence of Braxton Hick's contraction at $16^{tt}$ week.
- Ballotement of fetus at $16^{th}$ to $28^{th}$ week.

**Positive Signs**
These are signs attributable to the fetus as detected and documented by the examiner such as;

- Visualisation of the fetus by ultrasound (6 weeks+).
- Visualisation of fetal skeleton by x-ray $16^{th}$.
- Fetal heart sounds by ultrasound at $6^{th}$ week.
- Fetal heart sounds with fetoscope at $20^{th}$ week.
- Palpable fetal movements at $22^{nd}$ week.
- Visible fetal movements in late pregnancy.
- Palpation of fetal parts at $24^{th}$ week+

**SELF-ASSESSMENT EXERCISE**

i.   List and discuss the various physiological changes that occur during pregnancy.
ii.  Discuss the signs of pregnancy.

## 4.0   CONCLUSION

Fertilization occurs as a result of the male (sperm) and female (ovum) gamete to form the zygote. This occurs at the ampulla of the fallopian tube. Cell division takes place as the zygote moves into the uterus, the initial stage of cell division <u>morula</u> is formed, a fluid cavity blastocele appears in the morula to form <u>blastocyst</u>. Outside the blastocyst, a single layer of cell formed known as the <u>trophoblast</u>, the remaining cells clump together at one end forming the <u>inner cell mass</u>, the trophoblast latter develops into the placenta and chorion. The trophoblast becomes sticky and adheres to the endometrium, this embedment is usually complete by the 11<sup>th</sup> day after ovulation.

## 5.0    SUMMARY

The endometrium is known as <u>decidua</u> during pregnancy. Oestrogen causes the endometrim to grow four times its non-pregnant thickness. Corpus luteum produces progesterone in large quantity amount which stimulates secretory activity of the endometrial glands and increase its blood supply, this makes the endometrium soft, vascular and spongy for the fertilized ovum to implant.

## 6.0    TUTOR-MARKED ASSGNIMENT

For Mothers; Share how you coped with changes when you were first pregnant at the group discussion.
For other group members; Discuss with your group, how you can help primigravidas to cope with changes in pregnancy.

## 7.0    REFERENCES/FURTHER READING

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## UNIT 2    PSYCHOLOGICAL CHANGES IN PREGNANCY

**CONTENTS**

## 1.0    INTRODUCTION

What was your first reaction when you realized you were pregnant with your first baby? Mothers react differently to pregnancy and this depends on several factors. Pregnancy is a turning point in a family's life, accompanied by stress and anxiety whether the pregnancy is desired or not. For beginning families, pregnancy is the transition period from childlessness to parenthood. If the pregnancy results in birth of a child, the couple enters a new, irreversible stage of their life together (London, Ladewig, Ball, Blinder and Cowen, 2011).

## 2.0 OBJECTIVES

At the end of this unit, you should be able to:

- discuss the psychological changes in pregnancy
- discuss the psychological tasks in pregnancy.
- list and discuss the minor disorders in pregnancy.

## 3.0 MAIN CONTENT

## 3.1 Psychological changes in Pregnancy

Pregnancy can be viewed as a developmental stage with its own distinct developmental tasks. For a couple it can be time of support or conflict, depending on the amount of adjustment each is willing to make to maintain the family's equilibrium.

Pregnancy can be considered as maturational crisis, as it is a common event in normal growth and development of the family. If the crisis, is not resolved it will result in maladaptive behaviours in one or more family members and possible disintegration of the family.

**The Mother**
Pregnancy alters body image and necessitates reordering of social relationships and changes in roles of family members.
First Trimester - feelings of disbelief and ambivalence are paramount, she focuses on self and her pregnancy symptoms such as breast tenderness of morning sickness are unsettling and at times unpleasant, she becomes increasingly introspective and passive mood swings from joy to despair occur.

Second Trimester: Quickening occur which gives the perception of fetal movement helps the woman to think of her baby as a separate person. The woman becomes introspective as she evaluates her life, plans and her child's future. This helps her to prepare for her new mothering role. In some instances partner may withdrawal which may be distressing to the woman. As pregnancy become noticeable she feels great pride, embarrassment or concern. Women generally feel best during the second trimester because it is a relatively tranquil time.

Third Trimester:- The woman feels pride about her pregnancy and anxiety about labour and birth, physical discomforts increases and she is eager for the pregnancy to end, she experiences increased fatigue and interest in sexual activity decrease. There is usually a surge of energy as the woman prepares a nest for the infant (London et al 2011).

**The Father**
Pregnancy is psychologically stressful fathers anxiety often stem from inadequate preparation, this can be addressed by recognizing paternal needs and including fathers for more in antepartal education (Deave, Johnson and Ingram, 2008).

First Trimester: There is initial excitement on announcement of the pregnancy after which the father begins to feel left out, he may be confused by his partners mood changes, resent attention she receives and her need to modify relationship as she experiences fatigue possibly decreased interest in sex.

Second Trimester:  Pregnancy still appears vague but his involvement may increase as he watches and feels fetal movement and listen to fetal heartbeat during prenatal visit. The father needs to confront and resolve some of their conflicts about the parenting they received. An open, honest discussion about the expectations the parents have about their roles will help the father to be in his transition to fatherhood (Goodman, 2005).

Third Trimester: Concerns and fear may recur, he may worry about hurting the unborn baby during intercourse or become concerned about labour and birth. He may also wonder what kind of parents he and the parent will be.

**Siblings**
Bringing a new baby home often marks the beginning of sibling rivalry because the siblings views the baby as a threat to the security of their relationships with their parents constructive action can minimize the problem of sibling rivalry, consistency is important in dealing with young children.

## 3.2    Psychological Tasks in Pregnancy

Rubin (1984) identified four major tasks that the pregnant woman undertakes to maintain her inactiveness and that of her family which forms the foundation for a mutually gratifying relationship with her infant;

**Ensuring safe passage through pregnancy labour and birth: -**

-        She looks for competent maternity care to provide a sense of control
-        Seeks information from literature, observation of other pregnant women, new mothers and their discussions with other.

- Engages in self care activities related to diet, exercise, alcohol consumption.
- In the third trimester she becomes more aware of external threats in the environment.
- Sleep becomes more difficult she longs for birth even though it is frightening.

**Seeking Acceptance of this child by others**;
- Woman slowly and subtly alters her network to meet the needs of her pregnancy.
- Mother seeks to work to ensure acceptance of the coming child by the sibling.
- Parents support and acceptance help to form a maternal identity.

**Seeking Commitment and Acceptance of herself as mother to the infant** (**binding – in**)
- Strong emotional component, motivates the pregnant woman to become competent in her role and provides satisfaction for her in the role of mother.

**Learning to Give of oneself on behalf of one's child:-**
- Woman learns to delay immediate personal gratification to meet the needs of another.

**Minor Disorders in Pregnancy**
Minor disorders may occur in pregnancy hormonal changes, accommodation changes, metabolic and postural changes as every system of the body is affected by pregnancy.

### 4.2.2.6.1 Digestive System
Nausea and vomiting –
Occurs in 50 percent women between the $4^{th}$ and $6^{th}$ week of gestation
Cause – Hormonal influences, human chorionic gonadotrophin oestrogen and progesterone are all contributors. Smell of food may cause the mother to retch.
Helpful practices
- Eating of carbohydrate snacks at bedtime prevents hypoglycemia
- Dry toast and biscuit on waking up and breakfast after half an hour
- Salads and light snacks are more tolerable than full meals

**Heartburn**
Burning pain in the mediastinal region caused by reflux of stomach contents into the oesophagus. Occurs as the cardiac sphincter relaxes during pregnancy due to the effect of progesterone.

**Helpful practices**

- If heartburn is occasional, reflux can be prevented by avoiding bending and kneeling.
- Small meals that are easily digested should be taken.
- Fried and fatty foods should be avoided
- Antacids as prescribed by physician may be used

Excessive Salivation

Occurs 8$^{th}$ week of gestation usually accompanies heartburn

Pica

Craving of mothers for certain foods or substances such as coal

Cause is unknown. If the substances craved for are harmful to the unborn baby. Medical advice should be sought

Constipation

Is due to relaxant effect of progesterone on the smooth muscles causing decreased peristalsis pressure of the gravid uterus on the colon makes it worse near term.

Helpful practices

- Increase the intake of water
- Add green leafy vegetables, fruits and bran cereals to diet
- Take a glass of water early in the morning before breakfast to activate the gut and help regular bowel movements
- Regular exercise

**Musculoskeletal**

- Backache

The gradual weight gain and change in the body's center of gravity combined with the stretching of weak abdominal muscles often leads to hollowing of the lumbar spine

Helpful practices

- Advice relating to comfortable positions in sitting, standing, lying, general mobility and how to lift correctly
- Pillows should be placed to support the whole limb

- Cramps

Cramps has been attributed to deficiency of vitamin $B_1$ and decreased levels of calcium. These are quite common usually in the leg and worse at night.

Helpful practice

- Gentle leg movements whilst in a warm bath prior to settling for the night
- Sleep with the foot end of the bed elevated by 20-25cm
- Take vitamin B complex and calcium supplements
- Once cramp has occurred gentle kneading is effective

**Genito-urinary System**
- Frequent Micturition

Occurs in first trimester where there is pressure of the gravid uterus on the urinary bladder it is spontaneously relived when the uterus rises up in the abdomen it may recur late in pregnancy when the fetal head descends into the pelvic.
- Leucorrhea

Increased white non-irritant vaginal discharge in pregnancy.
Frequent washing of the vulva (3-4timesa day) with plain water would be sufficient.
She should wear cotton underwear and avoid tights
Midwife should exclude possibility of infection such as thrush and trichomonas.


**Circulatory System**
- Fainting

In early pregnancy fainting may occur due to vasodilation under the influence of progesterone. It may subside following the compensatory increase in blood volume. Later in pregnancy a mother may feel faint while lying flat on her back because the weight of the uterine content presses on the inferior vena cava and slows the return of blood to the heart. Turning the mother quickly on to her side bring rapid recovery.
- Variscosities

Progesterone relaxes the smooth muscles of the veins and results in sluggish circulation valves of the dilated veins become inefficient and varicosities result mostly in legs, anus haemorrhoids and vulva.
Helpful practices
- Exercising the calf muscles by rising on to the toes or making circling movements with the ankles.
- Resting with the legs vertical against the wall for a short time.
- Wearing support tights before rising or after resting with legs elevated.

When haemorrhoids occur advise to;
- Avoid constipation by including fiber in the diet and adequate fluids.
- Seek medical advice for tropical applications for vulva varicosities panty – girdle or sanitary pad may give support
- Edema

It results from venous and lymphatic stasis blood pressure of the woman should be checked to rule out pregnancy induced hypertension. Advise to elevate the legs, sleep in left lateral position and avoid sitting with the feet hanging down

**Intergumentary System**
- Skin

Some mothers complain of generalized itching, which often starts over the abdomen this is thought to have some connection with the liver's response to the hormones in pregnancy and with raised bilirubin levels.

It clears soon after the baby is born and comfort can be gained from local applications. Antihistamine may be prescribed if there is vulva irritation, infection such as thrush and glycosuria as a result of diabetes must be excluded. Washing with mild soap and cotton underwear may ease the irritation.

**Nervous System**
- Carpal Tunnel Syndrome

Mothers complain of numbness and pins and needles' in their fingers and hands. It usually happens in the morning. Wearing a splint at night with the hands resting on two or three pillows sometimes helps. Restriction of salt intake and flexing the fingers while the arm is held above the head can be helpful. The syndrome resolves spontaneously following delivery.

Bell's palsy a rare condition may develop in last trimester due to oedema compressing the facial nerve. It resolves in 3 to 4 weeks following delivery.

- Insomnia

Occurs due to discomfort caused by fetal movements, frequency of micturition and difficulty in finding a comfortable position. The woman should be advised to;

- Take rest in the afternoon
- Drink a glass of warm milk at bed time
- Tuck a pillow under the abdomen when lying in a lateral position
- Talk about her fears and anxieties so that she can have a sense of normality and lightness

**SELF-ASSESSMENT EXERCISE**

i. List the disorders of pregnancy -Explain the causes and measures for the relief of discomforts
ii. Outline the disorders that can possibly ameliorate the disorders requiring immediate intervention
iii. Discuss how emotional and psychological changes that commonly occur in a woman and her family during pregnancy can be addressed and provide necessary management.

*Notes on the Self Assessment Questions*
We have looked into the psychological changes in pregnancy and the tasks, which includes ensuring safe passage through pregnancy ,labour and birth; seeking acceptance of this child by others; acceptance of herself as the mother of the infant; learning to give oneself on behalf of one's child. Also the minor disorders in pregnancy such as disorders in the digestive system(e.g. Nausea and Vomiting, Heartburn, constipation and excessive salivation); Musculoskeletal, Urinary Circulatory and Nervous disorders were discussed. I do hope that the information here will make a better understanding of this subject matter.

## 4.0    CONCLUSION
Pregnancy can be viewed as a developmental stage with its own distinct developmental tasks. For a couple it can be time of support or conflict, depending on the amount of adjustment each is willing to make to maintain the family's equilibrium.

## 5.0    SUMMARY
Pregnancy can be considered as maturational crisis, as it is a common event in normal growth and development of the family. If the crisis, is not resolved it will result in maladaptive behaviours in one or more family members and possible disintegration of the family

## 6.0    TUTOR-MARKED ASSIGNMENT

Interview five pregnant women in your community on how they feel about their pregnancy and why they feel that way.

## 7.0    REFERENCES/FURTHER READING

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# MODULE 5      ASSESSMENT OF FETAL AND MATERNAL WELLBEING DURING PREGNANCY

Unit 1       Prenatal Care
Unit 2       Assessment of fetal wellbeing
Unit 3       Maternal Nutrition

# UNIT 1      PRENATAL CARE

**CONTENTS**

1.0     Introduction
2.0     Objectives
3.0     Main Content
       3.1     First antenatal visit in pregnancy
       3.2     Other tests that may be considered
       3.3     Subsequent visits during the antenatal period
       3.4     Late pregnancy tests of fetal well-being
4.0     Conclusion
5.0     Summary
6.0     Self -Assessment Exercise

## 1.0    INTRODUCTION

As a midwife, it is important to know that pregnancy is a time of many physiologic and psychological changes that can positively or negatively affect the woman, her fetus, and her family. Misconceptions, inadequate information, and unanswered questions about pregnancy, birth, and parenthood are common. The ultimate goal of any pregnancy is the birth of a healthy newborn. Nurses play a major role in helping the pregnant woman and her partner achieve this goal. Therefore, ongoing assessment and education are essential.

Once a pregnancy is suspected and, in some cases, tentatively confirmed by a home pregnancy test, women are usually advised to seek prenatal care to promote a healthy outcome. In this unit, you will learn about the assessments to be done in the first antenatal visit and for other subsequent visits.

## 2.0    OBJECTIVES

At the end of this unit, you should be able to:

- explain prenatal care
- assess the wellbeing of a fetus
- explain how maternal nutritional needs
- to explore the clinical signs and skills associated with the assessment of maternal and foetal well-being.
- to enhance awareness of the particular skills that may be needed when care of a woman and her baby becomes more complex.
- to practice the skills related to detection of deviation from the normal and clinical judgment and decision making that is associated with caring for women with more complex care requirements.
- to facilitate discussion and debate in smaller groups in relation to caring for women with complex needs.

## 3.0    MAIN CONTENT

## 3.1    First Antenatal Visit in Pregnancy

All women should be advised to attend in early pregnancy with a view to:
1.    Confirming pregnancy and establishing an estimated date of confinement (albeit that may alter after subsequent ultrasound examinations);
2.    A comprehensive clinical assessment in order to determine any clinical conditions that may be of relevance to the pregnancy; with a view to planning the management of these conditions; and
3.    Obtaining general advice regarding common issues of concern in early pregnancy**.**

**Clinical assessment**
As always, of greatest importance is a careful medical history and thorough clinical examination. Height and weight should be recorded, and BMI calculated.

**The following investigations are recommended (in the absence of specific complications):**

**Full blood examination**
Particular note should be taken of the Mean Corpuscular Volume as a potential indicator of an underlying Haemoglobinopathy.

**Blood group and antibody screen**
Where the blood group has already been performed it does not need to be repeated. However, the antibody screen should be repeated at the beginning of each pregnancy.

**Rubella antibody status**
All women should have their rubella antibody titre measured for each pregnancy. Although the past antibodies titres from a previous pregnancy screens may have been used to exclude a further antenatal test, there is evidence that levels may decline, particularly following immunization as compared to natural infection. This is particularly so given the low level of wild virus circulating in the community to boost women whose levels may fall below that of protection.

**Syphilis serology**
Syphilis testing should be performed by screening with a specific treponema pallidum assay, for example, Treponema pallidum haemaglutination assay (TPHA) or the Treponema pallidum particle assay (TPPT). The non-specific Treponema pallidum assays, such as rapid plasma regain (RPR) test, although cheaper, are less likely to pick up latent infection.

**Midstream urine**
Biochemical analysis and culture.

**HIV**
Before instituting screening for any viral infection in pregnancy, it is imperative that the woman is provided with appropriate counselling as to the limitations of screening for viral infections in pregnancy and the implications of both positive and negative findings. All pregnant women should be recommended to have HIV screening at the first antenatal visit.

**Hepatitis B serology**
All pregnant women should be recommended to have Hepatitis B screening in pregnancy. Women found to be chronic carriers of Hepatitis B, should have an assessment of their antigen and viral replicative status (viral load) with liver function tests performed, and be referred for specialist support.

**Hepatitis C serology**
All pregnant women should be advised to have Hepatitis C screening in pregnancy. Women who are known to be Hepatitis C antibody positive should have liver function tests performed and an assessment of their viral load (Hepatitis C RNA PCR).The viral load helps predict the risk

of perinatal transmission, being rare if Hepatitis C RNA PCR is negative at delivery but approximately a 6% risk if positive, proportional to the viral load. Consider referral to an Infectious Disease specialist for counselling and planning postnatal follow up. This is a contentious area of practice, where some overseas centres do not screen for Hepatitis C in pregnancy because treatment is not recommended during pregnancy.

**Varicella**
Consideration should be given to checking varicella antibodies at the first visit where there is no history or uncertain history of previous illness.

**Cervical cytology**
A cervical (Pap) smear should be recommended at the first antenatal visit if this would fall due during the pregnancy, according to cervical screening guidelines. There is no evidence to suggest that a Pap smear in pregnancy is harmful.

## 3.2    Other Tests that May be Considered

**Screening for haemoglobinopathies**
Each unit should have a defined policy for screening for haemoglobinopathies, taking into account the ethnic mix of patients screened. As a minimum, all women should be screened with Mean Corpuscular Volume (MCV) and Mean Corpuscular Haemoglobin Concentration (MCHC). Haemoglobin electrophoresis and iron studies should be performed in the event of thresholds not being reached. Consideration should also be given to the further screening of patients with DNA analysis for alpha-thalassaemia. Testing of normal-MCV women for haemoglobinopathies may be considered if they are members of high-risk groups.

**Vitamin D**
Pregnant women at risk for vitamin D deficiency should be tested in early pregnancy OR provided with vitamin D supplementation.

**Cytomegalovirus (CMV)**
Screening for CMV infection in pregnancy is currently not recommended as a routine.

**TSH**
Routine screening for subclinical thyroid disease remains controversial. Screening  for thyroid dysfunction to be considered for at risk groups.

See College Statement (C-Obs 46) Testing of serum TSH levels in pregnant women through the link below.

**General advice**
All women in early pregnancy should be informed with respect to:

1.    Potential teratogens (medications, alcohol, X-rays etc);
2.    Lifestyle advice which may include dietary precautions in pregnancy, cessation of cigarette smoking and other recreational drug use, optimal gestational weight gain in pregnancy, exercise in pregnancy, work and travel precautions;
3.    Vitamin and mineral supplementation; see College Statement(C-Obs25) Vitamin and Mineral Supplementation in Pregnancy through link below;
4.    Model of care, expected visit frequency, place of booking for confinement, expected costs for both pregnancy and confinement where relevant;
5.    Antenatal education options.

## 3.3    Subsequent Visits during the Antenatal Period

All women should be advised to attend with a view to:

1.    Utilising the principles of preventative medicine to minimise the risk of problems in pregnancy, labour and the puerperium;
2.    Obtaining advice that will assist the woman in preparation for labour, birth and the early puerperium;
3.    Ongoing assessment and treatment of any particular conditions or circumstances of relevance to the pregnancy;
4.    Obtaining general advice regarding common issues of concern in pregnancy.

**Clinical assessment**
All women should have a directed clinical assessment at each antenatal visit, with a focus on general well-being and early diagnosis of pregnancy complications. Investigations recommended are:

**Obstetric ultrasound scan**
All women should be offered an obstetric ultrasound before 20 weeks' gestation. This will include an ultrasound for foetal morphology and placental localization usually at 18-20 weeks gestation. Other scans may be indicated depending on individual circumstances.

**Screening for Down syndrome**
Refer to College Statement (C-Obs 4)Prenatal screening tests for trisomy 21, trisomy 18 and neural tube defects.

**Gestational diabetes**
Screening for Gestational Diabetes Mellitus is recommended in all pregnant women. See the original 1998 ADIPS Management Guidelines; Hoffman L, Nolan C and Simmons D. Gestational Diabetes Mellitus-Management Guidelines. Med J Aust 1998; 169 (2): 93-97.

**Group B Streptococcal Disease (GBS)**
Refer to College Statement (C-Obs19) Swabbing for Group B Streptococcus Maternal Group B Streptococcus in Pregnancy: screening and management.

**Blood group antibody testing**
Refer to College Statement (C-Obs 6) Guidelines for the use of Rh-D immunoglobulin (anti-D) in obstetrics in Australia; see link below. Further screening is recommended for Rh negative women at approximately 28 weeks gestation. Screening of Rh positive women at28 weeks gestation is at the discretion of the clinician/managing health service.

**Iron deficiency**
The haemoglobin level and platelet count should be repeated at 28 weeks gestation. If anaemia is detected, further investigation is warranted.

**Cytomegalovirus/Toxoplasmosis**
Selective testing for cytomegalovirus and toxoplasmosis is recommended only for those women at a substantially increased risk of acquiring an infection. Ideally such patients should be tested prior to pregnancy.

**Syphilis, Hepatitis B, Hepatitis C, HIV**
Consider repeat screening at 28 weeks in high-risk populations.

**Vaccination**
Influenza vaccination of pregnant women is strongly recommended. Refer to College Statement (C-Obs 45) Influenza Vaccination during Pregnancy; see link below. There is data suggesting that antenatal vaccination of pertussis reduces major infant morbidity in line with the Centers for Disease Control and Prevention recommendations, but Australian Immunisation recommendations are still pending.

## 3.4    Late Pregnancy Tests of Fetal Well-Being
Late pregnancy tests for assessment of feto-placental function should be performed when indicated on clinical grounds - either through a

suspicion of placental insufficiency, a predisposing factor for placental insufficiency or through an inability to clinically ascertain foetal growth (e.g. obesity). Tests of foetal wellbeing should be considered after 41 weeks gestation. Detailed and frequent assessment of foetal wellbeing, including an assessment of liquor volume, is mandatory in pregnancies at or beyond 42 weeks gestation.

**Chlamydia**
Selective testing for Chlamydia should be considered for those who may be at increased risk (e.g. less than 25 years).

**SELF-ASSESSMENT EXERCISE**
Now that you have completed this unit, you can assess how well you have achieved its Learning Outcomes by answering these questions. You can check your answers with the Notes on the Self-Assessment Questions at the end of this Module.

1.      (a.)    At what gestational age is it appropriate for a pregnant
                woman to make the first antenatal visit?
        (b.)    justify your answer to 1 (a.) with reasons
2.      What are the various laboratory investigations required during antenatal visit?

## 4.0    CONCLUSION
The ultimate goal of any pregnancy is the birth of a healthy newborn. Nurses play a major role in helping the pregnant woman and her partner achieve this goal. Therefore, ongoing assessment and education are essential.

Once a pregnancy is suspected and, in some cases, tentatively confirmed by a home pregnancy test, women are usually advised to seek prenatal care to promote a healthy outcome. In this unit, you will learn about the assessments to be done in the first antenatal visit and for other subsequent visits.

## 5.0    SUMMARY
In unit 1, you have learned prenatal care. The needs and care of expectant mothers has been explained.  Various clinical assessments and laboratory investigations that are beneficial to mothers and their babies.

## 6.0    TUTOR MARKED ASSIGNMENT
1.      Working with your preceptor, book five pregnant women in an antenatal clinic nearest to you.
2.      Assess these pregnant women's expectations of the role of midwives on their first antenatal visit.

## UNIT 2        ASSESSMENT OF FOETAL WELL BEING

**CONTENT**

1.0     Introduction
2.0     Objectives
3.0     Main Content
        3.1     Rationales for foetal wellbeing assessment
        3.2     Assessment of foetal wellbeing
4.0     Conclusion
5.0     Summary
6.0     Self Assessment Exercise
7.0     Tutor Marked Assignment

## 1.0     INTRODUCTION

The New Zealand College of Midwives considers that assessment of foetal wellbeing during pregnancy to identify those babies at risk is a routine part of midwifery care. Full assessment requires consideration of the individual woman and combinations of assessment techniques to detect deviations from the normal. The focus of maternity care must be on the promotion of, and support for pregnant women's health and wellbeing, and if that is achieved, foetal wellbeing will be a consequence in most cases. There is emerging evidence that the use of individualised foetal growth charts (which incorporate fundal-symphysis height measurements) may both reassure a woman that her baby is growing well and alert the midwife and the woman to possible concerns regarding the baby's growth.

## 2.0     OBJECTIVES

At the end of this unit, you should be able to:

•       explain the importance of assessing the foetal wellbeing
•       assess the wellbeing of a foetus

## 3.0     MAIN CONTENTS

## 3.1     Rationales for foetal wellbeing assessment

Physical identification and assessment of the position, growth and wellbeing of the baby by palpation is an integral and highly valued part of midwifery practice. It is also a time for the woman and midwife to discuss the developmental milestones of pregnancy, including sharing information about baby's growth and activity.

176

The changing health status of society in general and in pregnant women in particular (increased rates of obesity, high smoking prevalence in young women and older age of first pregnancy) have made these assessments even more important but equally they have become more difficult to conduct.

Normal growth and regular activity are reassuring signs of a healthy foetus. There is evidence that slowing of fetal growth in utero and a reduction in frequency or strength of foetal movements often precede intrauterine death. Midwives provide information to enable the woman to assess the well-being of her own baby by encouraging the woman to be aware of and report changes in fetal activity. Midwives inform women, that if the baby's movements are reduced, change significantly or are absent there is a need to contact their midwife that day. A reduction in foetal activity will not be a problem in most instances. However if the woman reports a definite reduction in the baby's normal level of activity or change in the quality of movements that is concerning to her, a full antenatal assessment with fundal-symphysis height measurement, cardiotocograph monitoring and consideration of ultrasound is warranted.

Foetal heart auscultation has been a routine component of foetal assessment antenatal. It also provides an opportunity for more intensive examination and discussion with the woman about her baby's wellbeing. Many women and/or her partner/family expect foetal heart auscultation at each antenatal visit and can feel reassured when the foetal heart is heard. However, *routine* foetal heart auscultation has little clinical or predictive value for foetal health as it merely confirms that the foetus is alive at that point in time

## 3.2    Assessment of Foetal Wellbeing

When the woman identifies a reported reduction in foetal movements, auscultation of the foetal heart should not replace a full antenatal assessment.

Plotting fundal-symphysis height measurements using a tape measure on a customised growth chart may alert midwives that a baby's growth is above or below normal parameters for that baby. A growth scan and more frequent assessments may be indicated at this point.

There is emerging evidence that bleeding during pregnancy may indicate a potential for increased risk to foetal wellbeing. Extra attention to foetal activity and assessments is therefore required in this instance.

**SELF-ASSESSMENT EXERCISE**

i.      Enumerate the various clinical examinations that could be performed on a woman to assess foetal wellbeing.

ii.     Describe what a midwife is to look for while performing each of the methods of foetal assessment.

**4.0     CONCLUSION**

**5.0     SUMMARY**

In module 1, you have learned about the needs and care that are to be rendered to a pregnant woman during the prenatal period. The importance and the technical know-how of carrying out assessment of pregnant women have been clearly explained. In addition, necessary laboratory investigations that aid evidence-based care have been enumerated and described. It is believed that you should be able to translate this knowledge gained in this unit to practice during clinical exposure.

**6.0     TUTOR-MARKED ASSIGNMENT**

1.      Working with you preceptor, assess ANC clients for foetal wellbeing.

2.      Discuss finding in the group discussion**.**

**7.0     REFERENCES/FURTHER READING**

Cunningham, FG, Leveno, KJ, Bloom, SL, Hauth, JC, Rouse DL. And Spong CY (2010) Williams Obstetrics 23rd edition, New York McGrawHill medical.

Deave, T. Johnson, D. and Ingram, J. (2008); Transition to parenthood: the needs of parents in pregnancy and early parenthood. Pregnancy and Childbirth (8) 30 – 35.

Goodman, JH (2005). Becoming an involved father of an infant. Journal of Obstetric, Gynaecology and Neonatal Nursing 34 (2) 190 – 200.

Rubin, R. (1984) Maternal identity and the maternal experience. New York, Springer.

**UNIT 3      MATERNAL NUTRITION IN PREGNANCY**

**CONTENTS**

## 1.0     INTRODUCTION

The conception and the subsequent weeks afterwards is the time when it is at its most vulnerable, as it is the time when the organs and systems develop within. The energy used to create these systems comes from the energy and nutrients in the mother's circulation, and around the lining of the womb, such is the reason why correct nutrient intake during pregnancy is so important.

During the early stages of pregnancy, since the placenta is not yet formed, there is no mechanism to protect the embryo from the deficiencies which may be inherent in the mother's circulation. Thus, it is critical that an adequate amount of nutrients and energy is consumed.



**Figure 5.3.1: A picture showing a pregnant woman with some fruits**

**SOURCE :www.independent.ie**

**Source:www.medindia.net**                                    Source:
www.nigerianfoodtv.com

## 2.0    OBJECTIVES

At the end of this unit, you should be able to;

•     explain the nutrition requirements of the pregnant woman
•     discuss the effect of nutritional deficiency in the mother and baby

## 3.0    MAIN CONTENT

## 3.1    Nutritional requirement of the Mother

Additionally, the frequent consumption of nutritious foods helps to prevent nausea, vomiting, and cramps. Supplementing one's diet with foods rich in folic acid, such as oranges and dark green leafy vegetables, helps to prevent neural tube birth defects in the baby, which alludes to pregnancy vegetarianism. Consuming foods rich in iron, such as lean red meat and beans help to prevent anemia and ensure adequate oxygen for the baby. A necessary step for proper diet is to take a daily prenatal vitamins, that ensure their body gets the vitamins and minerals it needs to create a healthy baby. These vitamins contain folic acid, iodine, iron, vitamin A, vitamin D, zinc and calcium.

During pregnancy maternal metabolism is adjusted by means of a number of hormones that serve as mediators, redirecting nutrients to highly specialized maternal tissues specific to reproduction like placenta and the mammary glands. The increased need for nutrients cannot always be met from the maternal diet, however ample it may be. The requirement for energy providing macronutrients increases modestly compared with several micronutrients that are unevenly distributed among foods. Hence altered nutrient utilization and mobilization of reserves come into play to balance enhanced needs. But this is not always successful, and in communities existing on marginal nutrition nutrient deficiencies are precipitated by repeated reproduction.

The transfer of bone forming minerals like calcium, phosphorous, magnesium and zinc across the placenta and later through breast milk place considerable demands on maternal mineral economy. Increase in food consumption, more efficient gastrointestinal absorption decreased mineral excretion and mobilization of tissue stores are the several biological mechanisms that come into play to meet these extra mineral requirements.

The state of the mother's physiology, especially reproductive physiology, at the time when she commences a pregnancy, has considerable influence on the growth of the fetus. Several studies provide evidence for the relationship between adult size, reproductive efficiency and socioeconomic status. In general, the baby of a short woman is lighter and has less vitality and a lower survival than that of a tall woman. Stunting in the mother cannot be overcome by a good diet in pregnancy, and the same applies to reproductive efficiency. It is axiomatic that preparation for pregnancy should begin with good nutrition and health care in childhood so that women enter motherhood having achieved optimal growth and health. For many years it has been known that the height of the mother is closely related to birth weight and pregnancy outcome. Studies have also revealed that there are more shod mothers in the lower socioeconomic groups, which means that inadequate nutrition and larger number of illnesses prevent many girls in this social group from achieving optimal physique. They are thus at a disadvantage as regards childbearing., conducted by the National Institutes of Health, have shown that mothers who weigh more than 150 lb (68 kg) at conception or who gain more than 30 lb (13.6 kg) in weight during pregnancy tend to have larger and healthier babies with a lower perinatal mortality compared to mothers who weigh less or gain less weight than above.

In addition to the above generalizations there are two factors of special significance for the pregnant woman in the developing world. In all

traditional societies marriages occur early, usually around the age of menarche. Hence childbearing also commences early. It is now generally agreed that major risk of low birth weight occurs within 2 years of menarche. For example, the risk of delivering a child less than 2500 g in weight is doubled.

Moreover, early childbearing and the resultant competition for nutrients between the fetus and a growing mother, as well as the hormonal changes of pregnancy, may be significant factors in the short stature of women in many developing countries. Secondly, in all traditional societies women have an inferior status. This is reflected in the high mortality rates of infant and young girls compared to boys, a shorter life-expectancy at birth for females as well as higher prevalence rates of nutritional deficiencies in women. Thus the nutrition of the mother during pregnancy is often no different from the deplorable state of nutrition in the non-pregnant woman. Hence the high prevalence of low birth weight in several countries.

**Iron and folic acid requirements**
Pregnancy imposes a considerable strain on the maternal blood-forming system. In most instances the greatest need is for iron and folic acid. The amount of elemental iron in a fetus at birth is approximately 300 mg and the quantity required for increased red cell formation in the mother to prevent anaemia in the face of increased plasma volume is 500 mg. In other words, the requirement for iron during pregnancy is slightly less than 1 g, concentrated for the most part in the last half of gestation. In an adequate diet the daily iron content is 10-15 mg, of which 10 -20 per cent is absorbed. Dietary iron will thus provide just a little less than the requirement so that other sources of iron are needed.

Body stores of iron, mainly in the bone marrow, are available, but frequently the amount is not sufficient to meet the demand. Iron stores in healthy young American women average 300 mg. However, a significant number of women in developing countries enter pregnancy with depleted or no iron stores because of previous pregnancies or menstrual loss. The relatively small amounts of iron in the diet, and the low stores of iron, are not enough to meet the greatly increased requirements of iron for the synthesis of maternal and fetal haemoglobin. Thus, anaemia is a relatively common complication of pregnancy, even in developed countries

**Folic Acid**
Animal studies had indicated the possible protective role of vitamins including folic acid against neural tube defects (NTDs), and this had led to small scale intervention studies in pregnant women. In 1991 the

results of a clinical trial sponsored by the British Medical Research Council provided evidence that the risk of recurrent NTD was significantly lower among women who took 4000 μg of folic acid daily (without other supplemental vitamins) than among those who did not.More recently a population based intervention study in China has reported on the effectiveness of 400 μg of folic acid in preventing NTD in northern China which suffers a high incidence of the defect.

It has been proposed that closure of the neural tube occurs at several sites and that the clinical types of NTD differ depending on the site at which closure fails. Variations in the cellular mechanisms of closure at various sites might also contribute to clinical variations in NTD. It has also been suggested that a closed tube may reopen in some cases. All these studies indicate that folic acid is just one of the factors influencing closure of the neural tube, and explain why supplementation brings about only 70% reduction in the occurrence of NTD.

As the role of folate in health has come to be better understood public health authorities in several countries are taking steps to improve the intake of folate in the general population. In the United States all grain products like flours and pasta are now fortified with 140 μg of folic acid per 100g of grain. National health services in several countries recommend that at the diagnosis of pregnancy women should be prescribed a daily dose of 400 μg of folic acid to be continued during the early months of pregnancy. The evolving knowledge about the role of folate in health should lead to a global public health policy response in the form of education of the general public, supplementation for the vulnerable groups, and fortification of staple foods.

**Other micronutrients**
Maternal micronutrient deficiency which is frequently multiple in developing countries can have serious implication for the growth of the foetus. When maternal nutrient supply is inadequate the delicate balance between maternal and foetal needs is disturbed and a state of biological competition gets established. Hence maternal nutritional status at conception has a bearing on how nutrients are partitioned between the maternal and foetal compartments. In severe deficiency maternal nutrition gets the preference. If the deficiency is marginal the foetal compartment may get favoured. Studies of nutrient partitioning have focused on energy and protein. But it is very likely that the partitioning of micronutrients follows a similar pattern.
Protein requirement is related to energy intake. Most balance studies show a linear relation between calorie intake and nitrogen balance. The average nitrogen retention during pregnancy is $51 \pm 40$ mg/ kg per day at the average intake of $52\pm 9$ calories and 1.7 g protein per kg body

weight daily. Based on the above considerations the World Health Organization has recommended an intake of 1.01 g/kg of protein and 46 kcal/kg for the average woman with a body weight of 55kg. These recommendations are general and tend to err on the safe side. Most countries have made specific recommendations in relation to their individual circumstances and national dietary patterns

**Recommended nutrients during pregnancy**

| Nutrient | Recommendation (Extra = Above RDA) | Maximum/Total amount |
|---|---|---|
| Energy | Increase by 200 kcal (840 kJ) per day in last trimester only. | RDA |
| Proteins | Extra 6 g per day | 51 g per day |
| Thiamin | Increase in line with energy; increase by 0.1 mg per day | 0.9 mg per day |
| Riboflavin | Needed for tissue growth; extra 0.3 mg per day | 1.4 mg per day |
| Niacin | Regular supplementation/diet of substance. No increase required. | RDA |
| Folate | Maintain plasma levels; extra 200 µg per day | 200 µg per day |
| Vitamin C | Replenish drained maternal stores; extra 120 mg per day | 500 mg per day |
| Vitamin D | Replenish plasma levels of vitamin 10 µg per day. | RDA |
| Calcium | Needs no increase | RDA |
| Iron | Extra 3 mg per day needed | RDA |
| Magnesium, zinc, and copper | Normal supplementation or consumption. | RDA |
| Iodine | Extra 100 µg per day. | 250 µg per day |

**Figure 5.3b: Influence of maternal nutritional status**
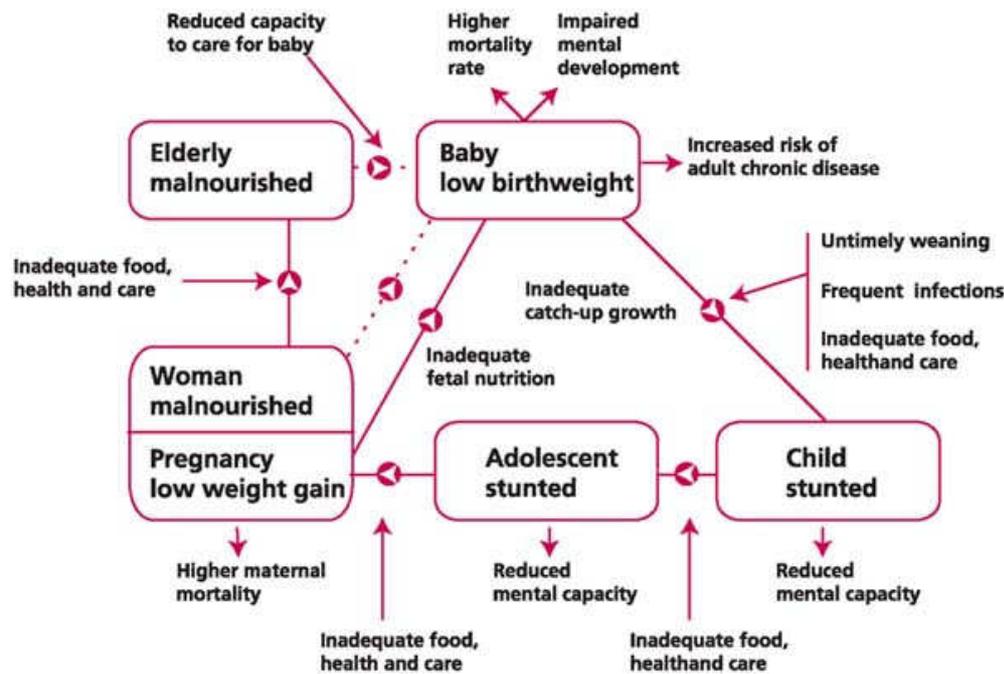
**SOURCE: www.dreamstime.com**

## 3.2  Effects of Nutritional Deficiency in Pregnancy

Several investigations in laboratory animals show that restricting food in pregnancy can have profound effects on the physiological adjustments in the mother, as well as on the growth and development of the fetus. The effects of restricting only calories cannot be separated from those of restricting proteins, because the body can burn proteins to provide energy; conversely, calories have a protein-sparing effect. Generally speaking, in most laboratory animals food deficiency in pregnancy reduces the size of the litter, the weight of the individual offspring and the survival rate. Subsequent growth of the offspring is also affected, though it is more so when food deficiency extends into the period of lactation.

More recent studies of the cellular mechanisms of growth have measured the DNA content of an organ as an index of cell number and the protein content as an index of cell size. These studies demonstrate that the growth of an organ takes place in phases. There is at first an increase in the number of cells followed by an increase in the size of the individual cell. Food restriction at the time of cell division can significantly affect the size of an organ, and conceivably such a restriction of growth is irreversible.

**Effects of supplementing maternal diet**

In well-nourished communities no supplementation is necessary beyond the administration of iron and folic acid in the last trimester and the normal satisfaction of hunger from a mixed diet. In communities where diets are inadequate, and where a large proportion of mothers enter reproduction after a childhood characterized by inadequate growth, supplementation is important to avoid fetal malnutrition. Repeated pregnancies in such a situation lead to depletion of maternal tissues and impaired reproductive efficiency.

Several countries have now evolved national programmes for protecting the diets of pregnant and lactating women through a supply of free subsidized foods, especially milk; through the establishment of fair price retail shops; through fortification of ordinary foods to improve their nutritive value; and sometimes through cash benefits to improve purchasing power.

**Figure 5.3c: Factors affecting maternal/foetal nutrition and wellbeing**
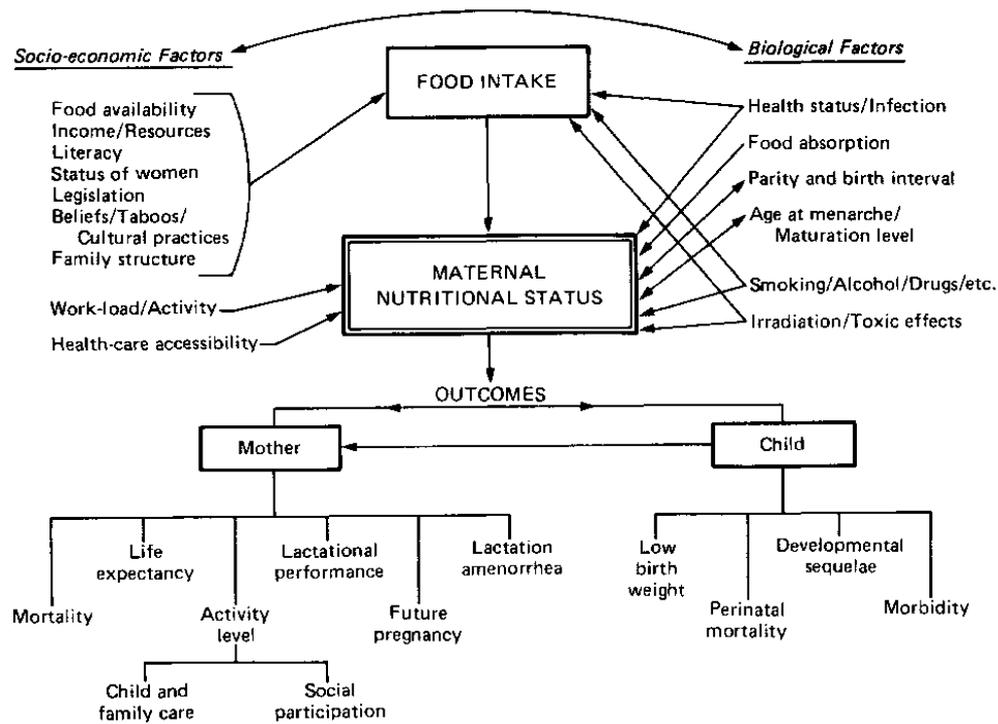


**SOURCE: www.dreamstime.com**

**SELF-ASSESSMENT EXERCISE**

i.    Discuss the socio-economic factors that influence on maternal nutrition in Nigeria.
ii.   Explain the physiology behind stunted foetal growth in relation to poor nutrition.

## 4.0    CONCLUSION

## 5.0    SUMMARY

In unit 3, you have learned about maternal nutrition and how it impacts on both the mother and their foetuses. This has been illustrated with the aid of pictures and diagrams. It is believed that you would be able to use this knowledge gained to educate mothers and their relations to improve maternal and foetal health throughout pregnancy and postpartum. In addition, you could use the information in this unit to inform policy at any level through advocacy.

## 6.0    TUTOR-MARKED ASSIGNMENT

During your MCH posting, form a focus group discussion of ten pregnant mothers to discuss nutrition in pregnancy: Ensure that you follow the principles of FGD. Write a report in your midwifery log book.

## 7.0    REFERENCE/FURTHER READING

Cunningham, FG, Leveno, KJ, Bloom, SL, Hauth, JC, Rouse DL. And Spong CY (2010) Williams Obstetrics 23rd edition, New York McGrawHill medical.

Deave, T. Johnson, D. and Ingram, J. (2008). Transition to parenthood: the needs of parents in pregnancy and early parenthood. Pregnancy and Childbirth (8) 30 – 35

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**MODULE 6    ASSESSMENT   OF   FOETAL   AND MATERNAL   WELLBEING   DURING LABOUR AND CHILDBIRTH**

Unit 1    Process of Labour and Childbirth
Unit 2    Stages of Labour
Unit 3    Management of second, third and fourth stages of labour

# UNIT 1    PROCESS OF LABOUR AND CHILDBIRTH

**CONTENTS**

1.0    Introduction
2.0    Objectives
3.0    Main Content
    3.1    Intrapartum Assessment
    3.2    Maternal Assessment
    3.3    Cervical Dilation and Effacement
    3.4    Foetal descent and Presentripant
    3.5    Rupture of Membranes
        Signs of labour
        Terms used in mechanism (movement)
        Common principles to all mechanisms
        Positions of vertex presentations
        Mechanism of R.O.A
4.0    Conclusion
5.0    Summary
6.0    Tutor-Marked Assignment
7.0    References/Further Reading

## 1.0    INTRODUCTION

In the previous units of this module, we have learnt much about pregnancy and care during the prenatal period. In this unit we will learn about the remarkable events that result in delivery of the baby. We shall discuss the physiology of labour, the factors that causes the onset of labour, signs of labour and how to alleviate the woman's sufferings in labour.

The process of labor and birth involves more than the delivery of a newborn. Numerous physiologic and psychological events occur that needs to be assessed and monitored in order to ultimately result in the birth of a newborn and the creation or expansion of the family. In this

module, you will learn how fetal and maternal wellbeing can be assessed.

## 2.0   OBJECTIVES

At the end of this unit, you should be able to:

- analyze issues that may face the new nurse who cares for women during the intrapartum period.
- explain teaching guidelines for going to the hospital or birth centre.
- describe admission and continuing intrapartum nursing assessments.
- describe common nursing procedures used when caring for women during the intrapartum period.
- identify nursing priorities when assisting the woman to give birth under emergency circumstances.
- relate therapeutic communication skills to care of the intrapartum woman and her significant others.
- apply the nursing process to care of the woman experiencing false or early labour.
- apply the nursing process to care of the woman and her significant others during the intrapartum period.
- describe the changes that occur in the uterine tissue during labour
- describe the stages of labour
- explain the spontaneous process of labour and how this may be enhanced or inhibited.
- plan and time care in order to optimize the well-being of both the mother and the baby during the course of labour.

## 3.0   MAIN CONTENT

### 3.1   Intrapartum Assessment

Childbirth, a physiologic process that is fundamental to all human existence, is one of the most significant cultural, psychological, spiritual, and behavioural events in a woman's life. Although the act of giving birth is a universal phenomenon, it is a unique experience for each woman. Continuous evaluation and appropriate intervention for women during labour are keys to promoting a positive outcome for the family. The nurse's role in childbirth is to ensure a safe environment for the mother and the birth of her newborn. Nurses begin evaluating the mother and foetus during the admission procedures at the healthcare agency and continue throughout labour. It is critical to provide

anticipatory guidance and explain each procedure (foetal monitoring, intravenous therapy, medications given, and expected reactions) and what will happen next. This will prepare the woman for the upcoming physical and emotional challenges, thereby helping to reduce her anxiety. Acknowledging her support systems (family or partner) helps allay their fears and concerns, thereby assisting them in carrying out their supportive role. Knowing how and when to evaluate a woman during the various stages of labour is essential for all labour and birth nurses to ensure a positive maternal experience and a healthy newborn.

## 3.2    Maternal Assessment

During labour and birth, various techniques are used to assess maternal status. These techniques provide an ongoing source of data to determine the woman's response to and her progress in labour. Assess maternal vital signs, including temperature, blood pressure, pulse, respiration, and pain, which are primary components of the physical examination and ongoing assessment. Also review the prenatal record to identify risk factors that may contribute to a decrease in uteroplacental circulation during labour. Monitor vital signs (blood pressure, pulse, and respirations) every 4 hours in the latent phase of labour, hourly in the active phase, and every 15 to 30 minutes during the transition phase of labour. Monitor temperature every 4 hours until the membranes have ruptured, and then every 1 to 2 hours thereafter. Assess uterine activity and foetal heart rate (FHR) every 30 to 60 minutes in the first stage of labour and every 15 to 30 minutes in the active and transition phases. If there is no vaginal bleeding on admission, a vaginal examination is performed to assess cervical dilation, after which it is monitored periodically as necessary to identify progress. Evaluate maternal pain and the effectiveness of pain-management strategies at regular intervals during labor and birth.

i.    **Vaginal Examination**
      Although not all nurses perform vaginal examinations on labouring women in all practice settings, most nurses working in community hospitals do so because physicians are not routinely present in labour and birth suites. Since most newborns in the United States are born in community hospitals, nurses are performing vaginal examinations (AHA, 2003). Vaginal examinations are also performed by midwives and physicians. It is an assessment skill that takes time and experience to develop; only by doing it frequently in clinical practice can the practitioner's skill level improve. The purpose of performing a vaginal examination is to assess the amount of cervical dilation, percentage of cervical effacement, and foetal membrane status

and gather information on presentation, position, station, degree of foetal head flexion, and presence of foetal skull swelling or moulding. Prepare the woman by informing her about the procedure, what information will be obtained from it, how she can assist with the procedure, how it will be performed, and who will be performing it. The woman is typically on her back during the vaginal examination. The vaginal examination is performed gently, with concern for the woman's comfort. If it is the initial vaginal examination to check for membrane status, water is used as a lubricant. If membranes have already ruptured, an antiseptic solution is used to prevent an ascending infection. After donning sterile gloves, the examiner inserts his or her index and middle fingers into the vaginal introitus. Next, the cervix is palpated to assess dilation, effacement, and position (e.g., posterior or anterior). If the cervix is open to any degree, the presenting foetal part, foetal position, station, and presence of moulding can be assessed. In addition, the membranes can be evaluated and described as intact, bulging, or ruptured. At the conclusion of the vaginal examination, the findings are discussed with the woman and her partner to bring them up to date about labour progress. In addition, the findings are documented either electronically or in writing and reported to the primary healthcare professional in charge of the case. To confirm that membranes have ruptured, a sample of fluid is taken from the vagina and tested with Nitrazine paper to determine the fluid's pH. Vaginal fluid is acidic, whereas amniotic fluid is alkaline and turns Nitrazine paper blue. Sometimes, however, false-positive results may occur, especially in women experiencing a large amount of bloody show, because blood is alkaline. The membranes are most likely intact if the Nitrazine test tape remains yellow to olive green, with pH between 5 and 6. The membranes are probably ruptured if the Nitrazine test tape turns a blue-green to deep blue, with pH ranging from 6.5 to 7.5 (Olds et al., 2004). If the Nitrazine test is inconclusive, an additional test, called the fern test, can be used to confirm rupture of membranes. With this test, a sample of fluid is obtained, applied to a microscope slide, and allowed to dry. Using a microscope, the slide is examined for a characteristic fern pattern that indicates the presence of amniotic fluid.

ii.     **Uterine Contractions**
        The primary power of labour is uterine contractions, which are involuntary. Uterine contractions increase intrauterine pressure, causing tension on the cervix. This tension leads to cervical dilation and thinning, which in turn eventually forces the foetus through the birth canal. Normal uterine contractions have a contraction (systole) and a relaxation (diastole) phase. The

contraction resembles a wave, moving downward to the cervix and upward to the fundus of the uterus. Each contraction starts with a building up (increment), gradually reaching an acme (peak intensity), and then a letting down (decrement). Each contraction is followed by an interval of rest, which ends when the next contraction begins. At the acme (peak) of the contraction, the entire uterus is contracting, with the greatest intensity in the fundal area. The relaxation phase follows and occurs simultaneously throughout the uterus. Uterine contractions during labour are monitored by palpation and by electronic monitoring. Assessment of the contractions include frequency, duration, intensity, and uterine resting tone (see Chapter 13 for a more detailed discussion). Uterine contractions with an intensity of 30 mm Hg or greater initiate cervical dilation. During active labour, the intensity usually reaches 50 to 80 mm Hg. Resting tone is normally between 5 and 10 mm Hg in early labour and between 12 and 18 mm Hg in active labour (Gilbert & Harmon, 2003). To palpate the fundus for contraction intensity, place the pads of your fingers on the fundus and describe how it feels: like the tip of the nose (mild), like the chin (moderate), or like the forehead (strong). Palpation of intensity is a subjective judgment of the indentability of the uterine wall; a descriptive term is assigned (mild, moderate, or strong). Frequent clinical experience is needed to gain accuracy in assessing the intensity of uterine contractions.

The second method used to assess the intensity of uterine contractions is electronic monitoring, either external or internal. Both methods provide an accurate measurement of the actual intensity of uterine contractions. Although the external foetal monitor is sometimes used to estimate the intensity of uterine contractions, it is not as accurate an assessment tool. For woman at risk for preterm birth, home uterine activity monitoring can be used to screen for prelabour uterine contractility so that escalating contractility can be identified, allowing earlier intervention to prevent preterm birth. The home uterine activity monitor consists of a pressure sensor attached to a belt that is held against the abdomen and a recording/storage device that is carried on a belt or hung from the shoulder. Uterine activity is typically recorded by the woman for one hour twice daily, while performing routine activities. The stored data are transmitted via telephone to a perinatal nurse, where a receiving device prints out the data. The woman is contacted if there are any problems. Although in theory identifying early contractions to initiate interventions to arrest the labour sounds reasonable, research shows that uterine activity

monitoring in asymptomatic high-risk women is inadequate for predicting preterm birth (Newman, 2003). This practice continues even though numerous randomized trials have found no relationship between monitoring and actual reduction of preterm labor. The value of monitoring uterine contraction frequency as a predictor of preterm delivery remains unclear (Iams *et al.,* 2002).

iii.    **Leopold's Maneuvers**
       **Leopold's maneuvers** are a method for determining the presentation, position, and lie of the foetus through the use of four specific steps. This method involves inspection and palpation of the maternal abdomen as a screening assessment for malpresentation. A longitudinal lie is

## 3.3    Cervical Dilation and Effacement

The amount of cervical dilation and the degree of cervical effacement are key areas assessed during the vaginal examination as the cervix is palpated with the gloved index finger. Although this finding is somewhat subjective, experienced examiners typically come up with similar findings. The width of the cervical opening determines dilation, and the length of the cervix assesses effacement. The information yielded by this examination serves as a basis for determining which stage of labour the woman is in and what her ongoing care should be.

## 3.4    Foetal Descent and Presenting Part

In addition to cervical dilation and effacement findings, the vaginal examination can also determine foetal descent (station) and presenting part. During the vaginal examination, the gloved index finger is used to palpate the foetal skull (if vertex presentation) through the opened cervix or the buttocks in the case of a breech presentation. Station is assessed in relation to the maternal ischial spines and the presenting fetal part. These spines are not sharp protrusions but rather blunted prominences at the midpelvis. The ischial spines serve as landmarks and have been designated as zero station. If the presenting part is palpated higher than the maternal ischial spines, a negative number is assigned; if the presenting fetal part is felt below the maternal ischial spines, a plus number is assigned, denoting how many centimeters below zero station. Progressive foetal descent ($-5$ to $+4$) is the expected norm during labour—moving downward from the negative stations to zero station to the positive stations in a timely manner. If progressive foetal descent does not occur, a disproportion between the maternal pelvis and the foetus might exist and needs to be investigated.

## 3.5     Rupture of Membranes

The integrity of the membranes can be determined during the vaginal examination. Typically, if intact, the membranes will be felt as a soft bulge that is more prominent during a contraction. If the membranes have ruptured, the woman may have reported a sudden gush of fluid. Membrane rupture also may occur as a slow trickle of fluid.

**Signs of Labour**
**I.**      **The Premonitory Signs of Labour**
       During the last three weeks of pregnancy or previous to onset of labour certain changes take place which serve as useful means to determine the approach of labour (pre-labour).

**i.**      **Lightening**
       This is the sinking of the uterus, and it takes place 2-3 weeks before term. It occurs as a result of softening of the pelvic bones, the symphysis public widens, the pelvic floor relaxes, softens and sags by as much as 4cm, therefore allowing the uterus to descend further into the true pelvis. The lower uterine segment stretches, and the foetus' head sinks further down into the uterus. This will cause the fundus to drop to a lower level and the uterus becomes more prominent. It leads to engagement of the head in primigravida with good, firm abdominal muscles provided there is no disproportion.

       In multiparous women the uterus will sag further forwards and the abdomen becomes pedulous the head may not engage. Walking becomes more difficult and this may also give more to backache or pain in the region of symphysis pubis. Slight discomfort may be experienced in the lower abdomen, groins and thighs. Vaginal discharges also became more profuse at this time. The uterus presses against the bladder, causing more frequency. There is leg cramps & backache due to pressure on the sciatic nerve.

**ii.**      **Frequency of Micturation**
       This is due to pressure of the foetal head on the bladder limiting its capacity therefore causing the woman to micturate more often. Sometimes there is mild stress incontinence as a result of laxed condition of the softened pelvic floor which gives rise to poor sphincter control- if the woman laughs, coughs or sneezes some urine may trickle out.

iii.     **False pains:** Spurious Labour
         These are eratic, irregular uterine contractions making the uterus to contract without retraction. It is very common with the primigravida. The pain is true but not rhythmic in pattern usually short in duration and not increased in intensity. It is relived by walking. Pain is felt in the abdomen alone.

iv.     **Taking up of the cervix Effacement**
         Taking up of the cervix may start in the latter 2-3 weeks of pregnancy. Occurs as a result of changes in the solubility of collagen present in cervical tissue, this is aided by alteration in hormones activity particularly oestradiol, progesterone, relaxin, prolactin and prostaglandin. Braxton Hicks contractions which become more stronger also enhance the process. In primigravidae, effacement of the cervix precedes dilatation, but in multigravidae the two occur simultaneously.

**II.     True Signs of Labour**

**i.      Contractions**
         Contraction of the uterus in labour brings about effacement, dilatation of the dexart of expulsion of the fetus in labour when the true labour is established the contractions are strong, rhythmic, regular and are felt by the woman as tightening discomfort or actual pains and occurs at 10 minutes internals. At this period the uterus feels hard to touch. At the beginning of labour the contractions are painless, weak lasting 15-30sec duration and infrequent occurring 10-20 minutes interval. The pain gradually increases in intensity, that is, they become stronger, more frequent in duration. In the second stage they occur 5-10min duration, it is intensified with walking and lasting about 40-60sec or more.

**ii.     Dilatation of the cervical OS**
         This is the widening of the external OS from a tiny circular opening to one sufficiently large enough to permit the passage of the foetal head. It is a gradual process. Progressive dilatation of the cervix is a definite sign of labour.

**iii.    Show**
         This is the release of a blood stained mucoid discharge as the cervix dilates. It is from the operculum, which is the plug of mucus guarding the cervical canal during pregnancy. The blood is from the detached chorion from the wall of the lower uterine segment as it stretches. It can be seen before labour or few hours after labour has started. It follows cervical dilatation.

**iv.     Rupture of Membranes**
         This may not be a true sign of labour as the membranes can rupture days or hours before labour and sometime membranes

may not rupture till the end of first stage of labour. To confirm if the fluid is urine or Amniotic fluids test with Nitrazine swab which will change from orange to navy blue if it is amniotic fluid. Membranes are thought to rupture as a result of increased production of prostaglandin $E_2$ in the amnion during labour, and force of uterine contractions causing increase in the fluid pressure of the fore waters and lessen of support as the cervix dilates.

**v.     Mechanism of Labour**

Is the series of passive movement of the foetus in its passage through the birth canal. The skilful management of normal delivery is based on a good knowledge of mechanism of labour.

## Terms used in mechanism (movement)
**i.      Flexion of the head**

Bending of the head over the chest and the limbs over the abdomen. The head is normally flexed at the beginning of labour, with good uterine contractions flexion of the head is increased, thereby helping descent. The smaller presenting part facilitates descent.

**ii.     Internal Rotation (of the Head)**

This is a turning forward of whatever part of the foetus reaches the pelvic floor first.

**iii.    Crowning of the head**

This is when the occipital eminence passes under the symphysis pubis and the head no longer recedes between contractions.

**iv.     Extension**

Is a movement by which the flexion of the head is undone.

**v.      Descent**

Downward movement of the presenting part of the foetus. It is aided by contraction of the uterus, abdominal muscles, positioning of the foetal body, Amniotic fluid and uterine pressure.

vi.     **Restitution**

This is the turning of the head to undo the twist in the neck which took place during the internal rotation of the head. Usually towards the back of the baby, it reveals the position of the foetus.

**vii.    Internal rotation of the shoulder**

The shoulders engage in oblique diameter of the pelvis. The anterior shoulder reaches the pelvic floor first and rotate forwards, bringing the shoulders into anterior posterior diameter of the pelvic outlet. It takes place during contraction after the head has been born.

**viii.     External Rotation of the head**
This is the turning of the head which accompanies the internal
rotation of the shoulders. That is the occiput turns a further $1/8^{th}$
of a circle and it should always be in the same direction as in
restitution. The body is ready to be born. Not the same as
restitution, so should be allowed to occur before the shoulders
are born.

**ix.     Lateral flexion of the body**
This is a sideways bending of the spines which takes place
while the body is being expelled so that it conforms to the curve
of the birth canal.

## Common Principles to all mechanisms

1.     Descent takes place throughout.
2.     Whichever part leads and meets the resistance of the pelvic floor
relates forwards until it comes under the symphysis pubis.
3.     Whatever emerges from the pelvic will pivot around the pelvic
bone.

## Mechanisms of normal labour
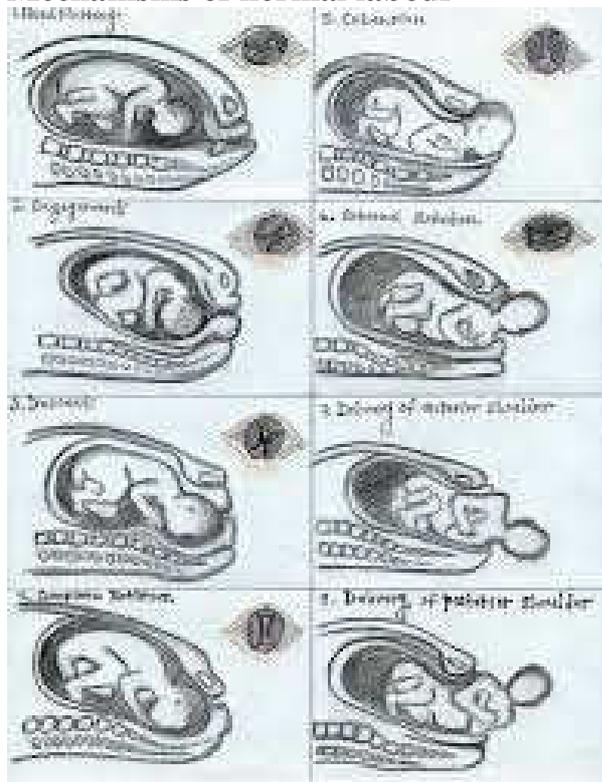


**SOURCE: www.dreamstime.com**

**Positions of vertex presentations**
**Mechanism of normal vertex presentation**
Left occipito anterior
Right occipito anterior
Left Ocicpito anterior – LOA
Lie: is longitudinal
Position: is left occipito Anterior
Presentation: Cephalic
Attitude: One of the complete flexion
Denominator: Occiput
Presenting part: Posterior area of right parietal bone.
Engaging Diameter: Sub-Occipito Frontal (10cm).
The occiput faces the left ilio perineal eminence while the sinciput faces the right sacro iliac joint. The sagittal suture lies in the right oblique diameter of the pelvic brim while the shoulders are in the left oblique diameter of the pelvis.

With good uterine contractions descent of the head takes place with increased flexion. The engaging diameter now reduced from sub-occipito-frontal (10cm) to sub-occipito-bregmatic (9.5cm). The occiput being the leading part reaches the pelvic floor first and rotate 1/8th of a circle forward (along left side of the pelvis. This causes a slight twist in the neck as the head is not in alignment with the shoulders. With further descent the occiput slips beneath the symphysis pubis, crowning occurs, sinciput, face and the chin sweep the perineum and the head is born by extension. Restitution, takes place (the occiput turns towards the left of mother).

The shoulders enter in left oblique diameter of the pelvis, with further descent, the anterior shoulder reaches the pelvic floor first and rotate 1/8th of a circle forwards along the right side of the pelvis). This internal rotation of the shoulders is accompanied by external rotation of the head. The shoulders are now in anterior posterior diameter of the pelvic outlet. The anterior shoulder slips under the symphysis pubis, the posterior one passes over the perineum and the body is born by lateral flexion towards the mother's abdomen.

**Mechanism for R.O.A.**
The same as the L.O.A. but has to substitute right for left and vice versa.

**SELF-ASSESSMENT EXERCISE**

i.   Describe the mechanism of labour of a foetal who is presenting with vertex and Left Occipito-anterior position
ii.   Enumerate the different positions a foetus may assume.

## 4.0    CONCLUSION

Childbirth, a physiologic process that is fundamental to all human existence, is one of the most significant cultural, psychological, spiritual, and behavioural events in a woman's life

## 5.0    SUMMARY

You have learnt about various assessments you should make when you are attending to a woman in labour. The different possible foetal positions have been clearly described in this unit. It is very crucial for a midwife to be able to carry out appropriate assessment during labour in order to aid effective monitoring of foetal and maternal wellbeing. This skill will certainly help you as a midwife to recognize any deviation from normal at any point in time.

## 6.0    TUTOR-MARKED ASSIGNMENT

Under the supervision of a clinician, conduct delivery of five pregnant mothers in the nearest hospital to you. Record your care in your logbook. Share your experiences on the assessment of the fetal and maternal wellbeing throughout the process of child birth on the discussion forum.

## 7.0    REFERENCES/FURTHER READING

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# UNIT 2     STAGES OF LABOUR

## CONTENTS

1.0     Introduction
2.0     Objectives
3.0     Main Content
       3.1     The first stage
       3.2     The second stage
       3.3     The third stage
       3.4     The fourth stage
       3.5     Duration of labour
              Calculation of duration of labour
              Management of first stage of labour
              Methods of pain relief in labour
              The use of drug (chemotherapy)
4.0     Conclusion
5.0     Summary
6.0     Self- Assessment Exercise
7.0     References/Further Reading

## 1.0    INTRODUCTION

Labor is typically divided into four stages that are unequal in length. The four stages of labor are the dilation stage, the expulsive stage, the placental stage, and then restorative stage. In this unit, you will learn how to recognize the stages in labour and the appropriate nursing care for the fetus and the mother.

## 2.0    OBJECTIVES

At the end of this unit, you should be able to:

- identify and recognize each of the stages of labour
- use pathograph in monitoring the progress of labour

## 3.0    MAIN CONTENTS

## 3.1    The First Stage

*"This is the period from the onset of the true regular uterine contractions until full dilatations of the cervical Os."* This is the period of cervical dilatation and it is described in phases.

a.    **Latent Phase**
      This is the period prior to active stage of labour. Time from spontaneous onset of labour until the cervix is 3-4cm dilated and the cervix shortens from 3cm to 0.5cm long. It may last 6-8hours in primip but  much shorter in multiparous, the line on the partogram remains horizontal.
b.    **Active phase**
      This is the period from 3-4cm to 10cm dilatation. The cervix undergoes more rapid  dilatation, at the rate of about 1cm per hour. The line on  the partogramme rises rapidly.  It lasts 2-6 hours but  shorter  in multiparous women.

## 3.2    The Second Stage

This  is that of expulsion of the foetus.  "It is the period from full dilatation of the cervix and the urge to push and ends when the foetus is expelled".

## 3.3    The Third Stage

It is that of separation and expulsion of placenta and membranes and the control of bleeding. "That is from the  birth of the baby until the delivery of the placenta and membranes and bleeding is controlled". Not affected by parity.

## 3.4    The Fourth stage

This is a period of one hour following the birth of placenta. This period is  given  recognition  in  order  to  emphasise  the  importance  of continuous vigilance  on  the  woman  for the  risk  of  post  partum haemorrhage. Not affected by party. It is actually the first one hour in puerperium.

## 3.5    Duration of Labor

There are wide variations in the duration of labour. The length of labour is influenced by party, time of the last delivery, type of pelvis, size and presentation of the   foetus, strength and frequency     of     uterine contractions. The greatest part of labour is taken up by the first stage. The most important thing is the progress of labour provided the woman is  comfortable and the foetus is well.   The   labour lasts longer in primigravidae than in multigravidae.

|             | 1st Stage   | 2nd Stage     | 3rd Stage        |
|-------------|-------------|---------------|------------------|
| Pimigravida | 8-12hrs     | 30-60mins     | 5-15mins         |
| Average     | 11hrs       | 45mins     :  | 15mins = 12hrs   |
|             |             |               |                  |
| Multipara   | 6 ½ - 8 hrs | 15-30mins  :  | 5 – 15mins       |
| Average     | 6:30mins    | 15mins:       | 15mins = 7hrs    |

Some times primigravidae spend less time while multipara spend more time in labour. Evidences have shown that the use of Oxytocin and one-to-one care has reduced the period of labour considerably.

**Calculation of duration of labour**
Example:
Date – 12/6/2008
Time:
Labour begins – 12:30a.m
OS fully dilated – 7.15a.m
Baby delivered – 7.25am.
Placenta & membranes delivered – 7.38a.m

$1^{st}$ Stage: 12.30 – 7.15a.m = 6hrs : 45mins

$2^{nd}$ Stage : 7.15 – 7.25a.m = 10mins

$3^{rd}$ Stage: 7.25 – 7.33a.m = 8mins
**TOTAL = 7hrs: 3mins**

**Management of First Stage Labour**

**I.      Pain Management in Labour**
It is not possible to assess how much pain a person is feeling because pain cannot be objectively measured. Pain leads to physical and emotional exhaustion and lessen the woman's confidence. The pain threshold varies from one individual to another so the woman in labour must be relieved from pain and baby's safety must be ensured.

**II.     Labour Pain**
Pain in labour is caused by uterine contractions, dilatation of the cervix and stretching of the vagina         and the         pelvic floor muscles to accommodate the presenting part (In late $1^{st}$ and $2^{nd}$ stage). The pains are said to be transmitted by the thoracic, lumber and sacral nerves.

**Methods of Pain Relief in Labour**
**1.        Psychological method**

This is the most important aspect of pain relief, because a woman who is already apprehensive with labour pain will relax if she is admitted into a clean, well organized, calm and reassuring environment. The midwife must be sympathetic and understanding. These will allay her fears, relax more and be able to cope with the pain. The personality of the Midwife should reflex kindness, interest in the patient with kind words and deeds. These include:

a.      Giving of information: as necessary
b.      Allaying of anxiety
c.      Participating in Planning and care
d.      Giving of physical care.

## 3.6   The Use of Drugs (Chemotherapy)

It is not possible to classify accurately the action of groups of drugs. A small dose of narcotic would act as sedative, while a large dose of tranquilizer would act as hypotic.  Since drugs are used for various reasons the Midwife must know the reason for administration of a drug that is to relief pain, alley apprehension, and induce sleep. The Midwife must have a good knowledge and understanding of the principle underlying the administration of various drugs, and the main action of the drug she administers. Success and safety of drugs depend on *the choice of the appropriate drug or combination of drugs, adequate dosage, proper timing, and checking the dose.*

1.      **Analgesics**
        These are drugs that are supposed to relief pain without rendering the patient unconscious. Examples are panadol, Aspirin fortral etc.

2.      **Narcotics**
        Allay anxiety and induce sleep – strong analgesic with some sedative effect e.g. pethidine, morphine, pethilorfan, fortal, tramal.

3.      **Hypnotics**
        Induce sleep, anti convulsant – chlorahydrate, Diazeperin, omnopon, paraldehyde.
4.      **Tranquillisers**
        Calm patient: Phenegan.

5.      **Sedatives**
        Induce sleep – Barbiturate groups.

6.      **Lytic cocktail**
        Refers to any of various mixtures of phenothiazine derivatives and Pethidine for intravenous administratin. E.g. chlorpromazine (Largactil) 50mg. Promethazine (Phenergen) 50mg. Pethidine 100mg.Mixed and given slowly intravenously until a state of sedative, tranquility and analgesia (ataralgesic) is produced.
        **Use:** In the treatment of pre eclampsia and eclampsia, for forceps and breech deliveries and caesarean section.

7.      **Inhalational analgesia:**
        It is permitted by Midwife Board: It is used on healthy women in late first stage of labour or in $2^{nd}$ stage of labour. They are volatile agents which are excreted fairly quickly from the body. They include Entonox: Pre mixed nitrous oxide 50% and Oxgyen 50%.

8.      **Trilene trichloroethylene**
        A blue liquid evaporates easily into the air to form a non-inflammable vapour. It is an anaesthetic agent with analgesic action. The anaesthetic effect depends on the concentration. It is administered in Emotril Automatic inhaler apparatus.

9.      **Obstetric anaesthesia**
        Anaesthesia means absence of sensation and free from pain or reversible depression of all the senses.
        Types of anaesthesia are:
        i.      General anaesthesia,
        ii.     Regional anaesthesia(e.g epidural block, spinal anaesthesia, pudendal block),
        iii.    Local anaesthesia(e.g. lignocan).

10.     **Spinal Anaesthesia**
        Technique whereby local anaesthetic solution is injected into the subarachnoid space i.e. into the CSF.

11.     **Pudenda block**
        Local anaesthetic solution is injected adjacent to the pudendal nerves just below the ischial spines where they supply pelvic floor, vulva and perineum.

12.     **Paracervical block**
        These cases the paracervical plexus are blocked. It is used in prolonged labour – 10mls of 1% lignocaine solution is injected into the lateral fornices of the vagina. It reduces pain and backache in the last 2-3hrs. There is risk of bradycardia – foetal death may occur due to spasm of uterine vessels.

13.    **Local anaesthesia**
       10mls of 0.5% Lignocain is infiltrated into the perineum for
       episiotomy. The technique used will depend on the type of
       episiotomy.

**SELF-ASSESSMENT EXERCISE**

i.     Describe the management of the first stage of labour.
ii.    Identify various pain management modalities used during labour
       and discuss their implications to both mother and the foetus.

## 4.0    CONCLUSION

## 5.0    SUMMARY

In module 6, unit 2, you have learned about stages of labour. You have
learned how to manage the various stages of labour when you are
attending to a woman in labour. Different methods of pain relief have
been clearly described in this unit. Pain is one of the issues that a
midwife must be able to manage during labour while attention is also
paid to the wellbeing of the baby.

## 6.0    TUTOR-MARKED ASSIGNMENT

Interview midwives and mothers about their perception of the use of
pain relief in labour.
During your clinical posting, track the types of pain relieving measure
admistered to women in labour while you are there.

## 7.0    REFERENCES/FURTHER READING

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## UNIT 3     MANAGEMENT OF SECOND, THIRD AND FOURTH STAGES OF LABOUR

**CONTENTS**

1.0     Introduction
2.0     Objectives
3.0     Main Content
       3.1     Signs of second stage of labour
       3.2     Active management of labour
       3.3     Methods of delivery
       3.4     Management of third stape
           3.4.1   Signs of placement separation
       3.5     Methods of delivery of placement
           Care after the delivery of placenta
           Episiotomy
           Timing of incision
           Infiltration
           Making the incision
           Repair of episiotomy
           Requirements for perineal suturing
           Advantages of episiotomy
           Minor disorders during bite
4.0     Conclusion
5.0     Summary
6.0     Tutor Marked Assignment
7.0     References/Further Reading

## 1.0    INTRODUCTION

Your knowledge of this unit is very important to you as a midwife. This is because your skill in the management of all the stages of labour of a woman will impress upon the family and the woman herslf that they are safe in the hands of a skilled personnel. In this unit, you will learn how to nurse a woman in labour through the second, third and forth satges of labour.

## 2.0    OBJECTIVES

At the end of this unit, you should be able to:

- plan a care that will meet individual needs of women during labour.
- enumerate supportive care features that alleviate the woman's suffering during the first stage of labour.

- conduct delivery with minimal or no injury to the mother and baby iv. deliver the placenta through accurate timing.
- prevent infection of the genital tract by careful attention to asepsis and antisepsis.
- ensure that the child is born alive with no injuries.
- prevent injury to the perineum.

## 3.0    MAIN CONTENT

### 3.1    Signs of Second stage of labour

The following signs and symptoms will be observed when a woman reaches the second phase of labour.

1. On vaginal Examination: OS fully dilated
2. Expulsive uterine contractions
3. Trickling of blood rupture of membranes
4. Tenseness between coccyx and anus Vulva gapes
5. Anus pouts gapes
6. Urge to push
7. Presenting part is visible
8. Perineum stretches and bulges.

**Fig. 6.3: Second stage of labour**



2nd Stage: Birth
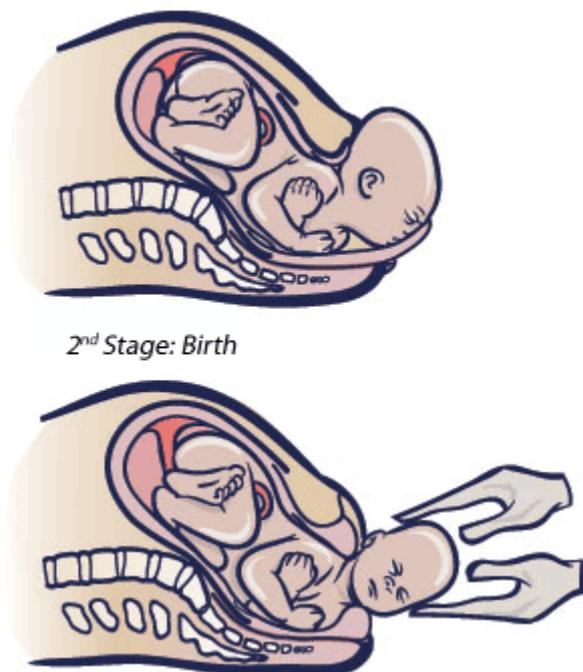
**Source: Myles Textbook of Midwifery**

## 3.2 Active management

Patient should be transferred to the second stage room or lie on her bed in the first stage room. She should not be left alone.

Vaginal examination is done to confirm full dilatation of the cervix. Patient can lie in any position she finds most comfortable for her. If membranes are intact it should be ruptured artificially using a pair of cockers or artery forceps. Observations and recordings continues and more frequently between contractions.

Uterine contractions (ii) Descent of the presenting part (iii) maternal pulse 5 – 15 minutes – intervals. (iv) Foetal heart rate every 5 minutes. Any irregularity must be reported. As oxygenation to the foetus may be less due to compression of head or cord.

1. **The Bladder:** must be kept emptied by catheterization at the end of first stage or at the beginning of second stage, if the bladder is full as this can cause delay in the engagement of the head and post partum haemorrhage in third stage. Only a sip of glucose drink is allowed if the second stage is getting prolonged and the woman's condition permits it, because of danger of vomiting. The hands and the face could be sponged with cold water. Two nurses should do a delivery at a time. One clean nurse and one assistant. Head should be delivered slowly to prevent injuries to the perineum. The woman should be discouraged from active pushing until the head is visible. She can practice breathing exercise – Rhythmic, easy breathing, avoid shallow panting, very deep breathing and prolong breath – holding. She should feel free to express herself – cry, shout, etc. it helps her to cope.

2. **Position:** Depend on maternal & foetal conditions, mother preference, the environment, Midwife's confidence. Positions include: Dorsal, Left lateral, Squatting, Kneeling, or standing, the birthing chair.

## 3.3 Methods of Delivery

1. **Dorsal Position**
   The advantages of this position are many: the woman can push more effectively. Can rest and relax between contractions. Observation of the abdomen is easily carried out and close observation on her face and general condition, early signs of distress detected. No changing of position for the third stage. Clearer view on the perinium. The woman lies on her

back with her knees Flexed and wide apart. As soon as the head is delivered, the eyes are swabbed with sterile water from within out using one swab at a time. The nose and the month are cleared of mucus. Feel for the cord round the baby's neck (Nuchal cord). If the cord is present and loose it should be clipped over the shoulder and the baby delivered through it, if tight, double clamp the cord and cut. Wait for the external rotation of the head which tells that the shoulders are in Anterio-posterior diameter of the outlet and ready to be delivered. With the hands on either sides of the baby's head or gentle downward traction is applied on the head during the next contraction to free the anterior shoulder from under the symphysis pubis. When the anterior shoulder is delivered, the posterior one and the rest of the body are delivered by lifting the head up. To allow the posterior shoulder to escape over the perineum the midwife will grasp around the chest to aid delivery of the trunk towards the mothers abdomen by movement of lateral flexion. The midwife checks the time immediately. The

baby is then held upside down or at on angle of $45^0$ to drain fluid from the respiratory passage and later laid between the mothers legs. The nose and mouth are sucked clear of remaining mucus with soft rubber catheter and a low grade sucker or by mucus extractor. Double clamp the cord with the artery forceps. Separate the baby from the placenta by cutting the cord between the forceps, ligates the cord. Do the apgar score at 1minute then at 5 minutes later. Show to the mother for identification of the sex, put identification band wipe body, wrap in warm towel and keep in a clean warm cot.

2.    **Left Lateral Position**
The woman lies on her left side with the buttocks at the edge of the bed and leg slightly flexed. The midwives stands behind the patient facing her feet while the assistant raises, the leg sufficiently enough to take the cot of the midwife's hand, she passes her hand between the thighs down to the vulva. The rest of the delivery is the same with the other methods.
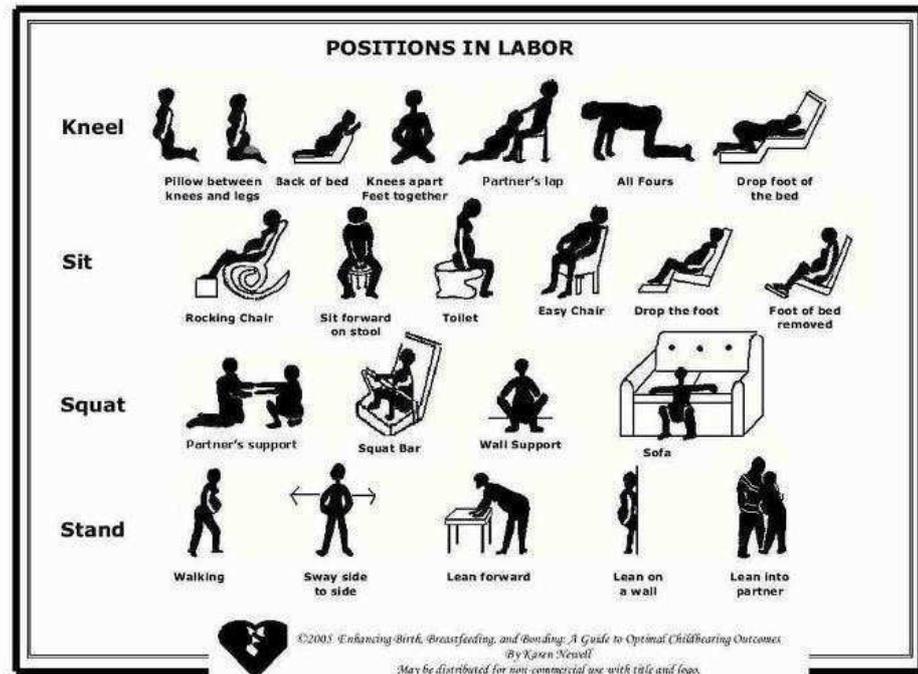
**Fig. 6.3.2 Positions in labour**
**Source: Google images**

## 3.4    Management of Third Stage

The uterus usually rest for a few minutes after the delivery of the baby. But normal contractions soon start again to separate the placenta and push it to the lower uterine segment or vagina. While the placenta separate there may be slight blood loss. The midwife must observe the woman's condition as she wait for signs of placenta separation.

The woman lies in dorsal position. The midwife places her left hand on the uterus to know that it is well contracted, when well contracted the uterus feels hard like a cricket ball (and also to note the size of the uterus). The hand must not meddle with the uterus. Signs of placenta separation are also observed for. Asepsis and antisepsis must be maintained throughout this stage.

### 3.4.1  Signs of Placenta Separation

1.      Cord lengthens.
2.      Uterus becomes harder and mobile.
3.      Small gush of blood.
4.      Fundus rises.

### 3.5    Methods of Delivery of Placenta

**1.     Controlled cord Traction**
This method is becoming commonly used nowadays  because of  its advantages of reducing  the  risk  of  post  partum Haemorrhage, shortens the third stage of labour.

It is done by administration of sytometrine 2 mls, which contains 5 unit Oxytocin, 0.5mg Ergometrine with the birth of the anterior shoulder or the after coming head. The success of the method depends on good knowledge of pharmacological action of the oxytocic drug used and proper timing of the procedure. A downward and outward traction is applied on the cord following birth canal while the left hand braces the uterus backwards to provide counter-traction. The uterus must be well contracted. Mayor forceps could be applied to give a firmer grip on the cord. This method must not be combined with fundal pressure to prevent inversion of the uterus. A sterile kidney should be placed against the perineum to collect blood loss and receive the placenta



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**Fig. 6.3.3 Controlled Cord Traction**
**Source: WHO 2008, Midwifery Education Manual**

**Contraindications**

i.     Preterm baby
ii.    Macerated foetus

**2.     Fundal pressure**
With this method the placenta must have separated and lying in the lower uterine segment or vagina. The uterus must be well contracted. The woman must relax her abdominal muscles by

breathing through her mouth gently. The well contracted uterus is used to push the placenta out as the piston is used to push fluid out of the syringe.

The midwife standing on the patient's right hand, grasp the fundus with her left hand with her fingers behind the uterus and her thumb in the front. She then applies a pressure with the palm of her hand towards the pelvic outlet in a downward and backward direction. The right hand receives the placenta at the vulva then the left hand joins it when the placenta is almost completely expelled. Give Ergometrine 05mg i.m.

3.      **Maternal Effort**
        Good uterine contraction will separate the placenta. When the placenta has separated and descended into the lower segment signs of placental separation are present with the next contraction the woman is asked to push as she did for the delivery of the baby. The placenta is received into a cupped hand, twisting the membranes into a rope to prevent it breaking. If membranes are adherent then apply a gentle up and down traction using a forceps.

4.       **Brandt Andrews manoeuvre**
        In this method the placenta must also have separated and the uterus well contracted. The midwife places her left hand on the uterus over the symphysis pubis. A forceps is applied on the cord or cord wound round the right hand twice, a gentle traction is applied while the left hand applied on upward pressure on the uterus. If properly used it is a safe method.

**Care after the Delivery of the Placenta**

When the placenta and the membranes are out give ergometrine 0.5mg or syntometrine 1ml (i.m) start to prevent haemorrhage. Swab the vulva examine the perineum and vaginal wall for any laceration. Suture if necessary. Make the patient comfortable by changing linens and applying a sterile pad to the perineum. Check vital signs and record. Check uterus to be sure it is well contracted.

Later wheel the trolley to the sluice room and examine the placenta and membranes for complexion. Measure all blood loss. The woman must be kept in the labour room for at least one hour for close observation – fourth stage. An hour after delivery, she is later transferred to the lying-in ward with her baby, after the uterus is explored of blood clots and uterus is checked and is contracted. An hour after delivery the blood clots are expelled and uterus checked for contraction. Check vital signs and transfer to the lying –in ward.

**Episiotomy**
An episiotomy is a deliberate surgical incision made into the perineum to enlarge the vaginal orifice (intritus) to facilitate the birth of the baby. It is a planned surgery but often, it is performed as an emergency, because the need for it may not be apparent until the second stage.

**I.      Indication**
1.      To minimize severe spontaneous maternal trauma.
2.      Delay second stage – Tear in imminent Disproportion, - Rigid perineum. Contracted outlet, abnormal positions e.g. OPP, face to pubes delivery.
3.      Foetal distress – e.g. prolapse cord. To hasten the delivery of the head.
4.      To facilitate vaginal and intrauterine manipulation e.g. forceps delivery, ventouse extraction, breech delivery.
5.      Preterm babies – to avoid intracranial damage.
6.      Previous complete perineal tear.
7.      Primipara with big baby.

**II.     Types of Episiotomy**
**1.      For Media**
        This is a midline incision which follows the line of insertion of the perineal muscle. It begins in the centre of the fourchette and directed posteriorly about 2.5cm.

**Advantages**

1.      Causes less bleeding, because it does cut through any big blood vessels.
2.      It is easy to repair and it heals better.
3.      It is more convenient for the woman.

**Disadvantage**
1.      It may extend and damage the anus (third degree tear) or to the rectum (fourth degree tear).
2.      It does not give enough room as medio-lateral for instrumental delivery and rotation used mainly in USA.

**2.      Medio-lateral**
        The incision begins in the centre of the fourchetter and directed to the right or left of the lateral margin of the anal sphincter, diagonally in a straight line, at an angle of $45^0$C between the tuberosity and the anus. It should not be more than 4-5cm long and about 2.5cm away from the anus. This line avoids damage to the anal sphincter and Bartholin's gland.

**Advantage**

Cannot lead to $3^0$C tear-recommended for midwives. Use more in U.K.

**Disadvantage**
1.    It is more difficult to repair.
2.    Bilateral mediolateral episiotomy are not recommended, because it can cause excessive bleeding.

3.    **J-Shaped or Schuchardt incision**
      The incision begins in the centre of the fourchette and directed posteriorly in the midline for about 2cm and then directed laterally (at 7.Oclock) to avoid the anus. It helps in difficult deliveries e.g. large head, shoulder dystocia or difficult breech. It is difficult to suture and the wound tend to wrinkle.

4.    **Lateral Episiotomy**
      The incision begins about 1-2cm away from the centre of the fourchette. It cut across the labia majora, large blood vessel and Bartholin's duct may be damaged.

**Disadvantage**
1.    Causes profused bleeding
2.    Difficult to repair
3.    Causes a lot of discomfort to the woman
4.    It has been abandoned.

**Timing of the incision**
Episiotomy must be properly timed to achieve the desired goal. It is given when the presenting part is directly applied to the tissue. If given too early it will fail to release the presenting part and causes profuse bleeding. The levator ani muscle would not have displaced laterally and may be incised. If given too late, there will be not enough time to infiltrate with local anaesthesia or the tear might have occurred. The purpose is then defeated. The woman should be in dorsal or lithotomy position.

**Infiltration**
The perineum should be adequately anaesthetized prior to the incision. Xylocaine or lignocaine 0.5% 10mls or 1% 5mls is used. It takes 3-4 minute to take effect and last for about 1 hour, so proper timing is very important. Clean the perineum with antiseptic solution. Insert two fingers along the proposed incision, to protect the foetal head. Insert the needle beneath the skin for 4-5cm in a straight line, withdraw to ensure it has not puncture a blood vessel. Inject the lignocaine as the needle is being withdraw slowly, reinsert into the other direction just before the tip of the needle is withdrawn.

**Making the incision**

A straight, blunt-ended pair or major's episiotomy scissors is usually used. The blade must be sharp to ensure a straight clean incision. Insert two fingers as before and position the blades and cut one straight line during a contraction. The length is better judged when the perineum is stretched. A single deliberate incision is better than small nips which result in ragged edge and difficult to unit. A 4-5cm long incision is made at the correct angle. Delivery of the head should follow immediately. If there is any delay pressure should be applied on the wound to minimize bleeding.

**Fig. 6.3d: Sites for different types of Episiotomy**
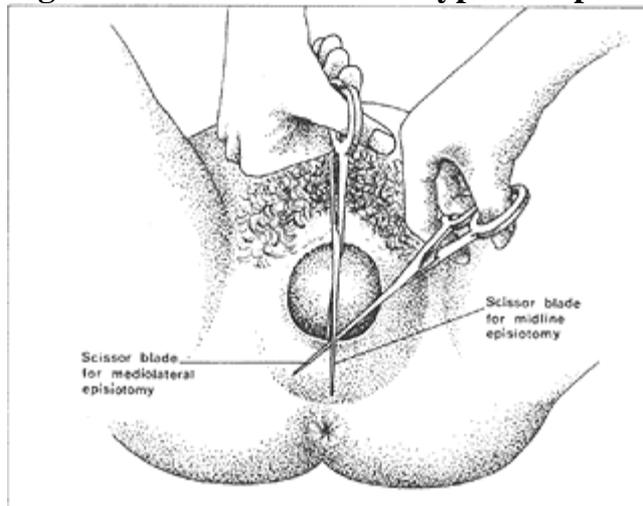


**Source: Pregnancy companion**

**Repair of Episiotomy**

Early suturing is recommended as this prevents sepsis and poor union. The local anaesthesia should be effective so she may not require another one for repair. Inhalational analgesic such as Trilene could be used to relief pains. She should be in dorsal position or Lithotomy position with legs well apart and thighs abducted buttocks at the edge of the bed or table. The vagina is packed to prevent obstruction by the uterine bleeding. Sterility must be maintained. An episiotomy is equivalent to $2^0$ tear so it is repaired in 2 layers.

i.      the vaginal wound
ii.     the pelvic floor muscles and perineal body
iii.    Perineal skin.

Touch the cut area to ensure that the effect of anaesthesia has not worn off. If she feels pains there is need to give more anaesthesia. Adjust the light for clearer view.

Use 2-2 or 3-0 chronic catgut is preferable because it is flexible, strong and last long enough for healing to occur. 0-1 may also be considered in the absence of non. Generally absorbable catgut is less painful, less tissue reaction. A curved round body needle is used for the tissue. Continuous or uninterrupted stitches are better, starting from the apex of the vaginal wound to the fourchette. This is followed by the pelvic floor muscles and the perineal body. Care must be taken not to suture the anus. Ensure that wound is properly aligned. The sutures should not be too light which can cause oedema, haematoma and prevent healing. Now close the subcutaneous tissue. The skin may be sutured with chromic 0 or 1 or non-absorbable suture with cutting edge needle. Then remove vaginal pack insert a gloved finger into the anus to feel top of the rectum of suture. If non-absorbable suture is made on the skin, the number should be recorded for removal. Double check to ensure no pack or instrument is left in the woman's vaginal. Clean her with antiseptic lotion and apply sterile pad and make her comfortable. Advise the woman to keep her perineum clean and dry. Use sanitary pad wash the vulva with soap and water three times daily or as necessary. She should report a week later for inspection of the wound.

**Requirements for perineal suturing**
1.      1 toothed dressing forceps
2.      1 majo's needle holder
3.      1 spencer well's artery forceps
4.      1 major's scissors
5.      suturing materials
6.      10 gause swabs
7.      20 wool mops
8.      1 perineal pad
9.      Haped vaginal tampon.
10.     Gown, mask, cap, hand towel and gloves.

**Advantages of Episiotomy**
1.      Prevents over-stretching of pelvic floor muscles.
2.      Reduces maternal exhaustion and incidence of PPH.
3.      Reduces the risk of cerebral damage to infant resulting from acidosis and hypoxia.
4.      Heals faster than ragged tear.
5.      Prevents damage to the urethra.
6.      Prevent third degree tear.
7.      Does not extend to involve the anus-mediolateral episiotomy.
8.      Easier to suture.

**Minor Disorders during Birth**
1. **Constipation**

Elevated progesterone levels in pregnancy enhance smooth muscle relaxation which results in reduced peristalsis and intestinal motility, enhanced sodium and water absorption in the colon, leading to smaller stools with lower water content. Dietary and lifestyle issues, hormonal, and mechanical changes cause constipation in pregnancy; this can effect up to 40% of women at some stage in their pregnancies. Straining to defecate can lead to damage of the pudendal nerve, impairing the supportive functioning of the pelvic floor muscles. This can be a contributing factor in development of utero-vaginal prolapse.

**Management**

*Clinical History*

Perform a medical history – diagnosis of constipation is made when there is a low frequency of stools (<3 per week), hard stools, and/or difficulty in evacuation of faeces.

Note any medical history that could lead to bowel symptoms, including use of laxatives, dietary habits, water consumption, physical activity, and use of medications such as iron supplements.

*Dietary Modifications*

Advise the woman to increase their fibre intake e.g. whole grains, rice and bran, beans and lentils, nuts, seeds, dried fruit, fresh fruit and vegetables. Introduce these foods gradually if the woman is not used to these foods otherwise bloating and flatulence causes discomfort.

Wheat fibre and psyllium are useful products to increase natural fibre supplements.

Women during pregnancy should aim to consume 18 - 30mg of fibre per day. Encourage adequate fluid intake when increasing fibre into the diet to prevent enhancing of constipation. The laxative effect of adding bran or fibre to the diet may take 3 - 5 days.

*Fluid Intake*

Encourage adequate fluid intake. The suggested intake is at least 2 litre per day. Inform the woman that caffeinate beverages such as tea, coffee, cola and hot chocolate should be kept to a minimum to avoid diuresis and dehydration.

*Physical Activity* Promote light physical activity to enhance peristalsis.2 Inform women strenuous activity may exacerbate constipation.

*Pharmacological interventions*

Fibre supplements increase the frequency of defecation and lead to softer stools. If constipation fails to resolve with this management laxatives that stimulate the bowel may be required.

Bulking agents are useful for mild constipation, small hard stools, and for long term control. They are safe to use in pregnancy, and take 48-72 hours to work. They are not suitable for acute constipation symptom relief. Encourage extra fluid to ensure a laxative effect. Examples include Metamucil, Fybogel (Orange) and Normacol. Osmotic laxatives are safe to use in pregnancy and work by drawing water into the faeces, contain lubricating properties, and may act as a stimulant. Examples include: Glycerol suppository – given if the stool is present in the lower rectum, and provides rapid relief within 5-30minutes. Lactulose – needs to be taken regularly, and is not suitable for acute constipation because it may take 1-3 days to be effective. Lactulose should be used with caution for diabetic women. Sorbitol – not suitable for acute constipation as may take 1-3 days to be effective. The dosage is adjusted according to response. Stimulant laxatives should be reserved for severe constipation unresponsive to bulking agents or osmotic laxatives. They act by increasing intestinal motility. In pregnancy they should be used only occasionally, and should not be given to women with a history of preterm labour without medical consultation. Example: Senna or Bisacodyl– used at night. The onset of action is 6-12 hours. Castor oil should be avoided as it may induce premature labour.

2.     **Gastro-Oesophageal Reflux / Heartburn**
       Gastro-oesophageal reflux is common in pregnancy, and occurs in two-thirds of women by the third trimester. Elevated levels of progesterone cause the lower oesophageal sphincter to become more relaxed allowing gastric reflux. Progesterone may also act upon the smooth muscle affecting gut motility and lead to delayed gastric clearance, however the American Society for Anaesthesiologists believe gastric emptying to be normal during pregnancy. The oesophagus contains no protective lining to prevent the corrosive effects of gastric acids; therefore reflux leads a burning or painful sensation around the sternum and can extend up into the throat.

**Management** *Clinical History*
Obtain a current history of symptoms and any previous history of reflux-type symptoms.
Exclude diagnosis of pre-eclampsia – check blood pressure and perform urinalysis.

*Dietary and other modifications*
- Eat small frequent meals
- Avoid eating and drinking at the same time to reduce stomach volume.
- Decrease fat in the diet, and increase protein consumption
- Avoid gastric irritants e.g. chocolate, coffee, citrus juices, tomato products, alcohol, fizzy drinks, spicy foods
- Avoid eating late at night or within 3 hours of going to bed.
- Chewing gum stimulates the salivary glands and may neutralise acid
- Cease smoking.

*Positioning*
- Elevate the head of the bed by 10-15cm12.
- Lying on the left side has been shown cause less frequent reflux.
- Encourage an upright position where possible, avoiding lying down after meals

*Pharmacological interventions* Pharmacological interventions may be initiated if adjustments to life-style changes provide a poor response.

Simple antacids are used by 30-50% women in pregnancy however limited data is available on their use in pregnancy. Most calcium and magnesium-based antacids are considered safe in pregnancy.

To prevent risk for hypercalcaemia, metabolic acidosis and renal insufficiency women should limit antacids containing calcium to 1.2 - 1.5 g per day of elemental calcium (3.0 -3.75 g calcium carbonate) per day.

Avoid the use of antacids containing sodium bicarbonate as they may precipitate alkalosis and fluid overload.

Antacids containing magnesium trisilicates should not be used in high doses or long term in pregnancy.

Avoid taking the antacid near the time of consuming supplemental iron (gastric acid facilitates the absorption of iron).Take antacids at least 1 hour apart from iron and other medications.

Ranitidine 150mg twice daily has been shown to effective treat oesophageal reflux.

3. **Varicose Veins and Leg Oedema**
   Varicosities may develop in up to 40% of pregnant women. The increase in blood volume during pregnancy and effect of

progesterone relaxing the muscular walls of the veins causes increased pressure on the veins. Varicose veins often improve three to four months following birth, and oedema generally reduces soon after birth.

Evidence regarding successful interventions for varicose veins and leg oedema in pregnancy is lacking, however despite lack of adequate research support measures such as use of compression stockings and elevation of the legs may provide comfort to women. Based on one small study reflexology appears to improve symptoms for women with leg oedema.

**Management** *Non-Pharmacological interventions*
- Elevate the legs when at rest.
- Walking in chest deep water in a pool if not contraindicated.
- Water immersion or compresses may alleviate symptoms.
- Reflexology may provide relief.
- Avoid prolonged standing or immobility and wearing of high heels.
- Avoid tight or restrictive clothing.
- Regular exercise improves calf muscle pump. Encourage ankle flexion exercise for at least 30 minutes per day.
- Compression stocking may relieve swelling and aching of legs and prevent more varicose veins from developing.
- If resting for long periods women are advised to lie on their left side which decreases pressure on the veins in the legs and feet (the inferior vena cava is on the right side, and left-sided position relieves it of the weight of the uterus).
- Encourage use of compression stocking for plane travel or long vehicle journeys.

4.    **Haemorrhoids**
      The greater blood volume in pregnancy causes an increase in venous dilatation and engorgement predisposing women to symptomatic haemorrhoids. Additionally venous stasis may be increased due to the enlarging gravid uterus and the increase in pelvic laxity.
      *Conservative management*
      Prevention of constipation - high fibre diet, increased fluid intake, exercise.
      Stool softeners.
      Mild analgesia.
      Avoid straining during defecation, and encourage defecating in the morning and after meals when colonic activity is highest.

Skin protection creams may be beneficial for pruritis and discomfort.

Topical local anaesthetic and/or corticosteroid agents may be beneficial20, 1e.g. Rectinol, Proctosedyl ointments. However, creams containing topical anaesthetic may induce sensitisation and topical corticosteroids may exacerbate local infection and cause skin irritation so use should be limited for < 7 days.

Warmed baths may be used to decrease sphincter tone or improve venous congestion.

*Surgical Management* Closed excision haemorrhoidectomy for symptomatic haemorrhoids using local anaesthetic can be safely performed during pregnancy.

**5.**     **Nausea and Vomiting** Approximately 50% of women experience nausea and vomiting in early pregnancy, and another 25% feel nausea alone. While in about 35% of these women the nausea and vomiting becomes clinically significant, only a small minority (0.3 - 1%) are diagnosed with hyperemesis gravidarum. This is characterised by persistent vomiting, weight loss of more than 5%, ketonuria, electrolyte imbalances, and dehydration. Nausea in pregnancy typically peaks at approximately 9 weeks gestation, with 60% of cases resolving by the end of the first trimester, and in the remaining women 91% of these cases will resolve by 20 weeks gestation. Nausea and vomiting correlates closely to levels of human chorionic gonadotropin (hCG) levels in the majority of studies.

A Cochrane review found high quality evidence is lacking about provision of good supportive treatments and advice for women experiencing nausea and vomiting.

**Note:** women attending a low risk midwives clinic for antenatal care, and who present with signs of hyperemesis gravidarum should be referred for medical review.

**MANAGEMENT** *Medical History*
Perform a medical history including the pattern of nausea and vomiting, fluid and dietary intake, factors exacerbating the condition, and current management.

Note signs of fever, headaches, abdominal pain or other symptoms that are not characteristic with uncomplicated nausea and vomiting in pregnancy.

Exclude other medical conditions causing nausea and vomiting e.g. gastro-intestinal, renal or endocrine24

*Clinical Assessment*
- Perform urinalysis including assessment of ketones, pH, and signs of urine infection such as nitrates, blood and protein.
- Maternal assessment for signs of dehydration.
- Perform a blood pressure.
- Perform temperature, pulse, and respirations if the medical history indicates risk for infection. If a women presents with a history of nausea and vomiting which is more than normally expected in pregnancy, perform a baseline weight (if not available).
- Perform a weekly weight until the nausea and vomiting resolves.
- Consider performing full blood picture, Urea and electrolytes, liver function tests, and thyroid function tests if clinical picture merits further investigation.

*Non-pharmacological Interventions*
- Small, frequent meals and snacks
- Bland, low fat, low carbohydrate, high protein diet.
- Take more liquids than solids in the diet.
- Encourage fluids to prevent dehydration – a least 2 litre/day.
- Avoid an empty stomach.
- Prevent a full stomach e.g. mixing solids with liquids.
- Avoid rich, spicy or fatty foods (including smelling and cooking).
- Eating dry crackers before rising in the morning
- Ice chips or icy poles may be beneficial

Consume a high-protein snack prior to going to bed.
Ginger (*Zingiber officinale)* extract may provide benefit for management of nausea and vomiting in some randomised studies, however a Cochrane review found the results were inconsistent and limited. Recommended dose: 125 - 250 mg every 6 hours (in 24 hours the dosage should not exceed 1 gm). Concomitant use of anticoagulants and ginger is not advised due to the theoretical risk of inhibiting platelet function. B6 acupressure may possibly provide some relief for some women.

**Management**
Conduct a medical history and physical examination to exclude other causes of pain e.g. trauma, fevers, neurological symptoms, inflammatory signs or tenderness.

Education and management for women with PGP or PLBP includes:
- avoidance of fatigue and have frequent periods of rest.
- avoiding situations that aggravate the condition e.g. unrelenting postures, twisting while lifting, activities such as unequal weight bearing, bouncing, hip abduction.
- using pillows to support the abdomen while lying in the lateral position, and to support the lower back when sitting, and placement of a lumbar roll behind the back with the feet slightly elevated.
- Use of massage and local applications of heat and cold may provide relief.
- hydrotherapy may be useful in decreasing back pain.
- utilisation of aids such as elbow crutches, walking frames and wheelchairs to assist mobility is some situations may be required.
- A supportive pregnancy belt may be beneficial to avoid wearing high-heel shoes.

6.      **Carpal Tunnel Syndrome**
        Carpal tunnel syndrome (CTS) in pregnancy usually presents in the second or third trimester and is caused by excess fluid compressing of the median nerve in the wrist. This causes paraesthesias, swelling and pain in the hand/hands, and impairs sensory and motor function of the hand.35 Symptoms often are worst at night, and can be exacerbated by forceful activity and extreme wrist positions. In pregnancy hormonal changes, oedema, and generalised slowing down of nerve conduction (if a woman has gestational diabetes) have been linked to causing CTS. Women who have pre-eclampsia, hypertension, excessive weight gain, and have oedema in pregnancy are at more risk for developing CTS.

**Management**
- Early treatment involves activity modification including:
- avoiding positions of extreme flexion or extension.
- avoiding prolonged exposure to vibration e.g. driving, lawn mowing, use of power tools.
- avoiding repetitive actions or aggravating activities e.g. typing.
- Arrange physiotherapy referral if symptoms require further management.

- wrist splinting may be initiated – a neutral position maximizes carpel tunnel volume and decreases pressure on the median nerve. Splints are normally worn at night, however some women may find they need to wear them during the day as well. Corticosteroid injections provide temporary relief in 80% of patients. However, if given to a patient with diabetes it can cause transient serum glucose elevation for up to 5 days. Inform women the symptoms of carpal tunnel syndrome normally resolve within 2 weeks of birth. Surgical options are generally not recommended during pregnancy.

7.    **Leg Cramps**
Leg cramps and restless leg syndrome usually occur at night and may effect up to 30% of pregnant women. The cause of leg cramps in pregnancy is unclear, although suggested reasons include the slowed venous return due to raised intra abdominal pressure, the progesterone effect causing decreased tone in the venous musculature, and nutritional deficiencies due to foetal demands. The pain experienced during leg cramps is caused by a build up of lactic and pyruvic acid leading to involuntary muscle contraction. Calcium supplementation have not be shown to be effective, however magnesium supplements may provide a slight effect at decreasing the number of attacks.

**Management**
Perform a health history to exclude other causes of leg cramps such as:
- electrolyte imbalances, dehydration, inactivity or excessive exercise
- musculoskeletal problems e.g. prolonged sitting, back injuries, strenuous exercise of lower limbs, flat feet.
- endocrine conditions e.g. thyroid disease, diabetes.
- renal damage leading to muscle cramping and weakness.
- cardiovascular conditions e.g. history of deep vein thrombosis causing venous insufficiency.
- neurological conditions e.g. multiple sclerosis, Huntington disease.
- Strategies for prevention or relief of cramps include:
- during leg cramps – massage, walking, and stretching may help.
- a warm bath prior to bedtime.
- drinking adequate fluids.
- prophylactic night-time calf stretching.

*Magnesium supplement dosage*

224

The Cochrane review suggests Magnesium lactate or citrate 5mmol in the morning, and 10mmol in the evening. Available medication at KEMH is in the form of MagMin 500mg tablets which contain 40mg of magnesium (1.65 mmol Magnesium).

**SELF-ASSESSMENT EXERCISE**

i.      List the different stages of labour.
ii.     Describe management of the second stage of labour.
iii.    (a) Enumerate the different minor disorders of pregnancy.
(b)     Explain the management of minor disorders of pregnancy.

## 4.0    CONCLUSION

## 5.0    SUMMARY

In module 6, you have learned about the process and stages of labour, management of second, third and fourth stages of labour. Minor disorders of pregnancy have been clearly explained as well. It is believed that you should be able to translate this knowledge gained in this module to practice during clinical exposure.

## 6.0    TUTOR-MARKED ASSIGNMENT

Explore what 4 newly delivered mothers who had episiotomy know about the procedure, and educate them about self care. Share your experiences with your clients with the group on the discussion forum.

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## MODULE 7       PUERPERIUM

**CONTENTS**

## 1.0    INTRODUCTION

In the previous unit in this module we have acquired enough knowledge to make you manage pregnancy and conduct delivery successfully.

Now we shall discuss the care the woman requires within the first 6 weeks after delivery and how the body readjusts back to the period before pregnancy. We shall review contraception, so that she will get pregnant only when she desires.

## 2.0    OBJECTIVES

At the end of this unit, you should be able to:

i.       analyse the process of involution of the uterus
ii.      discuss briefly, the wellbeing of women after delivery recognizing when lochia discharge is becoming abnormal
iii.     guide women in making informed choice on the method of family planning and list family planning method.

## 3.0    MAIN CONTENT

## 3.1    Normal Pueperium

Puerperium is defined as a period which commences after the expulsion of the placenta  and lasts up to about 6 -8 weeks after delivery. It is characterized by the following physiological and psychological changes when the reproductive organs return to their pre-gravid state, lactation is initiated and established and recuperation from physical and emotional experiences of pregnancy and delivery.

The foundations of the relationship between the mother and infant are laid. She assumes responsibility for the care and nurturing of her infant. The process by which the generative organs returned to their pre-gravid state is known as "Involution".

## 3.2    Psychology of Puerperium

Most women are happy during Puerperium.  Some  may  be  anxious, apprehensive and sensitive. These groups of women cry easily and find the task of caring for the baby too cumbersome. The midwife needs to be understanding in her dealings with the mother.  Mothers are always appreciative of  the  midwife's advice,  kind  approach, assurance, and assistance. Puerperium is a period of excitement, the mother is eager to share her experiences with partner, family and friends.

### 3.3    Physiology of Puerperium

These are    the    changes    that    take    place after  delivery. This   is characterized by endocrine activity.  Oxytocin acts upon the uterine muscle and breast  tissue. In the 3rd stage the action brings about the separation of the placenta and  prevents  hemorrhage (by the action of living ligature) and initiation of lactation. Other changes include the lochia which undergo sequential changes as involution progresses. The main changes occur in the uterine and decidua but the ligament also return to their former state prior to pregnancy. The stretched vagina, pelvic floor and perineum regain their tone but, in some instances a degree of laxity persists. There is a dramatic reduction in the level of estrogen and progesterone reaches basal level by the 7th day if she breastfeeds, otherwise the oestradiol begins to rise 14 – 21 days after birth indicating a resumption of ovarian follicle development and later ovulation

### 3.3.1  Involution of the Uterus

Return of the uterus to its pre-gravid state. The reduction in the size of the uterus is brought about by the process known as Autolysis and Ischaemia i.e. self digestion of the uterine muscle fibres by proteolytic enzymes and self destruction. The end results are removed by the phagocytic action of polymorphs and macrophages in the blood and lymphatic system which invades the collagen fibres between the myometrial cells and remove the fat from the area. This process is further assisted by the contraction and retraction of the uterine muscles under the influence of oxytocin resulting in the compression of blood vessels and reducing uterine blood flow causing the release of more lochia and after pain during breast feeding. Involution reduces the size of the uterus by about 1.6 in. (about a finger breath) a day.

Progressive changes in the uterus after delivery

|  | Weight of uterus | Diameter of placenta | Cervix |
|---|---|---|---|
| End of labor | 900gm | 12.5cm | Soft, flabby |
| End of 1 week | 450gm | 7.5cm | 2cm |
| End of 2weeks | 200gm | 5.0 cm | 1 cm |
| End of 6 weeks | 60 gm |  |  |
| slightly larger than | pre-gravid state 2.5 cm | A slit | |

The remains of the spongy layer of the decidua are shed. At the end of the 8th week, the placenta site is healed and a new endometrium is regenerated. After about 4 or more weeks menstruation may commence, by the 12th day of Puerperium the uterus has shrunk behind the symphysis pubis.

**Lochia**
This is the term given to the discharges from the uterus during the Puerperium. They are alkaline in reaction and organism flourish more in it than in the acid vaginal secretion. The amount varies in women and more in quantity than menstrual flow. The odor is heavy and unpleasant but not offensive, similar to menstrual flow. Lochia undergo changes as involution progresses. The volume is described as heavy, moderate and scanty.

**Progressive changes**

1.      Lochia rubra (red): 1 – 4 days of Puerperium. For the first 3 days the lochia consist mainly of blood, shred of decidua and fragments of chorion, amniotic fluid, laguno vernix caseosa and meconium.

2.    Lochia serosa (pink): 5 – 9 days. The discharge is paler and brownish in color.  It  contains less blood and more serum. Also contains  leucocytes and organism, no clots.

3.    Lochia Alba (white) 10 –15 days: the discharge is creamy greenish  in color  and contains leucocytes, organisms,  cervical mucus and debris from healing process in the uterus and vagina.

Slight blood discoloration may be seen for a further 2—3    weeks.  A persistent red lochia is a warning sign of retained product of conception and likelihood of  puerperal  hemorrhage  and  this should be reported without delay.

### 3.3.2  Urinary System

**Kidneys**

Renal action is increased in early part of Puerperium more urine is passed because of  reduction of blood volume (red cell mass) from its raised pregnancy levels and excretion of waste products of autolysis.
Bladder
In the first few days micturation may be difficult partly because of reflex suppression of the destrusor activity and sphincters spasm from irritation of  the  levator  ani  muscle  during  delivery  or  odema  of the urethra. During  the  first  1  or  2  days  marked  diuresis  occurs due  to  falling progestrone and alteration of cell metabolism to the non-pregnant state.

### 3.3.3   Circulatory System

During pregnancy circulatory  volume  increases  by  50%,  this  places exact strain on the heart. The cardiac output immediately after delivery increases for about 48 hrs returing to pre-gravid level in 4 weeks. Fluid loss result from diaphoresis (profuse perspiration) and diuresis (urinary output) during labour and childbirth is approximately 2.2kg. Up to 500mls  of blood  may  be lost  in normal  delivery.  Amniotic fluid is another source  during birth. The cardiovascular system has to quickly adjust  itself  to  these  changes.  It   also  results  in  improvement  in varicosities. There is relief of pressure on the vena cava placed on it by the gravid uterus.

**Blood changes**
In the last 4 weeks of pregnancy there is a significant rise in the levels of fibrous plasmogen factors       II,VII,VIII &X. A few days a rapid fall in fibrogen  plasminogen factor VIII level occurs while there is a

rise in circulating fibrinogen degradation products, probably due to the lysis of fibrin  deposits in placenta bed. By the  2nd   week of Puerperium the coagulability of the blood is altered and increases risk of thrombosis is present. The normal non-pregnant red cell levels are reached about the 40th day.

### 3.3.4  Musculo-Skeletal System

The stretching muscles and loss of tone of abdominal muscles during pregnancy results in  flabby appearances of the abdomen immediately after delivery. This normally responds to  exercise and involution and gradual tightening of pelvic muscles and ligaments. This is  however faster and better with primiparae than multiparae.

**Nervous systems**
This is normally unaffected except for the effects of drugs during labour.

**Integumentary**
Striae gravidarum become lighter and silvery; gradual disappearance of linea nigra,  chloasma  gravidarum and nipple hyperpigmentation. With exercise and good diet circulation, muscle tone, skin elasticity and healing improves.

**Respiratory**
After child birth many women are able to breathe easily. Shortness of breath at any time after child birth requires further assessment to rule out underlying pathophiology; Post –Partum Hemorrhage (PPH).

**Gastrointestinal system**
Some women experience constipation in puerperium which may be attributed to  relaxation of abdominal wall and loss of intra-abdominal pressure.  The presence of  hemorrhoids or an episiotomy may cause some discomfort during bowel movement.

**Breasts**
The female breast undergoes changes during pregnancy in preparation for lactation and  breast feeding. Colostrums supply the neonate with good nourishment. It contains more protein and salts (NaCl, Zinc) but less fat & Carbohydrate. The breast milk is secreted in the last month to 3 days postpartum when breast milk appears. It is rich in antibodies, acts as laxative aiding  massage of mechonium. Lactation begins 48-72hrs after child birth, but not fully established until about 10 days after birth.

## 3.4     Restoration of Ovulation and Menstruation

Women who breast feed exclusively and suckle on demand are likely to have delayed ovulation and menstruation for a considerable period. The more the woman suckles the higher the plasma prolactin level and the longer ovulation is delayed. For those who breastfeed partially ovulation may occur and subsequently pregnancy without menstruation for a considerable period. Ovulation may delay up to 5 months in lactating mothers though menstruation may start earlier in breastfeeding mothers. About 10% menstruation may start 10th week About 30% menstruation may start 20th week About 60% menstruation may start 30th week. About 80% of non breastfeeding mothers may start 10th week and ovulation is likely to occur from this time onwards.

*Post partum women should be warned that conception can take place whether they breastfeed or not.*

Diminished volume of circulatory progesterone has a reverse effect on pelvic floor, perineum, vagina, vulva and bowel. These organs become more active.

**Management of puerperium**
Caring for the woman, her newborn baby and her family after a normal delivery creates a happy, exciting and rewarding experience. It is a time when the midwife exercises her ability of observation and sensitivity to provide excellent nursing care. The puerperal woman is no more treated as ignorant, idle, ill woman, confined to bed. Today the puerperal woman is regarded to be healthy, intelligent, who is anxious to see, touch and care for her baby. The first ten days is regarded as the "lying-in-period" when close observation and adequate care should be given to the patient.

Care during puerperium must aim at
•     Promoting physical well being of client by correcting anaemia, providing comfort, cleanliness and promoting sufficient physical activity to ensure good muscle tone and involution of the pelvic organs.
•     Establishing emotional well being, quietness, freedom from worry and exicitment and proper phychological approach.
•     preventing infection.
•     promoting breast feeding.
•     providing education on the proper care of her baby.

Postpartum care is divided into two phases; immediate and subsequent.

**Immediate care**
The immediate period covers the first 24 hours after birth. The first 1 hour is most critical is regarded as the 4th    stage of labour. Ideally it should be spent in the labour ward. It is the time most Post –Partum Hemorrhage (PPH) occur, shock or sudden collapse. Close observation is needed. Pulse, BP, involution, Lochia, perineum, could  be done every  15minutes.  It includes condition of the uterus, condition of the perineum, bladder and voiding.

Rest/Sleep – sedation may be served. If B/P is high, sedation should be given orally or intraveinously to prevent postpartum eclampsia. The mother must be made comfortable and allowed to rest. At the end of one hour, she is observed again, cleaned up and offered a drink, encourage her to pass urine and uterus should be emptied. Uterus should be well contracted.

**Subsequent Care**
**These covers**
1.      Rest and Sleep: very essential calm atmosphere should be provided. No strenuous activities.
2.      Ambulation: 6 –12 hours after delivery- promote feeling of well-being, good circulation and drainage of Lochia. She can now participate in the management and care of her baby.
3.      Diet, fluids and vitamins: a protein diet, vitamins and minerals to promote  good  lactation,  adequate  fluids  milk,  fruit supplementary vitamins, iron, folic acid to prevent anemia.
4.      Care  of  bladder  and  bowel:  encourage  to  empty  bladder regularly  to   prevent  Post –Partum  Hemorrhage  (PPH),  sub-involution and urinary tract  infection. Catheterize if necessary to prevent   constipation.   dulcolax   suppository   or   magnesium hydroxide (30mls) could be given. May begin to take food rich in roughage.
5.      General comfort and cleanliness – vulval toilet regular perineal care and changing of pad, sanitary towel should be discarded.
6.      Promote involution – encourage early ambulation good health, prevent  infection,  breast  feeding,  postnatal  exercises  and estimate fundal height daily.
7.      Postnatal exercises: this should be done daily in puerperium.
8.      Promotion  of  breastfeeding:  this  should  be  encouraged  most mothers are eager. Empty breast at each feed nipples must be free from infections cracks and  engorgement. Mother must be free from infections.
9.      Prevention of infection: reduce visitors, antisepsis and asepsis should be observed  when caring for the vulva. On suspicion of infection, patient should be isolated or barrier nursed.

10. Records: all observation vital signs abdomen, uterine tenderness or full bladder. Involution, breast examination, Lochia color, odor amount and consistency, wound for healing or removal of stitches.
11. Education of the mother – mother must be educated on care of the baby and the need for post natal visit and family planning be emphasized.

**Method of measuring fundal height during puerperium:**
1. Done by the same person, same time using same instrument.
2. Patient should empty her bladder.
3. Palpate the abdomen and locate the fundus uteri and upper border of the symphysis pubis.
4. Using a flat graduated rule estimate the distance between the symphysis pubis and the uterine fundus.

**Post natal examination should be conducted 6weeks later to ensure that:**
1. organs affected by pregnancy return to their pregravid state.
2. lactation is fully established : assess if the breast is lactating well
3. mother is good condition generally –medically and gynecologically.
4. emphasis is paid onfamily planning.
5. baby is gaining weight, feeding well.

**The following procedures are done during the post-natal visit:**

1. Urine testing, vital signs and blood clot
2. Vital signs
3. Blood test
4. Examination – general, abdomen, breast.
5. Vaginal Examination (by doctor) to assess if the cervix is closed or still open.
6. Perineal examination – laceration, cough to exude prolapsed
7. Vaginal discharge return of menses.
8. Baby examination - general condition sleep elimination, circumcision, feeding general appearance
1. Ask questions on her wellbeing and that of the baby.

**Family Planning**



Family planning saves lives.

Having the number of children you want, when you want them, is called family planning. If you decide to wait to have children, you can choose one of several methods to prevent pregnancy. These methods are called family planning methods, child spacing methods, or contraception.

**Benefits of family planning**

Every year, half a million women die of problems from pregnancy, childbirth, and unsafe abortion. Most of these deaths could be prevented by family planning. For example, family planning can prevent dangers from pregnancies that are:

In poor countries about half of all deaths in women of child-bearing age are caused by problems of pregnancy and childbirth. Family planning prevents these pregnancies and deaths.

- **too soon.** Women under the age of 18 are more likely to die in childbirth because their bodies are not fully grown. Their babies have a greater chance of dying in the first year.

- **too late.** Older women face more danger in child bearing, especially if they have other health problems or have had many children.

- **too close.** A woman's body needs time to recover between pregnancies.
- **too many.** A woman with more than 4 children has a greater risk of death after childbirth from bleeding and other causes.

**As well as saving lives, family planning has other benefits**

Mothers and babies will be healthier, because risky pregnancies are avoided.

Fewer children means more food for each child.
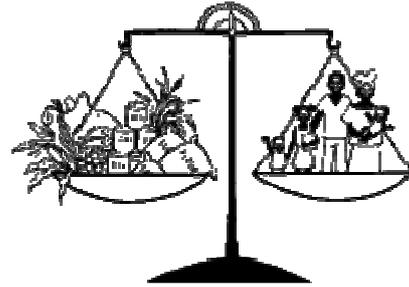
Waiting to have children can allow young women and men time to complete their education.

Fewer children can mean more time for yourselves and your children.
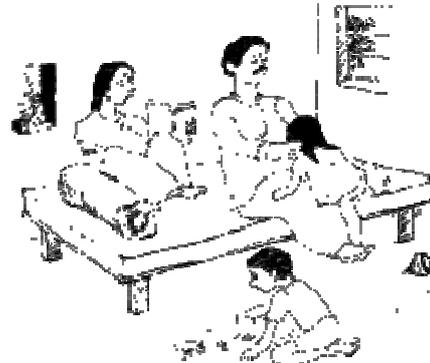
Family planning can also help you and your partner enjoy sex more, because you are not afraid of unwanted pregnancy. And some methods have other health benefits. For example, condoms can help protect against the spread of *sexually transmitted infections (STIs)*, including *HIV*. *Hormonal methods* can help with irregular bleeding and pain during a woman's *monthly bleeding*.

All of the family planning methods found in this chapter are used safely by millions of women.

This chart shows how well each method works to prevent pregnancy and to protect against STIs. The chart also shows the possible side effects for each method and other important information about how the method

must be used. Each method has stars to show how well it prevents pregnancy. Some methods have fewer stars because they are often used incorrectly. When a man and a woman use a method correctly every time they have sex, the method will work better.

**Choosing to use family planning**



*You have a right to make your own decisions about family planning.*

Some women want a lot of children—especially in communities where poor people are denied a fair share of land, resources, and social benefits. This is because children help with work and provide care for their parents in old age. In these places, having just a few children may be a privilege only wealthier people can afford.

Other women may want to limit the number of children they have. This often happens where women have opportunities to study and earn income, and where they can negotiate with men in a more equal way.

No matter where a woman lives, she will be healthier if she has control over how many children she has, and when she will have them. Still, deciding to use—or not to use—family planning should always be a woman's choice.

**Talking with your husband or partner about family planning**
It is best if you can talk together with your husband or partner about choosing to use family planning and what method you will use.

Some men do not want their wives to use family planning, often because they do not know very much about how different methods work. A man may worry about his wife's health, because he has heard stories about the dangers of family planning. He may fear that if a woman uses family planning, she will have sex with another man. Or he may also think it is 'manly' to have lots of children.

Try sharing the information in this chapter with your partner. It may help him understand that:

- family planning will allow him to take better care of you and your children.
- child spacing is safer for you and your children.
- family planning can make sex with him more pleasant, because neither of you will have to worry about an unplanned pregnancy. Being protected against unwanted pregnancy will not make you want to have sex with other men.

If your husband still does not want you to use family planning even after learning about its benefits, you must decide whether you will use family planning anyway. If you do, you may need to choose a method that can be used without your partner knowing about it.

**Choosing a family planning method**
Once you have decided to use family planning, you must choose a method. To make a good decision you must first learn about the different methods, and their advantages and disadvantages.
There are 5 main types of family planning methods:

- **Barrier methods**, which prevent pregnancy by keeping the sperm from reaching the egg.
- **Hormonal methods**, which prevent the woman's ovary from releasing an egg, make it harder for the sperm to reach the egg, and keep the lining of the womb from supporting a pregnancy.
- **IUDs**, which prevent the man's sperm from *fertilizing* the woman's egg.
- **Natural methods**, which help a woman know when she is fertile, so that she can avoid having sex at that time.
- **Permanent methods**. These are operations which make it impossible for a man or a woman to have any children.

These methods of family planning are described on the following pages. As you read about each method, here are some questions you may want to consider:
- How well does it prevent pregnancy (its effectiveness)?
- How well does it protect against STIs, if at all?
- How safe is it? If you have any of the health problems mentioned in this chapter, you may need to avoid some types of family planning methods.
- How easy is it to use?

- Is your partner willing to use family planning?
- What are your personal needs and concerns? For example, do you have all the children you want, or are you breastfeeding your baby?
- How much does the method cost?
- Is it easy to get? Will you need to visit a health center often?
- Will the side effects (the problems the method may cause) create difficulties for you?

After reading about these methods, you can get more help with choosing one. It may also help to talk with your partner, other women, or a health worker about different methods.

*Only you can decide which family planning method is right for you.*

| FAMILY PLANNING METHOD | Protection from Pregnancy | Protection from STIs | Possible Side Effects | Other Important Information |
|---|---|---|---|---|
| **Condom for men** | ★★ Good | | | Most effective when used with spermicide and water-based lubricant. Use with |

| | | | | |
|---|---|---|---|---|
| | | | | other methods to prevent STIs. |
| **Condom for women** | ★★ Good | | | |
| **Diaphragm (with spermicide)** | ★★ Good | | | Most effective when used with spermicide. Effective only when using the correct size. |
| **Spermicide** | ★ Some | | Skin allergy | More effective when used with another barrier method like diaphragm or condom. |
| **Hormonal Methods** **Birth control pill, patch, injections** **Implants** | ★★★ VERY GOOD ★★★ ★ BEST | | Nausea, headaches, changes in | These methods may be dangerous for women with certain health problems. |

| | | | monthly bleeding | |
|---|---|---|---|---|
| **IUD**  | ★★★★ BEST |  |  heavy and painful monthly bleeding | This method may be dangerous for women with certain health problems. |
| **Sex without intercourse (penis not inside vagina at all)** | ★★★★ BEST |  | | Sexual touch rarely passes STIs. Oral sex is less likely to pass STIs. Anal sex easily passes STIs. |
| **Breastfeeding (during the first 6 months only)**  | ★★★ VERY GOOD |  | | To be effective, a woman must give her baby only breast milk, and her monthly bleeding must not have returned. |

| | | | | |
|---|---|---|---|---|
| **Fertility awareness** | ★★ GOOD | | | A woman must understand when she is fertile and be able to choose when to have sex with intercourse. |
| **Sterilization** | ★★★ ★ BEST | | | A woman or a man will never be able to have babies after this operation. |
| **Pulling out (Withdrawal)** | ★ SOME | | | More effective when used with another method like spermicide or diaphragm. |
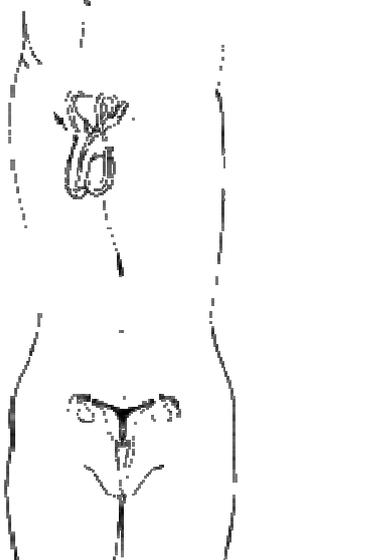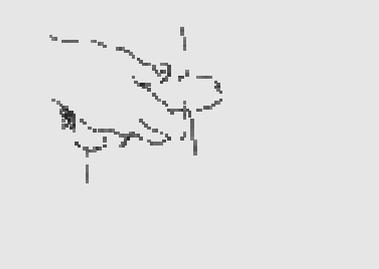
**Barrier methods of family planning**
Barrier methods prevent pregnancy by blocking the sperm from reaching the egg. They do not change the way the woman's or man's body works,

and they cause very few side effects. Barrier methods are safe if a woman is breastfeeding. Most of these methods also protect against STIs, including HIV. When a woman wants to become pregnant, she simply stops using the barrier method.

The most common barrier methods are the condom, condoms for women, the diaphragm, and spermicides.



**The condom**
If a condom breaks or comes off the penis, the woman should put spermicide in her vagina immediately. If possible, use emergency family planning.
The condom is a narrow bag of thin rubber that the man wears on his *penis* during sex. Because the man's semen stays in the bag, the sperm cannot enter the woman's body.
Condoms are the best protection against STIs and HIV. They can be used alone or along with any other family planning method. Condoms can be bought at many pharmacies and markets, and are often available at health posts and through AIDS prevention programs.
Be careful not to tear the condom as you open the package. Do not use a new condom if the package is torn or dried out, or if the condom is stiff or sticky. The condom will not work.
The condom must be put on the man's penis when it is hard, but before it touches the woman's *genitals*. If he rubs his penis on the woman's genitals or goes into her *vagina*, he can make the woman pregnant or can give her an STI, even if he does not spill his sperm (ejaculate).
**How to use a condom:**

**1.** *If the man is not circumcised, pull the foreskin back. Squeeze the tip of the condom and put it on the end of the hard penis.*

**2.** *Keep squeezing the tip while unrolling the condom, until it covers all of the penis. The loose part at the end will hold the man's sperm. If you do not leave space for the sperm when it comes out, the condom is more likely to break.*
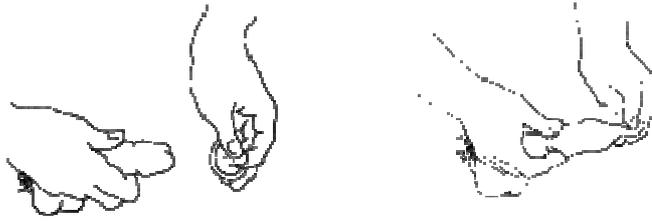
**3.** *After the man ejaculates, he should hold on to the rim of the condom and withdraw from the vagina while his penis is still hard.*

**4.** *Take off the condom. Do not let sperm spill or leak.*

**5.** *Tie the condom shut and dispose of it away from children and animals.*
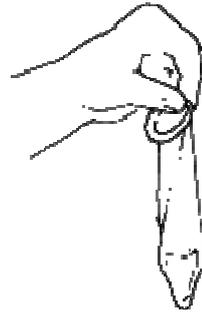
**Lubricants**

Lubricants make the vagina or the condom wet and slippery. They help keep condoms from breaking and can make sex safer and more enjoyable. Lubricants should be water based, such as spit (saliva), or K-Y Jelly. Rub the lubricant on the sides of the condom after it is on the hard penis. A drop of lubricant inside the tip of a condom can also make it feel better for the man. Do not use cooking oils, baby oil, mineral oil, petroleum gel, skin lotion, or butter. They can make the condom break easily.

A woman who is using another family planning method should also use condoms if she needs STI protection.

**Remember:**
- Use a condom every time you have sex.
- If possible, always use condoms made of latex. They give the best protection against HIV. Condoms made of sheepskin or lambskin may not protect against HIV.
- Keep condoms in a cool, dry place away from sunlight. Condoms from old or torn packages are more likely to break.
- Use a condom only once. A condom that has been used before is more likely to break.
- Keep condoms within reach. You are less likely to use them if you have to stop what you are doing to look for them.

At first, many couples do not like to use condoms. But once they get used to it, they may even recognize benefits besides protecting against unwanted pregnancies and STIs. For example, condoms can help some men last longer before they come.

**The condom for women (female condoms)**
Female condoms are larger than condoms made for men and are less likely to break. They work best when the man is on top and the woman is on the bottom during sex.
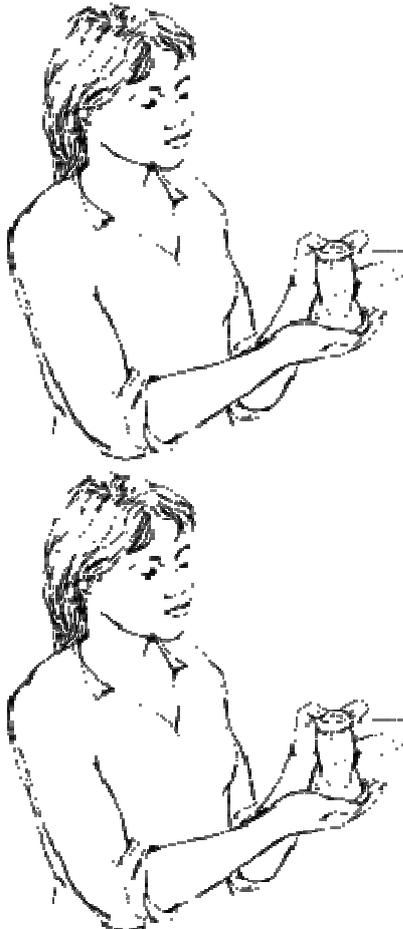
A female condom, which fits into the vagina and covers the outer lips of the *vulva*, can be put in the vagina any time before sex. It should be used only once, because it may break if it is reused. But if you do not have any other condoms, you can clean it and reuse it up to 5 times. The female condom should not be used with a male condom.

The female condom is the most effective of the methods controlled by women in protecting against both pregnancy and STIs, including HIV. There are now 3 types of female condom available. The newest are less expensive. The VA female condom fits more closely to the woman's body, so it is more comfortable and makes less noise during sex.

Female condoms are available only in a few places now. But if enough people demand this method, more programs will make them available.

**How to use the female condom:**

**1.** *Carefully                     open the packet.*
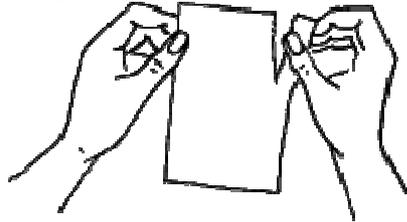
**2.** *Find the inner ring, which is at the closed end of the condom.*
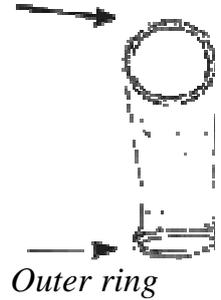
*Outer ring*

**3.** *Squeeze the inner ring together.*

**4.** *Put the inner ring in the vagina.*

**5.** *Push the inner ring up into your vagina with your finger. The outer ring stays outside the vagina.*

**6.** *When you have sex, guide the penis through the outer ring.*
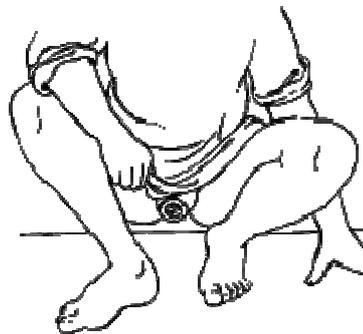
**7.** *Remove the female condom immediately after sex, before you stand up. Squeeze and twist the outer ring to keep the man's sperm inside the pouch. Pull the pouch out gently, and then dispose of it out of reach of children and animals.*

**The Diaphragm**

When a diaphragm is used correctly, it prevents pregnancy most of the time and may also give some protection against STIs.

The diaphragm is a shallow cup made of soft rubber or thin silicone that a woman wears in her vagina during sex. The diaphragm covers the cervix so that the man's sperm cannot get into her womb. The diaphragm should be used with spermicide. If you do not have spermicide, you can still use the diaphragm, but it may not work as well to prevent pregnancy.

Diaphragms come in different sizes, and are available at some health posts and family planning clinics. A health worker who has been trained to do *pelvic exams* can examine you and find the right size diaphragm.

Diaphragms can get holes, particularly after being used for more than a year. It is a good idea to check your diaphragm often. Replace it when the rubber gets dry or hard, or when there is a hole in it.

You can put the diaphragm in just before you have sex or up to 6 hours before. If you have sex more than one time after you put the diaphragm in, put more spermicide in your vagina each time before you have sex, without removing the diaphragm.

**How to use a diaphragm:**

*1. If you have spermicide, squeeze it into the center. Then spread a little bit around the edge with your finger.*

*2. Squeeze the diaphragm in half.*

*3. Open the lips of your vagina with your other hand. Push the diaphragm into your vagina. It works best if you push it toward your back.*

*4. Check the position of your diaphragm by putting one of your fingers inside your vagina and feeling for your cervix through the rubber of the diaphragm. The cervix feels firm, like the end of your nose. The diaphragm must cover your cervix.*
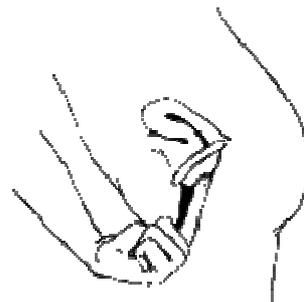


*5. If the diaphragm is in the right place, you will not be able to feel it inside you.*

*6. Leave the diaphragm in place for at least 6 hours after sex.*

*You can leave the diaphragm in for up to 24 hours. It is OK to use the diaphragm during monthly bleeding, but you will need to remove it and clean it as often as you would change a cloth or pad.*

### To remove the diaphragm:
*Put your finger inside your vagina. Reach behind the front rim of the diaphragm and pull it down and out. Wash your diaphragm with soap and water, and dry it. Check the diaphragm for holes by holding it up to the light. If there is even a tiny hole, get a new one. Store the diaphragm in a clean, dry place.*

## Spermicide
*Foam*
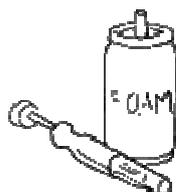
*Tablets*
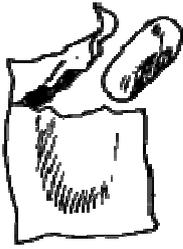
*Cream        or*
*Jelly*

**(contraceptive foam, tablets, jelly, or cream)**
Spermicide comes in many forms—foam, tablets, and cream or jelly—
and is put into the vagina just before having sex. Spermicide kills the
man's sperm before it can get into the womb.

If used alone, spermicide is less effective than some other methods. But
it is helpful when used as extra protection along with another method,
like the diaphragm or condom.

Spermicides can be bought in many pharmacies and markets. Some
women find that some types of spermicides cause itching or irritation
inside the vagina.

Spermicides do not provide protection against any STI. Because
spermicides can irritate the walls of the vagina, they may cause small
cuts that allow HIV to pass more easily into the blood.

**When to insert spermicide:**
Tablets or suppositories should be put in the vagina 10 to 15 minutes
before having sex. Foam, jelly, or cream work best if they are put in the
vagina just before having sex.

If more than one hour passes before having sex, add more spermicide.
Add a new tablet, suppository, or applicator of foam, jelly, or cream
each time you have sex.

**How to insert spermicide:**

**1.**     Wash your hands with soap and water.
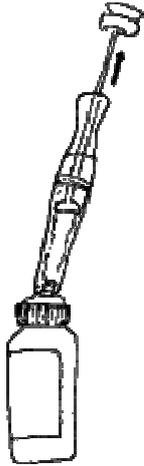


**2.**     **To use foam**, shake the foam container rapidly, about 20 times. Then     press     the     nozzle     to     fill     the     applicator. **To use jelly or cream**, screw the spermicide tube onto the applicator. Fill the applicator by squeezing the spermicide tube. **To     use     vaginal     tablets**,     remove     the     wrapping     and wet them with water or spit on them. (DO NOT put the tablet in your mouth.)

**3.**     Gently put the applicator or vaginal tablet into your vagina, as far back as it will go.



**4.**     If you are using an applicator, press in the plunger all the way and then take out the empty applicator.

**5.**     Rinse the applicator with clean water and soap.

**6.**     **Leave the spermicide in place for at least 6 hours after sex.** Do not douche or wash the spermicide out. If cream drips out of your vagina, wear a pad, cotton or clean cloth to protect your clothes.

**7.**     Rinse the applicator with clean water and soap.

**Hormonal Methods of Family Planning**
These methods contain *hormones*, called estrogen and *progestin*, that are similar to the estrogen and progesterone a woman makes in her own body. Hormonal methods include:

  **Pills,** which a woman takes every day.



**Injections,** which are given every few months.
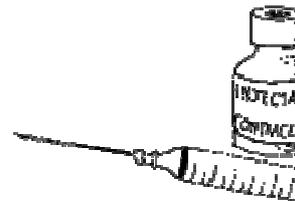


**Implants,** which are put into a woman's arm and last for several years.



**Important:** Hormonal methods do not protect against STIs or HIV.
A woman controls hormonal methods and they can be used without a man knowing.

Hormonal methods work by preventing the woman's ovaries from releasing an egg. The hormones also make the mucus at the opening of the womb very thick, which helps stop the sperm from getting inside the womb.

Most birth control pills and some injections contain both estrogen and progestin. These are called 'combination' pills or injections. The two hormones work together to give excellent protection against pregnancy. However, some women should not use pills or injections with estrogen for health reasons, or because they are breastfeeding .

Progestin-only pills (also called mini-pills), implants, and some injections contain only one hormone—progestin. These methods are safer than combined pills or injections for women who should not use estrogen, or are breastfeeding.

**These women should avoid ANY kind of hormonal method:**
Some medicines for seizures ("fits"), for tuberculosis (TB), or for HIV make hormonal methods less effective. A woman taking these medicines should use another family planning method or combine it with a second method such as a condom or a diaphragm.

Women who have breast *cancer*, or a hard lump in the breast. Hormonal methods do not cause cancer. But if a woman already has breast cancer, these methods can make it worse.

Women who might be pregnant or whose monthly bleeding is late.

Women who have *abnormal bleeding* from the vagina during the 3 months before starting hormonal methods. They should see a health worker to find out if there is a serious problem.

Some hormonal methods are harmful for women with other health problems. Be sure to check each method to see if it is safe for you. If you have any of the health problems mentioned and still wish to use a method, talk to a health worker who has been trained in hormonal methods of family planning.

252

**Side effects of hormonal methods**
Because hormonal methods contain the same chemicals that a woman's body makes when she is pregnant, these things may happen during the first few months:

**nausea       headaches      swelling   of weight       changes**
                            **the breasts   gain            in**
                                                          **monthly**
                                                          **bleeding**

Side effects often get better after the first 2 or 3 weeks or months. If they do not, and they are annoying or worrying you, see a health worker. She may be able to help you change the amount of the hormones in your method or to change methods. For more information about the specific side effects that are common with each hormonal method, read the sections lower on this page.

**The Pill**
The pills will not prevent pregnancy immediately. So, during the first 7 days on pills, use condoms or some other backup method to avoid pregnancy.

If you must change to a lower dose pill, use a barrier method of family planning or do not have sex during the first month.

**Combined pills (birth control pills with estrogen and progestin)**
Birth control pills will protect you from pregnancy as long as you take one pill every day. There are many different brands of combined pills with different types of estrogen and progestin in them and different amounts of each hormone. The most common combined pills are "low-dose" pills with 20, 30, or 35 micrograms (mcg) of estrogen. Low-dose pills and minipills are different—lowdose pills have both estrogen and progestin, while the minipill has only progestin.

Combined pills are usually available at family planning clinics, health posts, pharmacies, and through health workers.

Once you start taking pills, you should try to stick with one brand (and if you can, buy several packets at once). If you must change brands, try to get another with the same hormone names and strength. You will have fewer side effects and better protection.

**Who should not take combined pills:**
Some women have health problems that make it dangerous for them to use the pill. **NEVER take the pill if you have any of the** conditions listed above**,** or if you:

- have liver disease *hepatitis*, or yellow skin and eyes.
- have ever had signs of a *stroke*, *paralysis*, or heart disease.
- have ever had a *blood clot* in the *veins* of your legs, or in your lungs or brain. *Varicose* veins are usually not a problem, unless the veins are red and sore.

If you have any of the following health problems, try to use a method other than combined birth control pills. But if you cannot, it is still better to take the combined pill than to become pregnant.

**Try not to take combined pills if you:**
If you are breastfeeding, be sure to wait until your milk is coming in well before starting to take the combined pills. This usually takes about 3 weeks.

- **Smoke and are over 35 years old.** You have a greater chance of having a stroke or heart attack if you take combined pills
- **Have diabetes or epilepsy.** If you are taking medicine for seizures ("fits"), you will need to take a stronger (50 micrograms of estrogen) birth control pill. Get medical advice from a health worker or doctor.



If you are bothered by any body changes after starting birth control pills. Talk to a health worker. She might suggest a different pill.

- **Have high blood pressure** (more than 140/90). If you have ever been told you have high blood pressure or think you might have it, have your *blood pressure* checked by a health worker. If you weigh too much, have frequent headaches, get out of breath easily, feel weak or *dizzy* often, or feel pain in the left shoulder or chest, you should be tested for high blood pressure.

**Common side effects of combined pills:**

- **Irregular bleeding or spotting** (bleeding at other times than your normal monthly bleeding). Combined pills often make your monthly bleeding shorter and lighter. It is also normal to sometimes skip your monthly bleeding. This is the most common side effect of combined birth control pills. To reduce spotting, be extra careful to take the pill at the same time every day. If the spotting continues, talk with a health worker to see if changing doses of progestin or estrogen will help.

    If your monthly bleeding does not come at the normal time **and** you have missed some pills, continue to take your pills but see a health worker to find out if you are pregnant.

- **Nausea,** the feeling that you want to throw up, usually goes away after 1 or 2 months. If it bothers you, try taking the pills with food or at another time of day. Some women find that taking the pill just before going to sleep at night helps.

- **Headaches.** Mild headaches in the first few months are common. A mild pain medicine should help. If the headache is severe or comes with *blurred eyesight*, this could be a serious warning sign, see below.

If you are given a new medicine while on the pill, ask your health worker if you should use a barrier method or not have sex while taking the medicine. Some antibiotics and other medicines make the pill less effective.

**Warning signs for problems with combined pills:**
**STOP taking the pill and see a health worker if you:**
- have severe headaches with blurred vision (migraines) that begin after you start taking the pill.
- feel weakness or numbness in your arms or legs.
- feel severe pain in your chest and shortness of breath.
- have severe pain in one leg.
- have severe pain in the abdomen.



*If you have any of these problems, pregnancy can also be dangerous, so use another type of family planning such as condoms until you can see a health worker trained in hormonal family planning methods.*

**How to take combined birth control pills:**

The pill comes in packets of 21 or 28 tablets. If you have a 28-day packet, take one pill every day of the month. As soon as you have finished one packet, begin taking pills from another packet. (The last 7 pills in a 28-day packet are made of sugar. They have no hormones in them. These sugar pills help you to remember to take a pill each day.)
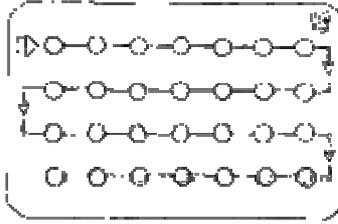
28-Day Pill Packet
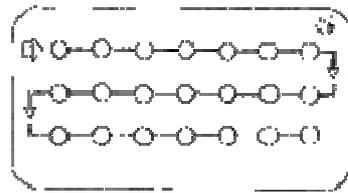
21-Day Pill Packet

If you have a 21-day packet, take a pill every day for 21 days, then wait 7 days before beginning a new packet. Your monthly bleeding will usually happen during the days you are not taking pills. But begin a new packet even if your monthly bleeding has not come.

With both 21-day and 28-day packets, take the first pill on the first day of your monthly bleeding. This way you will be protected right away. If it is after the first day, you can start taking a pill on any of the first 7 days of your monthly cycle. But you will not be protected right away, so for the first 2 weeks you are taking the pill you should also use another family planning method or not have sex.

**You must take one pill every day, even if you do not have sex.** Try to take your pill at the same time every day. It may help to remember that you will always start a new packet on the same day of the week.

**Forgetting to take pills:**

= missed pill

= take 2 pills

**If you miss pills you could get pregnant.**

**If you forget 1 or 2 pills**, take 1 pill as soon as you remember. Then take the next pill at the regular time. This may mean that you take 2 pills in one day.

**If you forget to take 3 pills, 3 days in a row**, take 1 pill right away. Then take 1 pill each day at the regular time.

If you are using a 28-day packet of pills, take only the hormone pills and skip the sugar pills, then start taking hormone pills from a new packet. If you are using a 21-day packet, start a new packet as soon as you finish the one you are taking now. Use condoms (or do not have sex) until you have taken a pill for 7 days in a row.

If you forget to take more than 3 pills, stop taking the pills and wait for your next monthly bleeding. Use condoms (or do not have sex) for the rest of your cycle. Then start a new packet.

Late or missed pills may cause some bleeding, like a very light monthly bleeding.



If you have trouble remembering to take pills, try taking a pill when you do a daily task, like preparing the evening meal. Or take the pill when you see the sun go down or before you sleep. Keep the packet where you can see it every day. If you still forget to take your pills often (more than once a month), think about changing to a different method of birth control. If you vomit within 3 hours after taking your pill or have severe diarrhea, your birth control pill will not stay in your body long enough to work well. Use condoms, or do not have sex, until you are well and have taken a pill each day for 7 days.

**Stopping the pill:**
If you want to change methods or get pregnant, stop taking the pills when you finish a packet. You can get pregnant right after you stop.

Most women who stop taking pills because they want to get pregnant will get pregnant sometime within the first year.

**The Minipill or Progestin-only Pills**
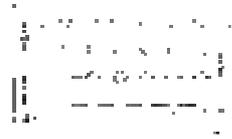


*The minipill is safe and effective during breastfeeding.*

If you forget a pill, use a barrier method (or do not have sex) for 7 days, AND keep taking your pills.

Because this pill contains no estrogen, it is safer for women who should avoid combined pills for health reasons or who have side effects from combined pills.

The minipill is very effective for most breastfeeding mothers who have not had monthly bleeding since giving birth. It is slightly less effective than combined pills for women who are not breastfeeding and for women who are breastfeeding more than 6 months after giving birth.
The minipill is usually available at family planning clinics, health posts, pharmacies, and through health workers.

Women with any of the [[Where_Women_Have_No_Doctor:Hormonal_Methods_of_Family_Pl anning#avoid|conditions listed above and women who are taking medicine for seizures should not take the minipill. The medicine makes the minipill less effective.

**Common side effects of the minipill:**
- **irregular bleeding or spotting.** This is the most common side effect. If it becomes a problem, taking ibuprofen may help stop spotting.
- **no monthly bleeding.** This is fairly common, but if you go more than 45 days without bleeding you may be pregnant. Keep taking

your pills until you can see a health worker to find out if you are pregnant.

- **occasional headaches.**

**How to take the minipill:**
- If you are not breastfeeding, or if you are breastfeeding and your monthly bleeding has started again, take the first pill on the first day of your monthly bleeding.
- If you are breastfeeding and have not had monthly bleeding, you can take the first pill any day from 6 weeks to 6 months after giving birth. You may not begin bleeding. This is normal. After 6 months with no monthly bleeding, you can take the first pill any day, but also use a barrier method or do not have sex for the first 2 days.
- Take the pill at the same time every day. If you take the pill even a few hours late, or if you forget to take the pill for only one day, you can become pregnant.
- When you finish a packet, start your new packet the next day, even if you have not had any bleeding. Do not skip a day.

*What to do if you miss a minipill:*
Take it as soon as you remember. Take the next pill at the regular time, even if it means taking 2 pills in one day. Use a barrier method with the pill, or do not have sex for 2 days. You may have bleeding if you take your pill at a later time than usual.

*Stopping the minipill:*
You can stop taking the pill any time. You can get pregnant the day after you stop, so be sure to use another family planning method right away if you do not want to become pregnant. If you can wait until the end of your cycle before stopping, your monthly bleeding will be more regular.

**Implants (Jadelle, Implanon, Norplant)**

Implants are small, soft tubes that are placed under the skin on the inside of a woman's arm. These tubes contain the hormone progestin and work like minipills. They prevent pregnancy for 3 to 5 years, depending on the type of implant.

**How to use implants:**
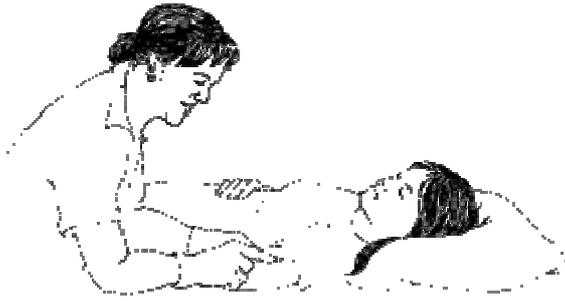
A trained health worker makes a small cut in the skin to insert and remove the implants. This is usually done at a clinic or family planning center.

**Important!** Before trying implants, be sure a health worker near you is trained and willing to remove the implants, in case you want them removed. It is harder to take implants out than it is to put them in.

Implants can be used by women who are breastfeeding and others who have problems with estrogen. Women should not use implants if they have any of the conditions described above, if they have heart disease, or if they want to become pregnant in the next few years. If you are taking medicines for seizures, you will need to use a backup method, like a condom or a diaphragm, as well as the implants.

**Common side effects of implants:**

During the first months, the implants may cause irregular bleeding (in the middle of your monthly cycle) or more days of monthly bleeding. Or you may have no bleeding at all. This does not mean that you are pregnant or that something is wrong. These changes will go away as your body becomes used to having more progestin. If this irregular bleeding causes problems for you, a health worker may have you take low-dose combined birth control pills along with the implants for a few months. You may also have occasional headaches and the same side effects common with progestin-only injections.

Many women want their implants removed early because they do not like the side effects. The most common concern is irregular bleeding.

**To stop using implants:**

Implants can be removed at any time—though it can be hard to find a health worker who knows how to remove them. After removal, you can get pregnant right away, so use another family planning method if you do not want to become pregnant.

**Birth control injections**



In this family planning method, a woman is given injections of hormones every 1 to 3 months, usually at a health center or family planning clinic, by someone who knows how. The protection lasts until you need a new injection, and can be used without others knowing.

**Progestin-only injections**
Progestin-only injections, such as Depo Provera and Noristerat, contain only the hormone progestin. These are especially good for women who should not use estrogen. They are given every 2 to 3 months.

Women should not begin progestin-only injections if they have any of the conditions listed above, if they are unable to get regular injections, or if they want to become pregnant within the next year.

**Common side effects of progestin-only injections:**
Progestin-only injections almost always cause changes in the monthly bleeding. You may have light bleeding every day or every once in a while. You will probably stop having monthly bleeding by the end of the first year. These changes are normal.

Because of the large doses of progestin given with each injection, women experience more changes in their monthly bleeding during the first few months than with other hormonal methods. Other common side effects are:

- **irregular bleeding or heavy spotting.** If this is a problem, a health worker can give 2 cycles of a combined low-dose birth control pill to take along with the injections to stop the spotting. Most irregular bleeding will stop after a few months.
- **no monthly bleeding.**
- **weight gain.**

**Combined injections**
Other injections, such as Cyclofem and Mesigyna, contain both estrogen and progestin. This type of injection is good for women who want to have regular monthly bleeding. Combined injections are given every month, are more expensive than progestin-only injections, and are harder to find.

Women who should not take combined birth control pills or progestin-only injections should not take combined injections either. Do not begin

combined injections while breastfeeding until your baby is 6 months old or your monthly bleeding returns, whichever happens first.

**Common side effects of combined injections:**
Because the injection contains the same hormones as combined birth control pills, the same side effects are common.

**How to use birth control injections:**
It is best to get your first injection during your monthly bleeding. This way you know that you are not pregnant. You can start the injections anytime if you are breastfeeding and have not started your monthly bleeding. The injection protects you against pregnancy immediately if it is given within 5 days after your monthly bleeding begins. If the injection was given 6 or more days after the beginning of your monthly bleeding, you should use condoms or not have sex for the next 7 days. You must have an injection every 1, 2, or 3 months, depending on the kind of injection:
- *Depo Provera*: every 3 months
- *Noristerat:* every 2 months
- *Cyclofem and Mesigyna:* every month

Try not to be late getting injections. The injection becomes less effective the longer you wait. If you are late, use a barrier method, or do not have sexual intercourse for 7 days after the injection.
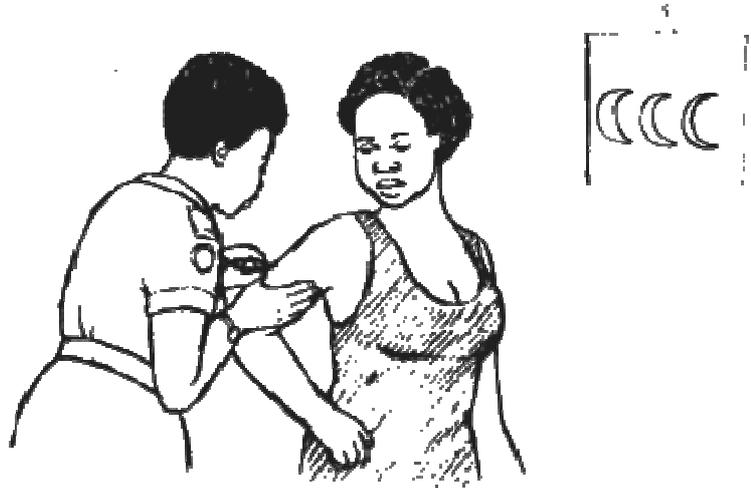


*You are using Depo Provera, so you will need to come back in 3 months for your next injection.*

**To stop using injections:**
You can stop having birth control injections any time you want. But after you stop, it can take a year or more to become pregnant and for your monthly bleeding to return to normal. But it also may come back

sooner. So if you do not want to become pregnant right away, you must use another family planning method during this time.

**Intra- Uterine Devices (Devices that go into the womb)**
**The IUD (IUCD, Copper-T)**
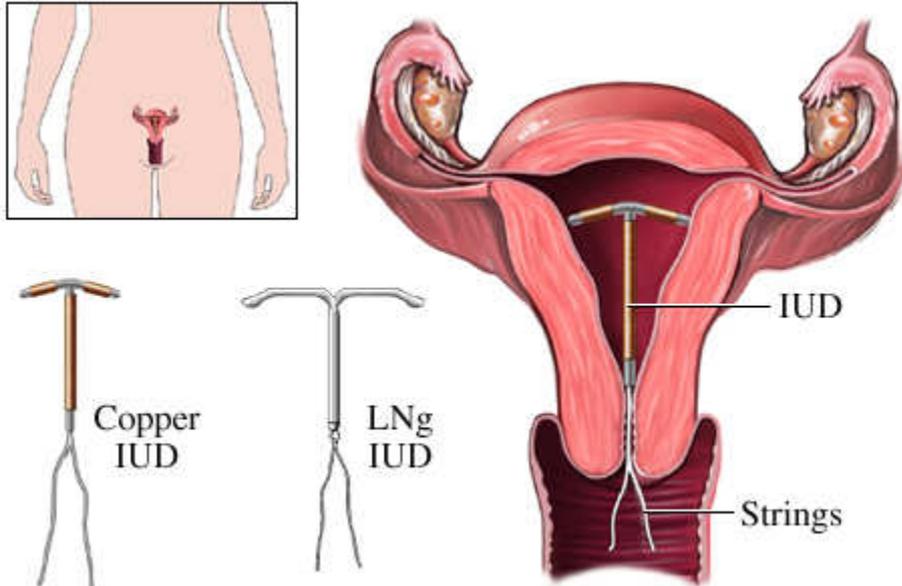


The IUD is a small object or device that is inserted into the womb by a specially trained health worker or midwife. Once in the womb, the IUD prevents the man's sperm from fertilizing the woman's egg. The IUD can stay in the womb for up to 10 or 12 years (depending on the kind of IUD it is) before it must be removed and replaced. An IUD can be used without the man knowing you are using it (although sometimes a man can feel the strings).

The most common IUDs are made of plastic, or plastic and copper.



**Progestin IUD (Mirena, Levonova)**
This kind of IUD also contains the hormone progestin and is available in some countries. Progestin decreases the pain and bleeding that some women have with the IUD. It protects against pregnancy for 5 years.

**Important!** IUDs do not protect against STIs, including HIV. And if a woman has an STI, the IUD can lead to more serious complications, such as pelvic inflammatory disease (PID). PID can lead to infertility.

IUDs can be used safely by women who are breastfeeding.
Do not use an IUD if you are unable to get to a health center or clinic
where you can have the IUD removed if necessary.

**Do not use an IUD if you:**
- are pregnant or might be pregnant.
- have an STI or are in danger of getting an STI. (This includes any woman who has more than one partner, or whose partner may have other sex partners.)
- have a lot of bleeding and pain during your monthly bleeding (a progestin IUD may be better).
- are very anemic (a progestin IUD may be better).

Wait for at least 3 months before using an IUD if you have had an
infection in your tubes or womb, or an infection after giving birth or
after having an abortion.

**Common side effects:**
You may have some light bleeding during the first week after getting an
IUD. Some women also have longer, heavier, and more painful monthly
bleeding, but this usually stops after the first 3 months.

*How to use the IUD:*
An IUD must be inserted by a specially trained health worker after
doing a pelvic exam. The best time to have the IUD put in is during your
monthly bleeding. After childbirth, it is best to wait 6 weeks for the
womb to return to its normal size and shape before getting an IUD.
Occasionally an IUD will slip out of place. If this happens, it will not be
effective in preventing pregnancy, so it is important to learn to check
your IUD to make sure it is still in place.



Most IUDs have 2 thread-like strings attached which hang down into the
vagina. You should check the strings after each monthly bleeding to
make sure the IUD is in place.

*How to check the IUD strings:*
1.      Wash your hands.
2.      Squat down and reach as far as you can into your vagina with your 2 fingers. Feel for the IUD strings, but **do not pull them.**
3.      Take out your fingers and wash your hands again.

**Warning signs for problems with an IUD:**
Pelvic inflammatory disease is the most serious problem that can result from having an IUD. Most infections happen in the first 3 months, usually because the woman already had an infection when the IUD was put in. Or it may happen because the health worker did not put in the IUD under clean conditions.

If you have any of the following signs, you should see a health worker trained to insert IUDs and to treat complications, or go to a hospital immediately:

- Your monthly bleeding is late.
- You have pain in your lower belly or pain during sex.
- You have a heavy or bad-smelling discharge from the vagina.
- You do not feel well, or have fever or chills.
- Your IUD string is missing, or is shorter or longer than usual.
- Your partner can feel the IUD (not just the strings) during sex.

**To stop using an IUD:**
When you want to stop using an IUD, it must be removed by a trained health worker. Never try to remove an IUD yourself. You can become pregnant as soon as it has been removed.

**Natural Methods of Family Planning**
There are also 3 methods to avoid pregnancy that do not require any devices or chemicals (as with barrier methods) or medicines (as with hormonal methods). The methods are:
- breastfeeding for the first 6 months
- the mucus method
- the counting days method

**Important!** Natural methods of family planning do not protect against STIs, including HIV. If you use any of the natural methods listed in these pages, you still need to think about ways to protect yourself from these diseases.

**Breastfeeding for the first 6 months (Lactational Amenorrhea Method, LAM)**

Breastfeeding under certain conditions can prevent the ovaries from releasing an egg. This method does not cost anything, but it is most effective for only the first 6 months after childbirth.

**How to use breastfeeding to prevent pregnancy:**
Breastfeeding is an effective method of family planning only when these 3 conditions are true:

**1.** Your baby is less than 6 months old.

**2.** You have not had your monthly bleeding since giving birth.
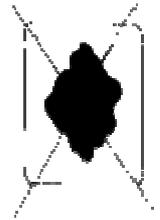
**3.** You are giving your baby only breast milk, and feeding it whenever it is hungry, day and night, with no more than 6 hours between feedings. Your baby does not sleep through the night without feeding.

Use another method of family planning that is safe with breastfeeding as soon as any of the following things happen:

- Your baby is more than 6 months old, **or**
- Your monthly bleeding starts, **or**
- Your baby starts taking other kinds of milk or other foods, or starts sleeping for more than 6 hours during the night, **or**
- You must be away from the baby for more than 6 hours and cannot remove milk from your breasts during that time.

All these methods require the man's cooperation or they will not be effective.

**The mucus method and the counting days method**
To use either of these methods, you must understand when you are fertile during your monthly cycle. This is sometimes called 'fertility awareness'. Then, to avoid pregnancy, you and your partner must not have sex, or must use a barrier method of family planning, during your fertile days.

Because there are no costs or side effects, these methods can be used by women who cannot or do not want to use other methods, or when other methods are not available.



*I'm tired of waiting!*

To practice fertility awareness more effectively, both you and your partner should visit a specially trained health worker to learn about your bodies and about fertility. It usually takes about 3 to 6 months of practice to learn how to use these methods.

**The mucus and counting days methods do not work as well if:**
- you have little control over when you will have sex. During fertile times, your partner must be willing to wait and not have sex or to use condoms or some other barrier method.
- your fertility signs change from month to month. You will not be able to know when you are fertile.
- you have just had a baby or miscarriage. It is hard to know when you are fertile at these times.

**What you should know about a woman's cycle of fertility:**
- A woman releases one egg each month.
- The egg is released from the ovary about 14 days before the next monthly bleeding.
- The egg lives for about 24 hours (1 day and 1 night) after it has been released from the ovary.
- The man's sperm (seed) can live up to 2 days inside the woman's body.

*To make all natural family planning methods more effective:*
- Have sex only on the days between the end of the fertile time and your next monthly bleeding.
- Use both the mucus method and the counting days method at the same time.

- Use condoms whenever you are not sure if you are fertile, or do not have sex.

**Mucus Method**

To use the mucus method, you must pay careful attention to the mucus (wetness) in your vagina. Your body produces wet mucus during your fertile time to help the sperm get into the womb. So if you check your mucus every day, you will know when you are becoming fertile. Then you can avoid sex during this time.

*How to tell when you are fertile:*

**1.** Wipe the outside of your vagina with your finger or a piece of paper or cloth.

**2.** If there is mucus there, take some between your fingers. How does it feel? Wet and slippery? Dry and sticky?

*clear, wet, slippery mucus = fertile*

*white, dry, sticky mucus = not fertile*

How to use the mucus method:
- Do not have sex on any day you see or feel wetness or mucus. Or, if you want to have sex on those days, use a condom or a diaphragm without spermicide (these are the only methods that do not change the mucus).
- Do not have sex until 2 days after the last day of clear, slippery mucus.
- Do not have sex during your monthly bleeding. There is a small possibility you could be fertile and not be able to tell.
- Do not douche or wash out your vagina at any time. This will wash the mucus away.

- If you are having trouble knowing when you are fertile, or if you have a vaginal infection, you should use another method.

**Counting Days Method**

With the counting days method, you do not have sexual intercourse during any time that you might be fertile. This method can be used only if you have regular cycles that last between 26 and 32 days. This means that the time from the first day of one monthly bleeding, to the first day of your next monthly bleeding, must be at least 26 days, and no more than 32 days.
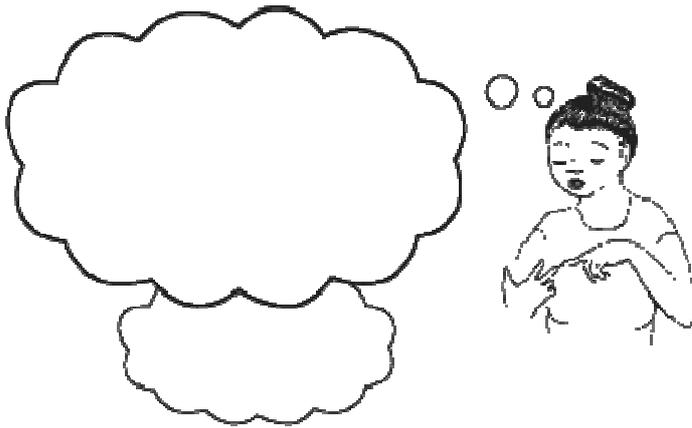


*I started my
monthly bleeding
8 days ago. So we
cannot have sex today,
or for the next
10 days.
I better go to
my sister's.*

This method will usually work if you have nearly the same number of days from one monthly bleeding to the next (regular cycles). But if you have one cycle of a different length, you can easily get pregnant. It is common for a woman to have a cycle of a different length when she is sick or feeling a lot of stress. So if you are sick or feeling stress, it will be best for you to use a different family planning method until you are well and your cycle is normal.

*How to use the counting day's method:* For this method to work, you cannot have sexual intercourse from the 8th day of your cycle through the 19th day of your cycle. If you have sexual intercourse during this time, you must use another method of family planning.

You can use beads, a chart, or some other tool to remember your fertile days. String 32 beads, of 3 different colors, into a necklace. Each color bead can represent a different part of your cycle.

*A red bead marks the
first day of
your monthly
bleeding.
13 more blue
beads show days
when sexual
intercourse will
not usually cause
pregnancy.*



*6 blue beads show days
   when sexual intercourse
     will not usually cause
      pregnancy.
      12 white beads
     show your fertile time —
   when sexual intercourse
can cause pregnancy.*



On the first day of your monthly bleeding, put a ring or string around the red bead. Each day, move the ring past one bead. When the ring is on any of the white beads, you may get pregnant if you have sexual

intercourse. Whenever you start your next monthly bleeding, move the ring back to the red bead at the start.

**Traditional and Home Methods**

Every community has traditional methods to prevent or stop pregnancy. Many of these can be very useful in limiting the number of children a couple has, although they are usually not as effective as modern methods. But some traditional methods are not effective at all, and some can even be very harmful.

**Traditional methods that work**



**Withdrawal or pulling out**  (coitus interruptus). With this method, a man pulls his penis out of the woman and away from her genitals before he ejaculates. This method is better than no method, but it does not always work. Sometimes a man is not able to pull out before he ejaculates. Even if the man pulls out in time, some liquid that contains sperm can leak out of his penis before ejaculation and cause pregnancy.

**Separating partners after childbirth** .In many communities, couples do not have sex for months or years after the birth of a baby. This allows the mother to give more time to the care of the new baby and to regain her strength without fear of pregnancy.

**Sex without intercourse.** There are also ways to have sex that do not cause pregnancy. Oral sex (mouth on genitals) and sexual touch (touching the genitals or other parts of the body) are both sexual activities that many couples enjoy. They have very low risk of passing

HIV and other STIs. Anal sex also cannot cause pregnancy, although HIV and other STIs can pass very easily this way.

Avoiding all sexual intercourse (the man's penis inside the woman's vagina) is the surest way to prevent pregnancy, although it may be difficult to practice for a long time.

**Traditional methods that do not work or can be harmful**
- Omens and magic do not prevent pregnancy.
- Putting grasses, leaves, pods, and dung in the vagina can cause infection and irritation.
- Washing out the vagina (douching) with herbs or powders does not prevent pregnancy. Sperm move very fast and some will reach the inside of the womb before they can be washed out.
- Urinating after sex does not prevent pregnancy. (But it can help to prevent infections of the urine system.)

**Permanent Methods of Family Planning**
**Sterilization (the operation for no more children)**
There are operations that make it almost impossible for a man or a woman to have any children. Since these operations are permanent, they are only good for those women or men who are certain that they do not want any more children.
To have one of these operations, you must go to a health center or hospital. The surgery is fast and safe, and does not cause side effects.

**The operation for the man (Vasectomy)**
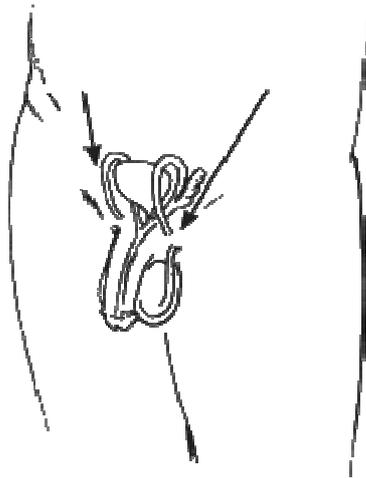


The man's tubes are cut :here and here
A vasectomy is a simple operation in which the tubes that carry the sperm from the testicles to the penis are cut. The man's testicles are not cut. This operation can be done in any health center where there is a trained health worker. It takes only a few minutes to do.

**The operation does not change a man's ability to have sex or to feel sexual pleasure.** He still ejaculates semen but there are no sperm in the semen. The tubes may still have sperm in them for as long as 12 weeks after the operation, so you need to use another method of family planning during that time.

**The operation for the woman (Tubal Ligation)**
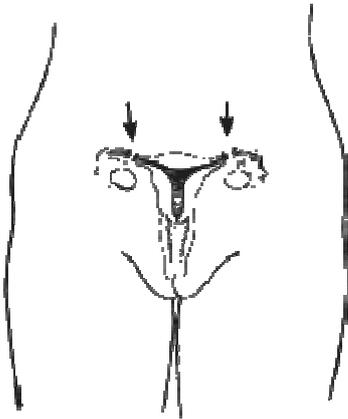
The woman's tubes are cut:
Here and here
A tubal ligation is a slightly more difficult operation than a vasectomy, but it is still very safe. It takes about 30 minutes.

A trained health worker inserts a tool through the skin near the belly button to cut or tie the tubes that carry the eggs to the womb. **It does not change a woman's monthly bleeding or her ability to have sex and sexual pleasure.**

**Important!** Sterilization does not protect against STIs, including HIV. So you will still need to think about ways to protect yourself from these infections.

**New Methods of Family Planning**
The following new methods of family planning are available or are being developed. They may only be available in some places and may be expensive. We include them here because the more women know about new methods and ask for them, the more likely it is that the methods will become available for everyone and perhaps be less costly. The more methods there are, the more likely it is that every woman who wants to prevent pregnancy will be able to find a method that suits her needs.

**The patch** is a thin piece of plastic that sticks to the skin and releases both estrogen and progestin into the body. You must put on a new patch once a week for 3 weeks in a row, then no patch for 1 week (the week of

your monthly bleeding). You should not use the patch if you have any of these conditions or these conditions. The patch can have the same side effects as combined pills.

**Once-a-week birth control pills** work by changing a woman's natural balance of estrogen, which prevents a fertilized egg from attaching to the womb wall. The once-a-week pill is less effective than regular daily birth control pills at preventing pregnancy. Little is known about its side effects.

**Vaginal rings** slowly release estrogen and progestin, or just progestin, into a woman's vagina. Vaginal rings come in only one size and a woman can put one in herself. They last from 1 month to 1 year. You can get pregnant as soon as you stop using a ring.

**Choosing the Best Method**
The best family planning method is the one you are most comfortable using. To choose the best method for you, it can be helpful to think about your day-to-day life, your relationships, concerns, needs, and desires. Whichever method you choose, it is important to understand and follow the instructions for how to use it effectively. Here are some ways to think about different methods based on your personal needs.

| You might PREFER: | You might AVOID: |
|---|---|
| Barrier methods, IUD | Hormonal methods |

*I want to keep having normal monthly bleeding.*

| You might PREFER: | You might AVOID: |
|---|---|
| Implants, injections, IUD | Combined pill, mini-pill, any natural method |

*I do not want to have to do something everyday.*

*My partner does not want to me use family planning.*

**You might PREFER:** Injections, implants, IUD

**You might AVOID:** Barrier methods, pills, natural methods

*I want to be able to have sex anytime without interruption.*

**You might PREFER:** IUD, hormonal methods

**You might AVOID:** Barrier methods, natural methods

*I want to have a child within a year.*

**You might PREFER:** Any barrier method, combined pill, mini-pill, any natural method

**You might AVOID:** Implants, injections, IUD, sterilization

*I am breastfeeding my baby.*

*I do not want to put things in my vagina or my womb.*

**You might PREFER:** Hormonal methods, male condom, natural methods

**You might AVOID:** Diaphragm, female condom, IUD

*I do not want any more children.*

**You might PREFER:** Sterilization, implants, injections, IUD

**You might AVOID:** Natural methods, barrier methods

*I think my partner has sex with others and may infect me with an STI.*

**You might PREFER:** Male or female condom

**You might AVOID:** Any hormonal method, any natural method, IUD, sterilization

*My husband does not want to be involved in using a family planning*

*method.*

**You might PREFER:** Male or female condom, diaphragm, implants, IUD, minipill, progestin-only injections

**You might PREFER:** Female condom, diaphragm, any hormonal method, IUD

**You might AVOID:** Combined pill, monthly injections until your baby is 6 months old or your monthly bleeding returns.

**You might AVOID:** Male condom, natural family planning

**Emergency Methods of Family Planning**



Emergency family planning methods should not be used in place of other methods.

Emergency methods are ways for women to avoid pregnancy after having unprotected sex. They are only effective if used soon after having sex.

Emergency methods are safe and effective. But they are not as effective as consistent use of the other family planning methods discussed in this chapter and they can cause unpleasant side effects.

**Emergency Pills**
The pills used for emergency family planning are often the same birth control pills that some women take each day. But in emergencies, you take a much higher dose for a short time. There are now also special emergency pills that have the high dose in 1 or 2 pills. For any of these, you must take the pills within 5 days of having unprotected sex. The sooner you take the pills after unprotected sex, the more likely it is you will not get pregnant (see 'How to take pills for emergency family planning'). If you are already pregnant, taking emergency pills will not end the pregnancy or cause birth defects.

Until your next monthly bleeding, you should use a barrier method of family planning, like condoms, or not have sex. After your monthly bleeding, you can use any family planning method you choose.

Your next monthly bleeding should begin in about 2 weeks. If it does not, you may have become pregnant despite the emergency family planning. You should continue to use a barrier method of family planning until you know for sure.

**Other emergency methods**

**IUD (Intra-Uterine Device):** A Copper-T IUD can also keep the egg from attaching to the womb wall.

- The IUD must be inserted by a specially trained health worker within 5 days after having unprotected sex. The IUD can be kept in and continue to protect you from pregnancy for up to 10 or 12 years. Or you can have the IUD removed after your next monthly bleeding when it is certain you are not pregnant. Do not have an IUD inserted if you think you might have an STI.

**Working for Change**

Sometimes a woman would like to space her children or limit the number she has, but cannot use family planning. This can happen because:

- she cannot get the information about different methods.
- some family planning methods are not easily available or cost too much for the family to afford.
- there are no women's health or family planning services nearby, or the local health worker is not trained to provide family planning services.
- religious beliefs forbid the use of family planning.
- a woman's husband does not agree to use family planning.

Here are some things that groups of people can do to make family planning services more available to all women in the community, and to encourage the use of family planning:
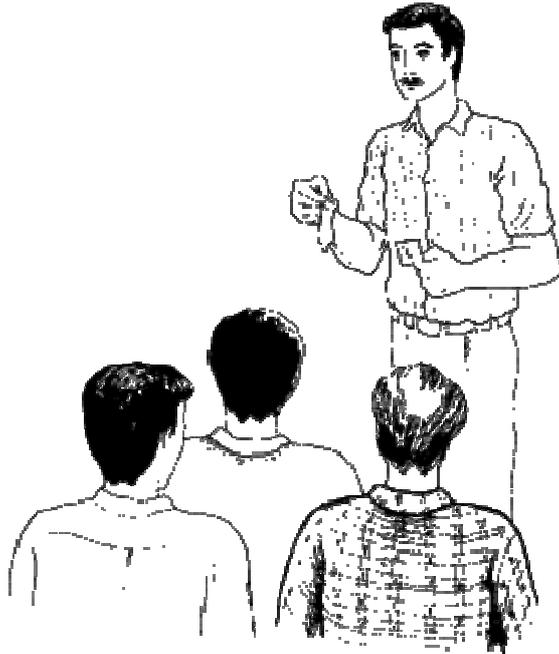
- **Provide education.** Make information about family planning available to everyone—boys and girls as well as women and men. Education programs can show the benefits of family planning and help couples choose the best methods for them. Perhaps you can lead discussions with women or couples about their concerns and experiences related to family planning. Include information about preventing STIs and HIV when you talk about family planning.
- **Make family planning methods accessible at a low cost.** Have a local health worker trained to provide family planning services start a women's health center or include family planning services at your local clinic.
- **Train male outreach workers** to educate men about the importance and benefits of family planning. Help men understand their role in reproduction so they can see that they should share the responsibility for family planning. Try to change attitudes about what is 'manly' so that men will support and participate in family planning with their partners.
- **Address local religious concerns** about family planning. If a family planning method can be explained in a way that respects religious beliefs, it will help create more acceptance of it.

As you talk about family planning in your community, it helps to remember and remind others that family planning is important to improve not just women's health and well being, but the health and quality of life of everyone in your community.

**SELF-ASSESSMENT EXERCISE**

Describe the hormonal family planning methods

**4.0    CONCLUSION**

Puerperium is defined as a period which commences after the expulsion of the placenta and lasts up to about 6 -8 weeks after delivery. It is characterized by the following physiological and psychological changes when the reproductive organs return to their pre-gravid state, lactation is initiated and established and recuperation from physical and emotional experiences of pregnancy and delivery.

**5.0    SUMMARY**

This unit has defined the period of puerperium as the first six weeks after delivery. A lot of processes of readjustment take place in the body; the effect in the uterus will result in the reduction of the size and the discharge of lochia. Lochia changes in volume and color as the placental site heals from rubia, red, serosa, pink and finally alba (white). Persistently red lochia is a sign of problem in the uterine cavity. Care during puerperium is classified into immediate when the woman is observed for bleeding, and the subsequent care which include follow up. Birth control can start as soon as she desires to commence coitus after six weeks when placenta site would have healed. The method will be based on informed choice by the midwife/ practitioner.

**6.0    TUTOR-MARKED ASSIGNMENT**

During your midwifery posting choose 2 primigravida and 2 multigravida mothers and manage them till discharge.Record in your Midwifery Log book

**7.0    REFERENCES/FURTHER READING**

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