ANATOMY AND PHYSIOLOGY OF THE FEMALE REPRODUCTIVE SYETEM (Pregnancy)

Anatomy and Physiology of the Female Reproductive System
Section Two: Physiology of Pregnancy

Unit Objectives

By the end of this unit you will be able to:

- Describe the anatomy and physiology of the female reproductive system
- Explain the physiological changes that occur during pregnancy

Section 1:

Anatomy and Physiology of the Female Reproductive System

Introduction

The Safe Motherhood Initiative (SMI) is designed to reduce the high numbers of deaths (maternal mortality) and illnesses (maternal morbidity) resulting from complications of pregnancy and childbirth. It is, therefore, important to study and understand the whole process of reproduction, that is, the anatomy and physiology of the human reproductive system.

Objectives

By the end of this section you will be able to:

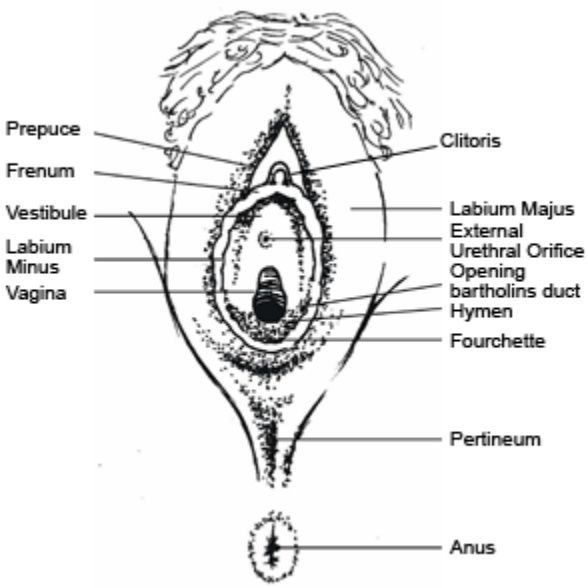
- Describe the components of the female reproductive system
- Describe the functions of the hormones that regulate the menstrual cycle and pregnancy
- Describe obstetric anatomy
- Outline the anatomy of the foetal skull

The Components of the Female Reproductive System

The female reproductive system consists of two parts: the external genitalia and the internal genitalia.

The External Genitalia (Vulva)

The external genitalia is also known as the vulva. It is made up of all the external organs, It extends from the mons veneris anteriorly, to the perineal body posteriorly.



The External Genitalia (Vulva)

The following are parts of the external genitalia

The Mons Veneris

This is a pad of fat lying over the body of the pubic bone and is covered by skin on which hair grows from the time of puberty.

The Labia Majora

These are two thick folds of fatty and areola tissue covered by skin externally. They start in the Mons Veneris and merge into the Perineum posteriorly.

The Labia Minora

The labia minor are two small thin folds of skin lying between, and almost covered by the labia majora. They fuse posteriorly thus forming the fourchette.

The Clitoris

This is a highly sensitive erectile structure situated at the anterior junction of the Labia minora. It is the female equivalent of the male penis.

The Urethral Meatus

This is a small opening about 2.5 centimetres below the clitoris.

The Vaginal Orifice

This is also known as the introitus of the vagina. It lies between the labia minora and posteriorly to the urethra. It is partially occluded by the hymen in girls who have not been sexually active.

The Hymen

This is a thin membrane which partially shuts the introitus in the vagina.

The Bartholin's Glands

These are two small glands, one on either side of, and slightly posterior to the vagina, beneath the labia majora. Their ducts open into the vaginal orifice. They secrete mucus, which lubricates the vaginal orifice.

The vulva receives its blood supply from the internal and external pudendal arteries and which is then returned through the pudendal veins. The lymphatic drainage is via the inguinal glands, while the nerve supply is derived from the pudendal nerve

These parts make up the external genitalia. Now move on to look at the internal genitalia.

The Internal Genitalia

The internal genitalia comprises of:

- The vagina
- The uterus
- The uterine tubes
  (also called the fallopian tubes)
- The ovaries

The Vagina

The vagina is a fibro-muscular canal joining the external genitalia and the uterus. The posterior wall of the vagina is longer than the anterior wall. This is because the cervix projects at right angle into the upper part of the anterior wall. Its walls are arranged in folds known as rugae, which allow the vagina to stretch during sexual intercourse and childbirth.

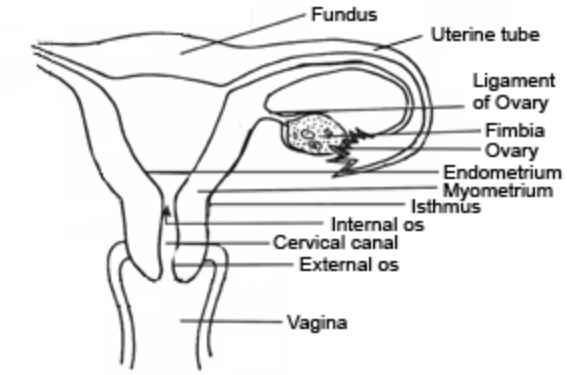
The vault is the upper end of the vagina, which forms four arches known as fornices. The posterior fornix is the largest.

The vagina has four layers, these are:

- The inner layer or lining made of
  squamous epithelium
- The vascular connective tissue beneath it
- The muscle layer that is divided into a weak inner fibre and a stronger outer coat of longitudinal fibres
- A layer of connective tissue, which surrounds the vagina

Blood Supply - The blood supply comes from branches of the internal iliac artery, the vaginal artery and a branch of the uterine artery. The blood drains through the vaginal vein and a branch of the uterine artery. Lymphatic drainage is via the inguinal, the internal iliac and the sacral glands. Nerve supply is via the Lee Frankenhauser plexus.

In front of the vagina lies the bladder and the urethra, which are closely connected to the anterior wall. Behind the vagina are the pouch of Douglas, the rectum and the perineal body. Each of these occupies about one third of the posterior vaginal wall. The uterus lies above the vagina.



The Uterus

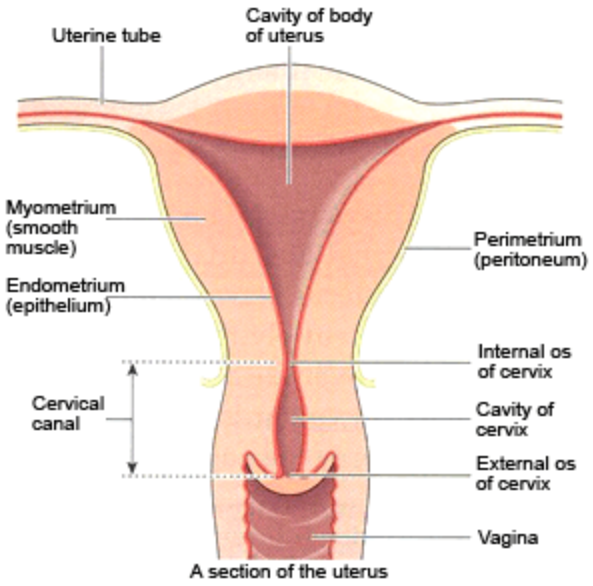
The non-pregnant uterus is a hollow pear-shaped muscular organ situated in the pelvic cavity. It is 7.5 centimetres long, 5 centimetres wide, 2.5 centimetres deep and 1.25 centimetres thick.

It lies behind the bladder and in front of the rectum. It leans forward over the bladder, which is known as anteversion and bends forward the cervix at the level of the internal os, which is known as anteflexion. When a woman stands, the position becomes almost horizontal with the fundus, resting on the bladder.

The uterus performs the following functions among others:

- Receives the fertilised ovum
- Provides shelter for the foetus during pregnancy
- Expels the uterine contents during childbirth

Anterior to the uterus lie the utero-vesical pouch and the bladder, while posteriorly lie the recto-uterine pouch of Douglas and the rectum. Laterally, on either side, are the broad ligaments, the uterine tubes and the ovaries.

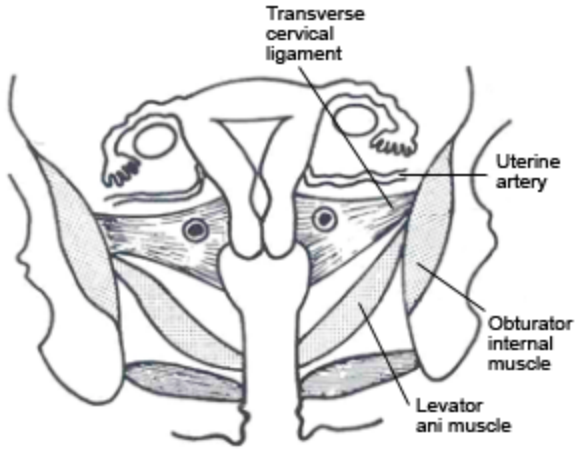


The uterus is kept in its normal position in the pelvis by the following supports:

- Ligaments
- The muscles of the pelvic floor which is mainly the levator ani
- The pubovesico-cervical support consisting mainly of fascia

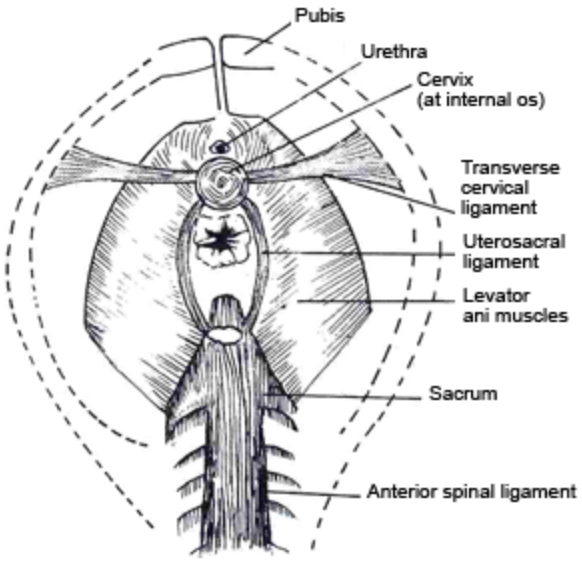
The ligaments are the most important support structures and help to maintain the uterus in its position. They consist of the following:

- The transverse cervical ligaments
- The uterosacral ligaments
- The pubocervical ligaments
- The broad ligaments
- The round ligaments
- The ovarian ligaments



The transverse cervical (also called cardinal ligaments) are the most important uterine support. They fan out from the sides of the cervix to the sidewalls of the pelvis to give lateral stability to the cervix. The utero-sacral ligaments pass backwards from the cervix to the sacrum. They maintain the body of the uterus in anteversion position.

The round ligaments arise at the cornua of the uterus and descend through the broad ligaments and inguinal canal to the labia majora. They hold the fundus forward in anteversion, especially when forces such as distension of the bladder tend to push the uterus back. The broad ligaments are folds of peritoneum over the fallopian tubes and do not support the uterus.



Structure of the Non-Pregnant Uterus

The uterus of a non-pregnant woman is a hollow pear shaped muscular organ that consists of the following parts:

- **The body** makes up the upper two-thirds of the uterus and is the biggest part.
- **The fundus** is the upper rounded part above the insertion of the fallopian tubes.
- **The cornua** are the upper outer angles where the uterine tubes join.
- The uterine cavity is the triangular space between the anterior and posterior walls, with the base of the triangle uppermost.
- **The isthmus** is the narrow area between the cavity and the cervix.
- The cervix protrudes into the vagina with the upper half above the vagina.
- **The internal** os is a narrow opening between the isthmus and the cervix, the external os is a small round opening at the lower end of the cervix.

The Layers of the Uterus

The uterus has three layers: the endometrium, the myometrium and the perimetrium.

The Endometrium

This is the inner lining of the uterus composed of ciliated epithelium (mucous membrane) on a connective tissue base and it changes in thickness during the menstrual cycle. The basal layer does not change. This will be discussed further under the menstrual cycle.

The Myometrium (or Muscle Coat)

This is the middle layer of the uterus. It is the thickest layer and is made up of three layers of muscle fibre. The fibres run in all directions and intermingle to surround the blood vessels and lymphatics.

The Perimetrium

This is a double serous membrane and extension of the peritoneum, which is draped over the uterus and uterine tubes.

The Uterine Tubes (Fallopian Tubes)

The fallopian tubes are passages that link the ovaries to the uterus. Each tube is between 10 - 12 centimetres long and is divided into four main parts, namely:

- **The interstitial portion**, which is the medial part that opens into the uterus. Its whole length lies within the walls of the uterus. It is the shortest and narrowest part of the tube with a length of 1.25 centimetres and its lumen is 1 millimetre wide.
- **The isthmus**, which is the narrow portion immediately adjoining the uterus.
- **The ampulla**, which is the widest and longest (5 centimetres long) part of the fallopian tube and it is here that fertilisation occurs.
- **The infundibulum**, which is the fimbriated end of the fallopian tube. It is in close proximity to the ovary and its finger-like projections are known as fimbriae. One of the fimbriae, being

longer than the others, is in contact with the ovary and picks up the ovum from the surface of the ovary at ovulation.

The uterine tube has three coats or layers. These are the serous, the muscular, and the mucous layers. The inner epithelium is lined with a mucous membrane of ciliated cubical epithelium, which is arranged in folds. These folds slow the ovum down on its way to the uterus. In the lining are cells that produce a secretion containing glycogen to nourish the ovum. Beneath the lining is a layer of vascular connective tissue.

The middle layer of thin muscle coat consists of two layers, a longitudinal outer layer and a circular inner layer, both of smooth muscle. The tube is covered with peritoneum.

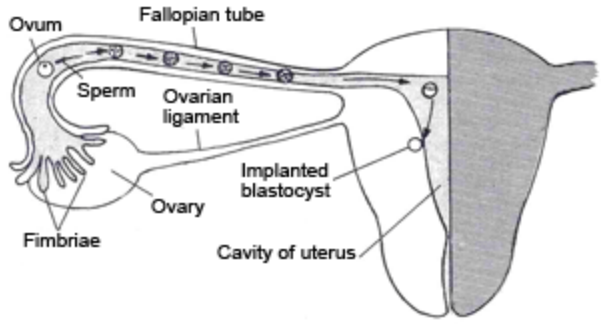
The blood supply comes from the **uterine and ovarian arteries** and returns through the **corresponding veins**. The lymphatic drainage is carried out through the lumbar glands and the nerve supply is from the **ovarian plexus.**

The Ovaries

These are two glandular structures lying on the posterior surface of the broad ligament, supported by the ovarian and the infundibulo-pelvic ligaments. They are oval shaped and are composed of a medulla and a cortex, which is covered with germinal epithelium.

The medulla is made up of fibrous tissue, throughout which the ovarian blood vessels and the lymphatics and nerves travel. The cortex is the functional part of the ovary. It contains the Graafian follicles that are in different stages of development, surrounded by the stroma.

From puberty some of the Graafian follicles enlarge under the influence of the follicle-stimulating hormone. One Graafian follicle matures each month and ruptures to release an ovum. The ovaries produce ova and the hormones oestrogen and progesterone.



Blood supply to the ovaries is provided by the ovarian arteries and drained by the ovarian veins. The lumbar glands maintain lymphatic drainage while nerve supply is from the ovarian plexus.

The vagina acts as a receptacle of the semen during sexual intercourse, as a passage for menstrual blood and for the foetus during delivery. **uterus** is the site where the foetus grows from implantation to maturity, **the fallopian** tubes are passages through which the ova passes to be propelled to the uterine cavity, and that the functions of the ovaries include production of ova and hormones.

Hormones

From puberty to menopause, the female reproductive system goes through regular cycles, governed by various hormones.

The most important hormones in relation to reproduction in the female are:

- The Follicle-Stimulating Hormone (FSH)
- The Luteinizing Hormone (LH)
- Oestrogen
- Progesterone

Functions of FSH and LH

The hypothalamus controls and governs the anterior pituitary gland. The hypothalamus produces Gonadotrophin-Releasing Hormone (GnRH) which acts on the anterior pituitary gland to secrete two gonadotrophins: the Follicle-Stimulating Hormone (FSH) and Luteinizing Hormone (LH).

Follicle-Stimulating Hormone (FSH)

The FSH causes the Graafian follicle in the ovarian cortex to develop, mature and rupture to release the ovum into the fimbriated end of the fallopian tube. This is known as ovulation.

Luteinizing Hormone (LH)

It influences development of the corpus luteum to produce oestrogen and progesterone. LH is produced for only fourteen days after which the FSH reappears.

Ovarian Hormones

The ovaries produce two hormones: oestrogen and progesterone.

Oestrogen

This is produced under the influence of FSH. It is produced by three different parts, which are:

- The granulosa and theca cells of the Graafian follicle during the first 14 days of the twenty eight day cycle.
- The corpus luteum and the adrenal cortex in small quantities after ovulation.
- The placenta during pregnancy.

Oestrogen is comprised of oestriol, oestriadiol and oestrone compounds.

Effects of oestrogen:

- Oestrogen stimulates the growth of the secondary sex characteristics.
- It causes proliferation of the uterine endometrium during the menstrual cycle.
- During pregnancy it promotes growth of the uterine muscles.
- It promotes proliferation of the uterine endometrium.
- It suppresses ovulation.
- It inhibits lactation.
- It assists water and electrolyte retention in the body.

Progesterone

Progesterone is produced by the corpus luteum under the influence of the Lutenizing Hormone (LH) and by the placenta during pregnancy.

Progesterone only acts on tissues, which have previously been acted on by oestrogens, and its effect is mainly evident during the second phase of the menstrual cycle when it causes the endometrium to increase in size. It also increases secretions and blood supply in readiness for possible arrival of a fertilised ovum.

The Menstrual Cycle

The average menstrual cycle is taken to be 28 days, although it may vary in length from 22 to 35 days. The hormones control the menstrual cycle. A normal menstrual cycle is divided into three phases

Phase 1: The Menstrual Phase

This is the phase during which vaginal bleeding occurs. It lasts three to five days. The endometrium is shed down to the basal layer and discharged together with blood from the capillaries and the unfertilised ovum.

Phase 2: The Proliferative/Follicular Phase

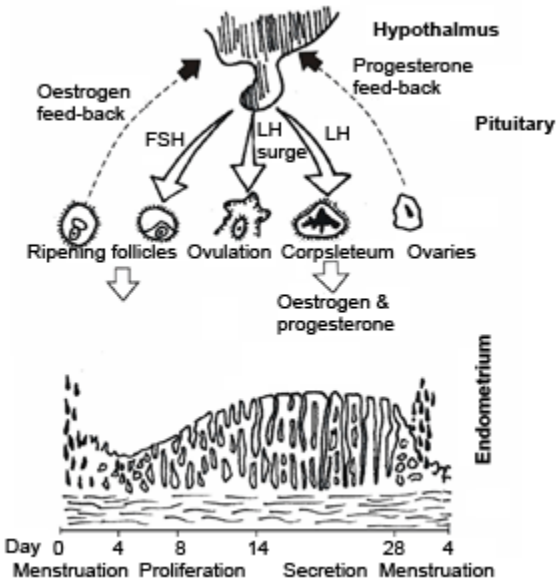
This phase follows the menstrual phase and lasts until ovulation, approximately 14 days from the first day of menstruation in a 28-day cycle. It is the phase of regrowth and thickening under the influence of oestrogen.

Phase 3: The Secretory/Luteal Phase

This phase follows immediately after ovulation under the influence of progesterone and oestrogen from the corpus luteum. The endometrium thickens and becomes spongy, and there is an increase in secretions from the endometrial glands. If the fertilisation does not occur, the ovum dies and degenerates 36 to 48 hours after its release. The corpus luteum also degenerates about 10 days later. Menstruation then takes place 14 days after ovulation. If, on the other hand, fertilisation occurs, the corpus

luteum continues to grow and produces hormones that support the pregnancy. The fertilised ovum gets implanted on the endometrium.

The illustration below shows the phases of the menstrual cycle.



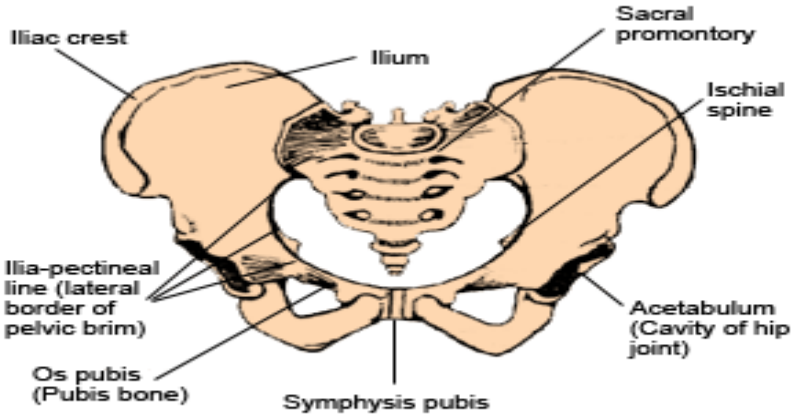
Obstetric Anatomy

In a normal vaginal delivery, the foetus must pass through the bony canal formed by the pelvic bones. The foetal skull is the most rigid structure that has to pass through this canal. You should therefore know the limits of a normal female pelvis so that you can detect deviations from the normal. By so doing, you will be able to identify women at risk and refer them to a hospital, where a caesarean section can be performed.

The Bony Pelvis

The shape of a normal female pelvis is cylindrical and has a slight anterior curve near the outlet. The curve results from the fact that the posterior body of the pelvis sacrum and coccyx is longer than the anterior border which is the symphysis pubis.

In order for the foetal head to pass through the maternal pelvis, the diameter of the pelvis at the inlet, outlet and mid-cavity levels must be adequate.



the bony female pelvis is a basin-like structure with a hole at the bottom through which the baby passes. It is made up of four bones, namely: two innominate bones, one sacrum and one coccyx

The Innominate Bones

These form the sides of the basin. They are joined together at the front by the symphysis pubis and are separated at the back by the sacrum. Each innominate bone is composed of three parts: the ilium the ischium and the pubic bone.

The Three Parts of the Innominate Bones

The Ilium

The ilium is large and flares out. The upper border is called the iliac crest. The anterior superior iliac spine is a bony prominence that is at the front of the iliac crest, and below it is the anterior inferior iliac spine. At the end of the iliac crest are the posterior-superior and posterior-inferior iliac spines. The iliac fossa is the concave anterior surface of the ilium.

The Ischium

This is the thick lower part of the innominate bone. When sitting, the body rests on its large prominence, that is, the ischial tuberosity. The ischial spine lies behind the ischial tuberosity.

The Pubic Bones

These form the anterior part of the innominate bone. They have a body and two projections: the superior ramus and the inferior ramus. The two pubic bones meet at the symphysis pubis and the two inferior rami form the pubic arch.

The Sacrum

The sacrum is a wedge shaped bone consisting of five fused vertebrae. The upper border of the first sacral vertebra juts forward and is known as

the sacral promontory. The anterior surface of the sacrum is concave and is known as the hollow of
the sacrum.

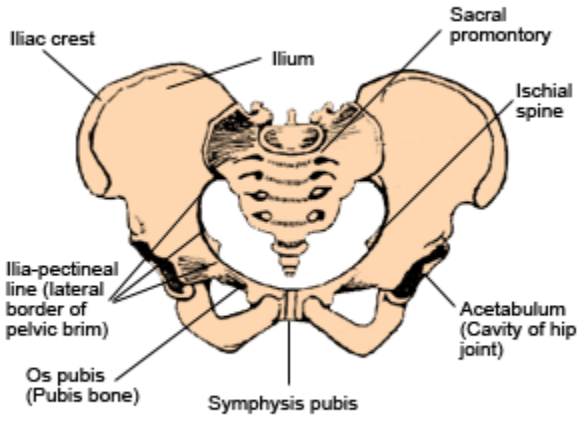
The Coccyx

The coccyx is the tailbone. It consists of four fused vertebrae and is the lowest part of the vertebral column. It has no significance in applied obstetric anatomy as it moves out of the way during delivery.

Pelvic Joints

There are four pelvic joints, namely:

- The symphysis pubis which is formed at the junction of the two pelvic bones, which are united by a pad of cartilage.
- Two sacroiliac joints which join the sacrum to the ilium and so connect the spine to
  the pelvis.
- The sacrococcygeal joint that is formed where the base of the coccyx articulates with the tip of the sacrum.



When there is no pregnancy, there is very little movement in these joints. However, during pregnancy due to endocrine activity the ligaments soften, allowing the joints to give. This allows for more room for the foetal head as it passes through the pelvis. The sacroiliac joints allow a limited backward and forward movement of the tip of the promontory of the sacrum.

The sacrococcygeal joint allows the coccyx to be deflected backward during the birth of the head.

The Pelvic Ligaments

Ligaments hold each pelvic joint together. These are:

- Interpubic ligament at the symphysis pubis
- Sacroilliac ligaments
- Sacroccygeal ligaments

There are two more ligaments that are also important in midwifery, namely:

- The sacrotuberous ligament, which runs from the sacrum to the ischial tuberosity.
- The sacrospinous ligament, which runs from the sacrum to the ischial spine.

Types of Pelvis

The pelvis has been classified into four types, according to the shape of the pelvic brim. However, many individuals have a combination of more than one type. The four types are:

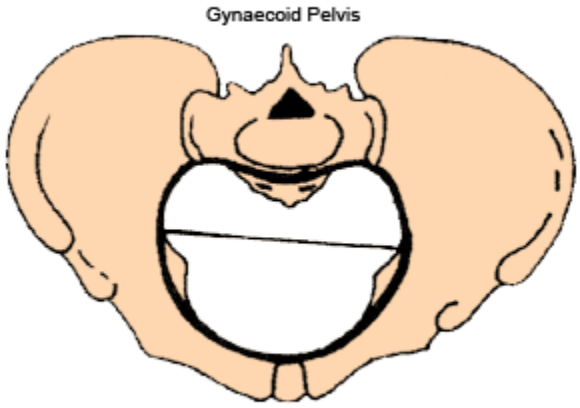
The Gynaecoid Pelvis

Also referred to as the true female pelvis, the gynaecoid pelvis has the following features:

- A rounded brim
- A generous fore-pelvis
- Straight side walls
- A shallow cavity with a broad, well curved sacrum

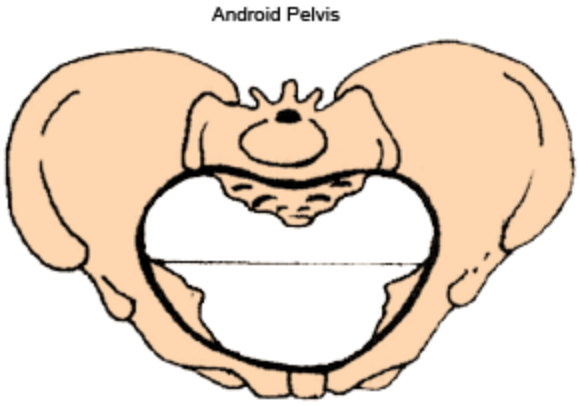
- Blunt ischial spines
- A wide sciatic notch and pubic arch of 90°

The gynaecoid pelvis is found in women of average build and height with a shoe size of four or larger. It is the ideal pelvis for child bearing.



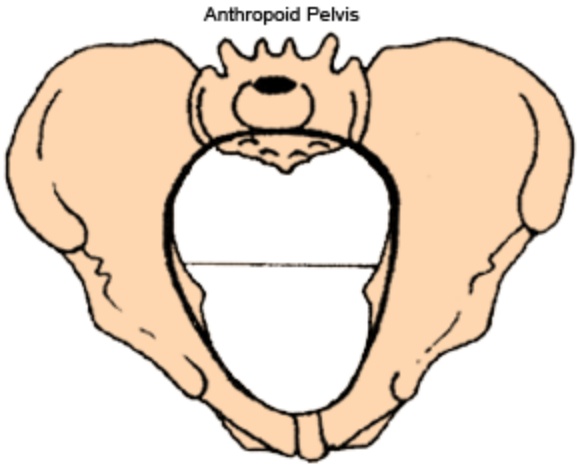
The Android Pelvis

The android pelvis is also known as the male pelvis. Its brim is heart-shaped with a narrow
fore-pelvis. The pelvic cavity is funnel-shaped. The ischial spines are prominent and the pubic arch is less than 90°. It is mostly found in short and heavily built women. It predisposes to an occipital posterior position of the foetal head. It is the least suited to childbearing.



The Anthropoid Pelvis

The anthropoid pelvis has a long oval brim, in which the anteroposterior diameter is longer than the transverse. The sides diverge and the sacrum is long and deeply concave. The ischial spines are not prominent and the sciatic notch is very wide and so is the sub-pubic angle. It tends to be found in tall women with narrow shoulders. Labour usually does not present any difficulties, but a direct occipito-anterior or occipito-posterior position is often a feature.

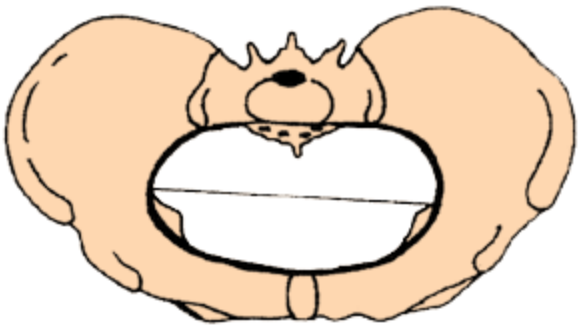


The Platypelloid Pelvis

As illustrated below, the Platypelloid pelvis is a flat pelvis, with a kidney shaped brim. The antero-posterior diameter is reduced while the transverse is increased. The sidewalls diverge, the sacrum is flat, and the cavity is shallow.

The ischial spines are blunt. The sciatic notch and sub-pubic angle are both wide. The foetal head usually descends through the cavity without difficulty.

Platypelloid Pelvis



The features of the different types of female pelvis are summarised in the table below.

Features	Gynaecoid	Android	Anthropoid	Platypelloid
Brim	rounded	heart-shaped	long oval	kidney-shaped
Fore pelvis	generous	narrow	narrowed	wide
Side walls	straight	convergent	divergent	divergent
Ischial spines	blunt	prominent	blunt	blunt
Sciatic notch	rounded	narrow	wide	wide
Sub-pubic angle	90 degrees	<90 degrees	>90 degrees	>90 degrees
Incidence	50%	20%	25%	5%

The True Pelvis

The true pelvis is the body canal through which the foetus must pass during birth. It has a brim, a cavity and an outlet.

The Pelvic Brim

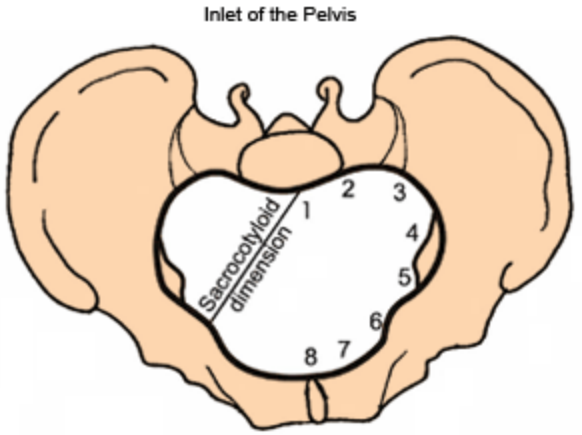
The pelvic brim, which is also known as the inlet, is surrounded anteriorly by the symphysis pubis, laterally by the iliac bones and to the posterior by the sacral promontory. The sacral promontory projects into the brim. This tends to make the anteroposterior diameter less than the transverse diameter, thus forcing the oval head of the foetus to engage the brim in the more accommodating transverse diameter.

As a reproductive health nurse, you need to be familiar with the fixed points on the pelvic brim, which are known as its landmarks.

The landmarks commencing posteriorly are:

- Sacral promontory (1)
- Sacral ala or wing (2)
- Sacroiliac joint (3)
- Iliopectineal line (4)
- Ilepectineal eminence - rough area where the superior ramus of the pubic bone meets the ilium (5)
- Superior ramus of the pelvic bone (6)
- Upper inner border of the body of the pelvic bone (7)
- Upper inner border of the symphysis pubis (8)

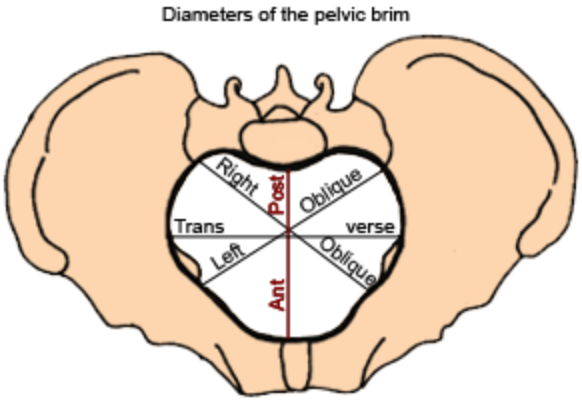
The diameters of the brim.



The Anteroposterior Diameter

This is measured from the upper border of the symphysis pubis to the sacral promontry. When measured to the uppermost point of the pubis, it is called the anatomical conjugate and measures
12 centimetres. When taken to the posterior border of the upper surface, which is about 1.25 centimetres lower, it is called the obstetrical conjugate and measures 11 centimetres.

The obstetrical conjugate represents the available space for the passage of the foetus. Both these diameters are sometimes referred to as the
true conjugate.



The Diagonal Conjugate

This is measured from the lower border of the symphysis pubis to the sacral promontory. It measures 12 to 13 centimetres. It can be estimated per vaginum when conducting pelvic assessment.

The Oblique Diameter

This is measured from one sacro-iliac joint to the iliopectineal eminence on the opposite side of the pelvis.

It measures 12 centimetres. There are two oblique diameters, that is the, left oblique and right oblique.

Transverse Diameter

This is the line between the furthest points on the iliopectineal lines. It measures 13 centimetres. Another dimension is the sacrocotyloid which is between the sacral promontory and the iliopectineal eminence on each side.

It measures 9 to 9.5 centimetres. It is important because in posterior position of the occiput, the parietal eminencies of the foetal head may become caught there.

The Pelvic Cavity

The pelvic cavity, which is also known as the mid-cavity, is a forward curving canal that is bounded above by the plane of the pelvic brim, laterally by ischial spines, posteriorly by the forward curving sacrum and anteriorly by the ascending ramus of the ischium.

The anterior wall is only about 4 centimetres and the posterior wall is approximately 12 centimetres. The transverse diameter, which is 12.5 centimetres, is slightly narrower than the antero-posterior diameter, which is 13.5 centimetres. The oval head of the foetus therefore has to turn through 90° so that its long axis fits in this more accommodating antero-posterior diameter.

The Pelvic Outlet

The posterior outlet is bounded anteriorly by the pubic arch, laterally by the ischial tuberosities, posteriorly by the tip of the sacrum or coccyx and the ligament joining the ischial tuberosities to the sacrum, which are known as sacrotuberous ligaments.

There are two outlets that are described as:

- The anatomical outlet, which is formed by the lower borders of each of the bones and the sacrotuberous ligaments.
- The obstetrical outlet, which is of greater significance because it includes the narrow pelvic strait through which the foetus must pass. It is the space between the narrow pelvic strait and the anatomical outlet. The outlet is diamond-shaped and has three diameters.

The three diameters of the obstetrical outlet.

The **anteroposterior diameter** is from the lower border of the symphsis pubis to the sacro-coccygeal joints and is
13 centimetres. It indicates the space available
during delivery.

The **oblique diameter** lies between the obturator foramen and the sacrospinous ligament but there are no fixed points. It is 12 centimetres.

The **transverse diameter** lies between the two ischial spines and measures 10 to 11 centimetres.

Pelvic Assessment

It is very important for you to understand how to assess the landmarks and measurements of the female pelvis. This is because it will help you to anticipate complications that may occur during delivery so that you can take the appropriate action to save the mother and child.

The adequacy of the pelvis can be judged clinically through a vaginal examination. Three diameters are measured:

Anteroposterior Diameter

During a vaginal examination, you can estimate the Antero-Posterior diameter (AP) of the pelvic inlet by palpating for the sacral promontory with the examining finger. Then you note where the lower margin of the symphysis pubis touches that finger. This gives the diagonal conjugate.

The true conjugate is the line from the sacral promontory to the upper border of the symphysis pubis. The true conjugate is derived by subtracting 1.5 from the diagonal conjugate.

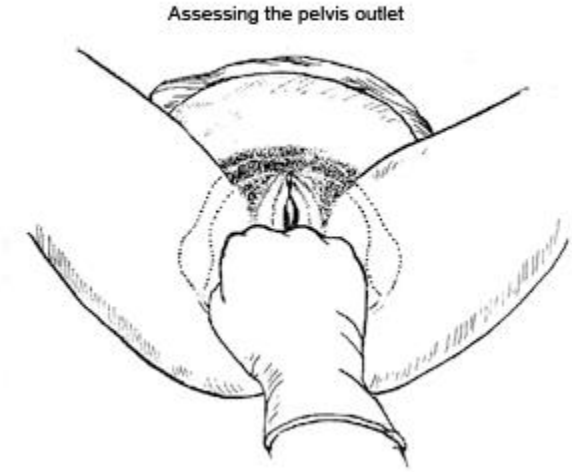
The Oblique Diameter

This is the line from one sacroiliac joint to the iliopectineal eminence on the opposite side of the pelvis. It measures 12 centimetres. There are two oblique diameters, the left oblique and right oblique.

Transverse Diameter

The transverse diameter of the pelvic outlet is measured by placing a clenched fist between the two ischial tuberosities (see illustration below). A measurement of 8 centimetres or more suggests an adequate diameter, which is at least about four knuckles.

Another dimension is the sacrocotyloid dimension. It passes from the sacral promontory to the iliopectineal eminence on each side and measures 9 to 9.5 centimetres. It is important
because in posterior position of the occiput, the parietal eminencies of the foetal head may be caught there.



The Pelvic Floor

The pelvic floor is formed by two muscle layers and layers of pelvic fascia. The most important of these is the strong diaphragm of muscles slung like a hammock from the walls of the pelvis. This pelvic diaphragm is made up of muscles and fascia, which unite in the midline. The muscles are:

- Levator ani, which are flat muscles that form a sling which supports the pelvic organs
- Coccygeus, which are triangular sheets of muscle and tendinous fibres situated behind the levator ani

The pelvic floor supports the weight of the abdominal and pelvic organs. Its muscles are responsible for the voluntary control of micturition and

defecation. They also play an important part in sexual intercourse. During childbirth, the pelvic floor influences the passive movement of the foetus through the birth canal and relaxes to allow its exit from the pelvis. In prolonged labour, it is strained and overstretched. This may lead to genital prolapse later.

Every pregnant woman needs to have an assessment of the pelvic capacity to determine pelvic adequacy for the passage of the child she is carrying.

It is important for you to understand the obstetric anatomy of the female pelvis. You will need this knowledge in order to understand and appreciate the mechanisms of labour, which will be covered later in unit three.

The Foetal Skull

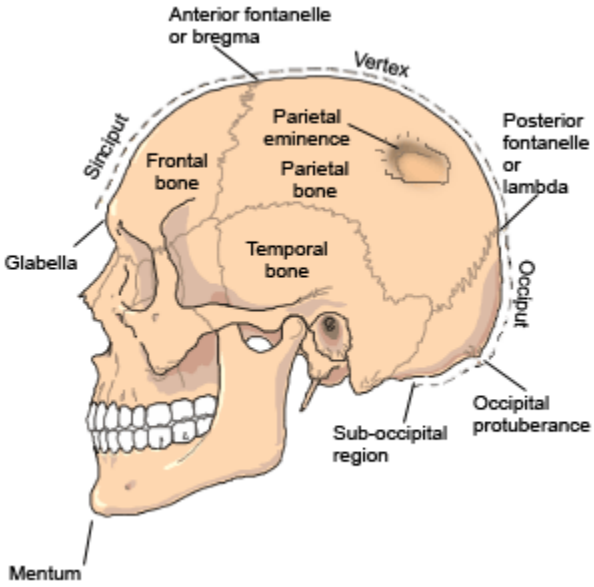
The foetal skull contains a delicate brain, which may be subjected to great pressures as the head passes through the birth canal. You need to understand the landmarks and measurements of the foetal skull, so that you are able to recognise normal presentation and positions, and thus facilitate delivery with the least possible trauma to mother and child.

The landmarks of the skull:

- The vault, which lies between the orbital ridges and the nape of the neck. Here the bones are thin and pliable so as to allow for alterations of the skull at birth. It is composed of the occipital bone, two parietal bones and two frontal bones.
- The base, which is comprised of firmly united bones that protect the vital centres in the medulla.
- The face, which is composed of 14 small bones that are firmly united and cannot be compressed.
- The mentun, which is also called the chin.

The regions of the skull are:

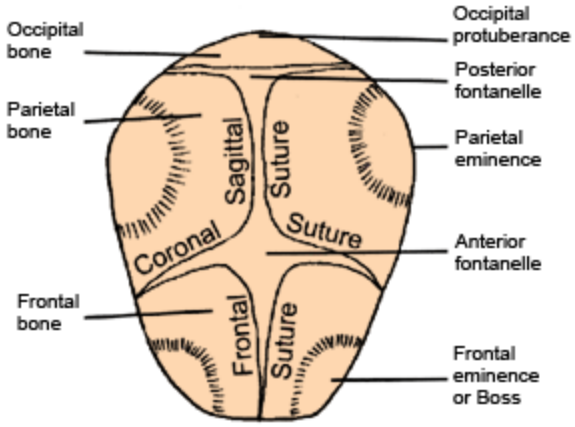
- The occiput, which lies between the foramen magnum and the posterior fontanelle. The sub-occipital region is the part below the occipital protuberance.
- The vertex, which is bounded by the posterior fontanelle, the two parietal eminences and the anterior fontanelle.
- The sinciput or brow, which occurs from the anterior fontanelle and the coronal suture to the orbital ridge.



The Foetal Skull - The Sutures

Sutures and fontanelles separate the bones of the skull from each other. These allow for a degree of overlapping during labour and delivery. They are cranial points that are formed where two bones adjoin. They include:

- The lambdoidal suture, which separates the occipital bone from the two parietal bones.
  The sagittal suture, which lies between the parietal bones.
- The coronal suture, which separates the frontal bones from the parietal bones.
- The frontal suture, which runs between the two halves of the frontal bone. The frontal suture becomes obliterated with time while the other sutures become fixed joints.



The Foetal Skull - The Fontanelles

This refers to the point where two or more sutures meet. They include:

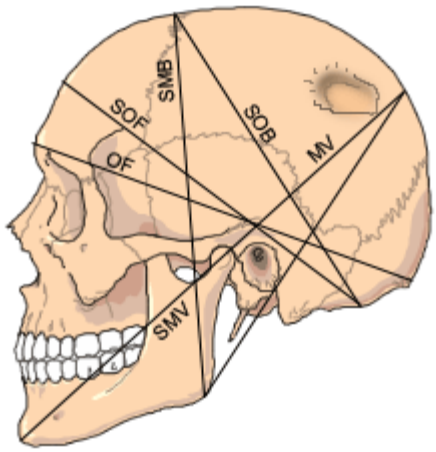
- The posterior fontanelle or lambda, which is at the junction of the lambdoidal and sagittal sutures. It is triangular in shape and can be recognised per vagina. Normally it closes at about six to eight weeks of age.
- The anterior fontanelle or bregma is at the junction of the sagittal, coronal and frontal sutures. It is broad and diamond shaped and measures 3 to 4 centimetres long and
  2 to 5 centimetres wide. The average time of closure is 18 months, but the fontanelle may close as early as 9 to 12 months.

Diameters of the Foetal Skull

The foetal skull has eight measurements. There are two transverse diameters and six longitudinal or anteroposterior diameters.

The transverse diameters are:

- The biparietal diameter, which is measured between the two parietal eminences and is 9.5 centimetres.
- The bitemporal diameter, which is taken between the furthest points of the coronal sutures and the temples. It measures
  8.2 centimetres.



Key		
Abbreviation	**Diameter**	**Length**
SOB	Sub-occipitobregmatic	9.5 cms
SOF	Sub-occipitofrontal	10.0 cms
OF	Occipitofrontal	11.5 cms
MV	Mentovertical	13.5 cms
SMV	Sub-mentovertical	11.5 cms
SMB	Sub-mentobregmatic	9.5 cms

The longitudinal or anteroposterior diameters are:

- Sub-occipitobregmatic, which measures 9.5 centimetres running from below the occipital protuberance to the centre of the anterior fontanelle.
- Sub-occipitofrontal, which is 10 centimetres, measured from below the occipital protuberance to the centre or the frontal suture.
- Occipitofrontal, which measures 11.5 centimetres from the occipital protuberance to the glabella.
- Mentovertical, which is 13.5 centimetres, measured from the point of the chin to the highest point on the vertex.

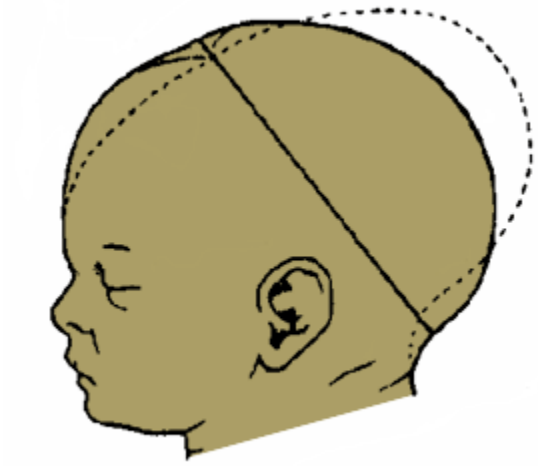
- Sub-mentovertical, which is 11.5 centimetres, measured from the point where the chin joins the neck to the highest point of the vertex.
- Sub-mentobregmatic, which measures 9.5 centimetres from the point where the chin joins the neck to the centre of the bregma.

The Foetal Skull - Moulding

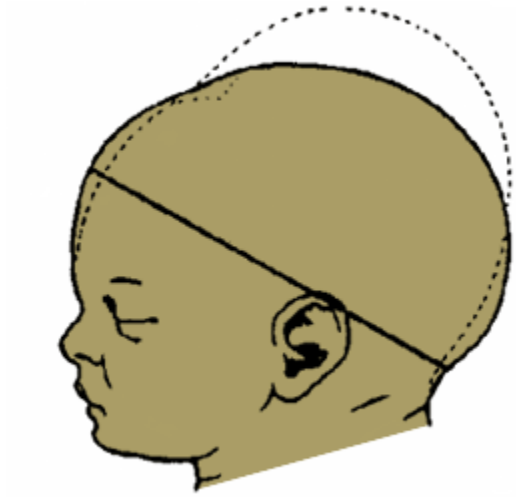
Moulding is the term applied to the alteration in the shape of the foetal head that takes place during its passage through the birth canal. This alteration is possible because the bones of the vault allow a slight degree of bending and the skull bones are able to override at the sutures.

The overriding allows a reduction in the size of the presenting diameters while the diameter at right angles to the presenting diameters is able to lengthen due to the give of the skull bones.

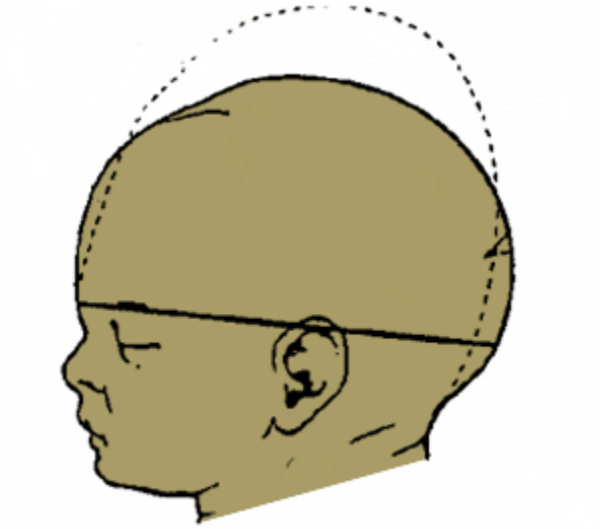
Vertex presentation, head well flexed



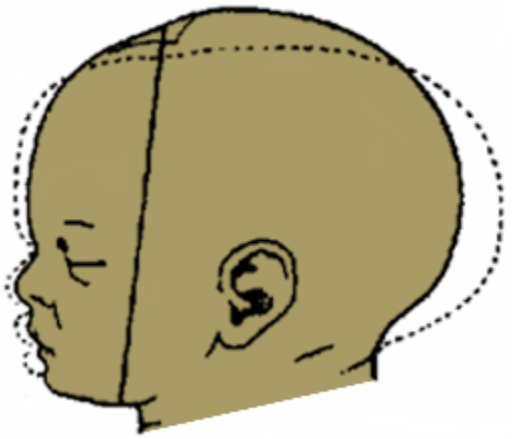
Vertex presentation, head partially flexed



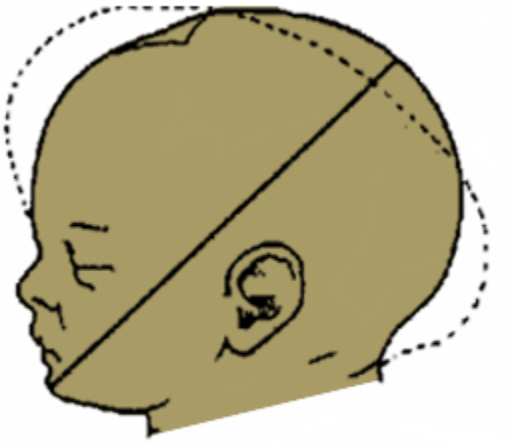
Vertex presentation, head deflexed



Face presentation

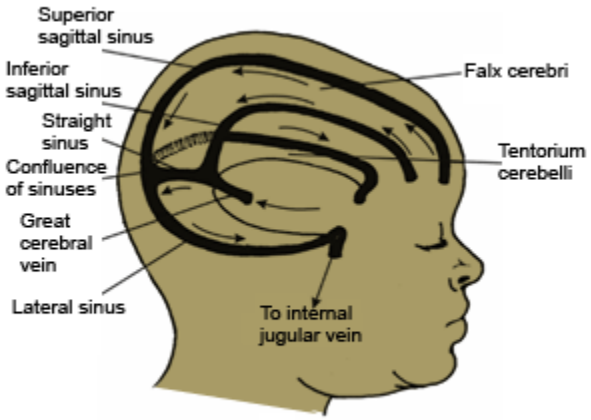


Brow presentation



Moulding is a protective mechanism and prevents the foetal brain from being compressed as long as the moulding is not excessive, too rapid or in an unfavourable direction.

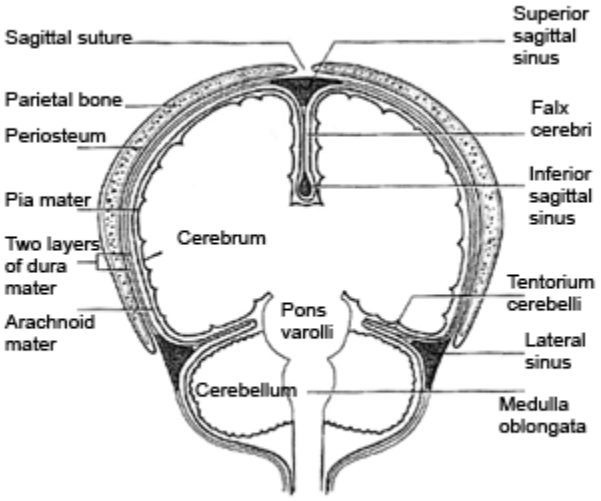
If the foetal skull is subjected to abnormal moulding during normal delivery certain structures may be damaged.



The structures that may be damaged as a result of abnormal moulding include:

- The intracranial membranes and sinuses, most importantly, the associated folds of the dura mater and the venous sinuses.
- The falx cerebri, which is a fold of membrane that dips down between the two cerebral hemispheres and runs beneath the frontal and sagittal sutures, from the root of the nose to the internal occipital protuberance.
- The tentorium cerebelli, which is a horizontal fold of dura mater that lies in the posterior part of the skull at right angles to the far cerebri. It is situated between the falx cerebrum and the cerebellum. The membranes contain large veins or sinuses, which drain blood from
  the brain.

The illustration opposite shows the coronal section through the foetal head to show intracranial membranes and venous sinuses.



Physiology of Pregnancy

Objectives

By the end of this section you will be able to:

- Discuss the process of fertilisation and development of the fertilised ovum
- Describe the development of the placenta and its functions
- Discuss the physiological changes that take place during pregnancy

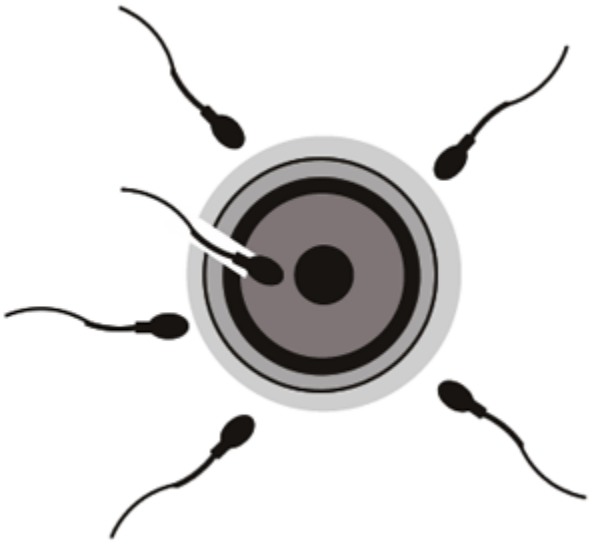
Pregnancy is a critical period for both the woman and her unborn child. It is, therefore, very important for you to understand the physiological changes that occur during pregnancy in order to appreciate the effect they may have on the pregnant woman and to be able to manage her pregnancy appropriately.

Fertilisation and Development of the Fertilised Ovum

Fertilisation takes place when the sperm meets the ovum in the fallopian tube. After ovulation, the ovum passes into the fallopian tube and is moved along by the cilia and the peristaltic muscular contraction of the tube. At this time the cervix produces alkaline mucus that attracts the spermatozoa.

When intercourse takes place many spermatozoa (about 300 million) are deposited in the upper vagina. Those that reach the light cervical mucus survive and propel themselves towards the fallopian tubes while the rest

are destroyed by the acid medium of the vagina. Many sperm will reach the fallopian tube where they meet the ovum. During this journey the sperm mature and are capable of producing an enzyme known as hyaluronidase, which will help penetration into the ovum. Only one sperm will enter the ovum. After the sperm goes into the ovum, the membrane is sealed to prevent other sperm from entering.



In order to understand the process of fertilisation you will need to remember some of the basic facts. These are:

- Each nucleus of the human body cell contains 46 chromosomes. These chromosomes are responsible for the transmission of all inheritable qualities.
- The ovum and the spermatozoon each contain only 23 chromosomes, hence when fertilisation occurs, the total 46 chromosomes are established. Thus, some inherited qualities are from the father and some from the mother.
- An ovum always contains one X chromosome.
- A spermatozoon contains either an X chromosome or Y chromosome.
- When a sperm with an X chromosome fertilises an ovum, the combination will be XX. This will give rise to a female. If a sperm with a Y chromosome fertilises an ovum, the combination will be XY. This will give rise to a male.

- The unfertilised ovum stays alive for about 24 hours and spermatozoa for up to 48 hours in the genital tract.

The sperm and the ovum will each contribute 23 chromosomes to make a total of 46 chromosomes. The fertilised ovum is now known as a zygote.

After fertilisation has taken place in the ampulla of the fallopian tube, the zygote goes through the tube and continues until it reaches the uterus three to four days later. During this time, cell division takes place and the fertilised ovum or zygote divides into two cells, then into four and so on until a cluster of cells known as **morula** is formed. Next, a fluid filled cavity (**blastocele**) appears in the morula, which now becomes known as a **blastocyst**. A single layer of cells called the **trophoblas**t, which will later form the **placenta** and **chorion**, surrounds the blastocyst. The mass of inner cells forms the **foetus** and **amnion.**

Pregnancy begins immediately after fertilisation. This process is then followed by implantation of the developing embryo into the deciduas. Thereafter, there is growth and differentiation of the various organs in the foetus in the first three months of pregnancy.

Development of the placenta and membranes is almost complete by the tenth week of pregnancy.

Formation of the Decidua

The decidua is the name given to the endometrium during pregnancy. From conception, increased secretion of oestrogen causes the endometrium to grow four times more than its non-pregnant size. The endometrial glands become larger, more tortuous and dialled. Blood vessels increase in size. This results in a soft spongy vascular bed in which the zygote implants. Three layers can now be differentiated:

the basal layer,

the spongy layer

and the compact layer.

The Basal Layer

The basal layer lies immediately above the myometrium.
It remains unchanged but will regenerate a new endometrium during puerperium.

The Spongy Layer

The spongy layer, also called functional layer, lies above the basal layer. It consists of tortuous glands rich in secretions, enlarged blood vessels and stroma cells. The chorionic villi invade this layer to form a secure anchorage. This allows them to access oxygen and nutrition. The spongy layer will separate as soon as the baby is born.

The Compact Layer

The compact layer forms the surface layer of the decidua. It comprises the necks of the glands and stoma cells.

Implantation

This is a process by which the blastocyst burrows into the thickened endometrium known as decidua. This process takes place on or about the sixth day after fertilisation. When the blastocyst enters the uterus, the trophoblast that lies over the inner cells mass becomes sticky and adheres to
the endometrium.

The trophoblast secretes an enzyme, which digests the stroma cells and causes a depression in which the blastocyst lies. This digestion continues until the blastocyst is buried in the spongy layer and the site of entry is sealed. The endometrium closes over it completely.

The **blastocyst** is now referred to as the **embryo**. The decidua underneath the blastocyst is called the **basal decidua**, that which covers it is the **capsular decidua** and the remainder is called the **true decidua**. Eventually, as the blastocyst grows and fills the uterine cavity, the capsular decidua meets and fuses with the true decidua.

The Trophoblast

Small projections called chorionic villi appear all over the surface of the trophoblast at the point of contact with the basal decidua. These grow rapidly and obtain nourishment for the growing embryo.

The villi that proliferate are known as Chorion frondosum, which by the twelfth week are fully developed and form the placenta. Those that surround the decidua capsularis degenerate and become the membrane called the chorion.

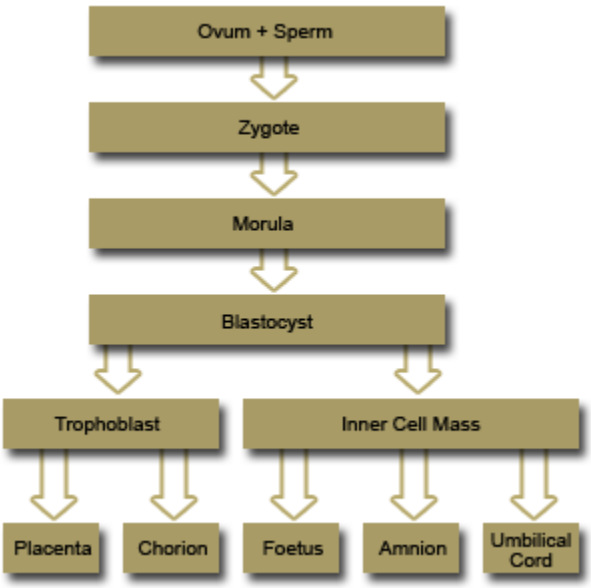
The Inner Cell Mass

While the trophoblast is developing into the placenta, which will nourish the foetus, the inner cell mass is forming the foetus. The cells differentiate into three layers, each of which forms particular parts as follows:

- The ectoderm, which forms the skin and the nervous system.
- The mesoderm, which forms the bones, muscles, the heart and blood vessels.
- The endoderm, which forms the mucous membranes and glands.
- Two cavities, which appear in the inner cell mass. The amniotic cavity on the side of the ectoderm and the yolk sac on the side of the endoderm.
- The amniotic cavity, which is filled with fluid, enlarges and folds round the embryo to enclose it. The amnion forms the lining. It swells and eventually comes into contact with the chorion.

- The yolk sac nourishes the embryo until the placenta is sufficiently developed to take over.
- Embryo is the name given to the blastocyst for the period from implantation up to eight weeks. During this period all the organs and systems of the body are laid down and thereafter they only grow. From the eighth week through to delivery, the embryo is known as a foetus.

The different stages of the fertilised ovum.



The Placenta

The fully formed placenta is a spongy disc, circular in shape, about 20 centimetres in diameter, and
2.5 centimetres thick. It weighs about 500 grams and is dark red in colour. It is composed of mainly chorionic villi, which are also known as chorion frondosum. The placenta begins to develop around the fourteenth day after fertilisation, and is fully formed by the sixteenth week of pregnancy.

The placenta has a foetal and a maternal surface. The maternal surface is the one attached to the uterine wall. The foetal surface lies adjacent to the foetus and is covered with amnion, which gives it a shiny appearance.

The placenta is divided into 15 to 20 centimetre lobes by deep grooves. It is made up of 15 to 20 cotyledons and an umbilical cord, which is usually attached near its centre. The umbilical cord has two arteries and one vein.

The developing chorion villi are of two kinds: those that enter deeply into the basal deciduas, anchoring the placenta and shorter ones, which hang loosely in the maternal blood and absorb food, oxygen and excrete waste, known as the nutritive villi. The former are less in number. Mature chorionic villi are tree-like and contain the foetal capillaries network arising from one stem. Each villum is covered with few layers of tissue, which make it impossible for the foetal and maternal blood to mix.

The placenta is fully formed by the sixteenth week after fertilisation. Foetal blood is pumped by the foetal heart along the umbilical arteries and through their branches to the capillaries in the chorionic villi in the placenta. Here the blood absorbs oxygen and nutrients and is returned via the umbilical vein to the foetus.

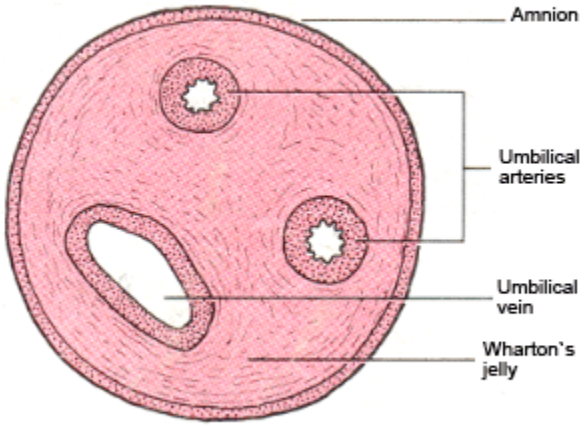
Functions of the Placenta

- Respiratory, that is, oxygen from the mother's haemoglobin passes to the foetus and the foetus gives off carbon dioxide by simple diffusion.
- Nutritive, whereby the foetus obtains nutrients from the mother's diet through the placenta.
- Excretory, that is, waste products of metabolism and carbon dioxide are excreted into maternal blood by diffusion.
- Protective, where the placenta acts as a barrier against transfer of infection from the mother to the foetus. However, a few organisms such as the rubella virus and the spirochaete of syphilis are able to pass through.
- Storage, that is, the placenta stores glycogen and re-converts it for use as required and also stores iron and fat soluble vitamins.
- Endocrine, where the placenta acts as an endocrine gland and produces a number of hormones as follows, which include Human Chorionic Gonadotrophin (HCG), oestrogens, progesterone and Human Placental Lactogen (HCL).

The Umbilical Cord or Funis

The umbilical cord extends from the foetus to the placenta. It consists of the umbilical blood vessels, two arteries and one vein. The blood vessels are enclosed and protected by Wharton's jelly and a layer of amnion covers the whole cord.

The length is about 50 centimetres. If it measures 40 centimetres or less, then it is considered to be short. A very long cord may become wrapped around the neck or body of the foetus or become knotted and cause occlusion of blood vessels, especially during labour.



Anatomical Variations of the Placenta and Cord

Succenturiate Lobe

This is the most significant variation. It is a small extra lobe separated from the main placenta and joined to it by blood vessels, which run through the membranes. It is dangerous because it can be retained in utero after delivery and cause infection and haemorrhage. It is important to examine the placenta carefully after delivery.

Circumvallate Placenta

Circumvallate placenta is when the placenta has two membranes that form an opaque ring on the foetal surface. It is formed by a doubling

back of the amnion and chorion and may result in the membranes leaving the placenta nearer the centre instead of at the edge.

Velamentous Insertion of the Cord

This is when the cord is inserted into the membranes. The umbilical vessels run through the membranes from the cord to the placenta. The cord may become detached during active management of the third stage. If the placenta is low lying, the vessels may run across the uterine os. This situation is known as vasa praevia. In this case there is danger of haemorrhage from the foetus when the membranes rupture.

Bipartite Placenta

In this case two separate lobes are present, each with a cord leaving it. The two cords join a short distance from the two parts of the placenta.

Tripartite Placenta

In tripartite placenta, there are three distinct lobes similar to bipartite placenta.

The Foetal Sac

This consists of a double membrane. The outer membrane is the chorion, which lies under the capsular decidua. It becomes closely adhered to the uterine wall. The inner membrane is the amnion, which contains the amniotic fluid.

The Amniotic Fluid (Liquor Amnii)

The amniotic fluid is a clear, pale, straw-coloured fluid consisting of 99% water. The amniotic fluid fills the space enclosed by the amnion which is the innermost membrane enclosing the foetus.
It is constantly in circulation, being excreted by the placenta and the amnion itself. Later in pregnancy, the foetus swallows the amniotic fluid and passes it out as urine.

The amniotic fluid is contained in the foetal sac, which consists of a double membrane. The outer membrane is the chorion and the inner is the amnion. The chorion is a thick, opaque and fragile membrane while the amnion is a smooth, tough translucent membrane. It is derived from

the inner cell mass. The foetal sac contains the amniotic fluid and the foetus.

The functions of the amniotic fluid

- It allows for the growth and free movement of the foetus.
- It guards the foetus against mechanical shocks, that is, it acts like a shock absorber.
- It equalises the pressure exerted by the uterine contractions.
- In the early months of pregnancy, it allows plenty of room for free movement.
- In labour, the bag of fore waters assists the dilatation of the cervix.
- When membranes rupture during labour, the liquor flushes the birth canal from above with fluid that is aseptic and bactericidal.

The source of amniotic fluid is thought to be both foetal and maternal. It is secreted by the amnion, especially that which covers the placenta and the umbilical cord. Some fluid is excluded from the maternal vessels in the deciduas and some from the foetal vessels in the placenta. Foetal urine also contributes to the volume from the tenth week of gestation onwards.

The normal amount of amniotic fluid is about 600 to 1500 millilitres. If the amount exceeds 1,500 millilitres the condition is known as polyhydramnious and if it is less than 1,300 millilitres, it is known as oligohydramnious. These abnormalities are often associated with congenital malformations of the foetus.

Development of the Embryo and Foetus

The development of the embryo occurs as follows:

0 – 4 weeks:	Primitive central nervous system forms. The heart develops and begins to beat and limb buds form.
4 – 8	There is very rapid cell division. Head and facial features

weeks:	develop and all major body organs are in place in primitive form. Early movements are visible on ultrasound.
8 – 12 weeks:	Eyes fuse and kidneys begin to function. From 12 weeks the foetus begins to pass urine. Circulation functions properly and sucking and swallowing begin. Sex is identifiable.
12 - 16 weeks:	There is rapid skeletal development and meconium is present in the gut. Nasal septum and palate fuse.
16 - 20 weeks:	Mother feels foetal movements or quickening. Foetal heart is heard on auscultation.

20 - 24 weeks:	Most organs are able to function and foetus responds to sound. The skin is red and wrinkled.
24 - 28 weeks:	May survive if born at this stage. There is respiratory movement and eyelids open.
28 - 32 weeks:	The testes descend into the scrotum. Foetus begins to store fat and iron. Skin becomes less wrinkled.
32 - 36 weeks:	The body is more rounded because of increased fat deposit and head hair is grown, nails reach finger tips and ear cartilage is soft.
36 - 40 weeks:	Skull is firm and contours rounded. Birth is due.

Foetal Circulation

The foetus does not breathe in the utero. If it did, it would drown in liqour amnii. Since the foetus does not breathe, the blood does not go to the lungs for oxygen. This means that the foetus must get oxygen and nourishment through the placenta, so extra structures are required to provide for this need. Thus the foetus develops its own blood and at no time do foetal and maternal blood mix.

There are five temporary structures in foetal circulation.

The Umbilical Vein

This leads from the umbilical cord to the underside of the liver and carries blood rich in oxygen and nutrients. It has a branch that joins the portal vein and supplies the liver.

The Ductus Venosus

This is a vessel from the umbilical vein to the inferior vena cava, which carries oxygenated blood to the heart.

The Foramen Ovale

This is a temporary opening between the two atria in the foetal heart that allows oxygenated blood to enter the left atrium so as to be pumped out through the aorta.

The Ductus Arteriosus

This vessel connects the pulmonary artery to the descending arch of aorta. It deoxygenates blood from the head and upper limbs thereby bypassing the pulmonary circulation.

The Hypogastric Arteries

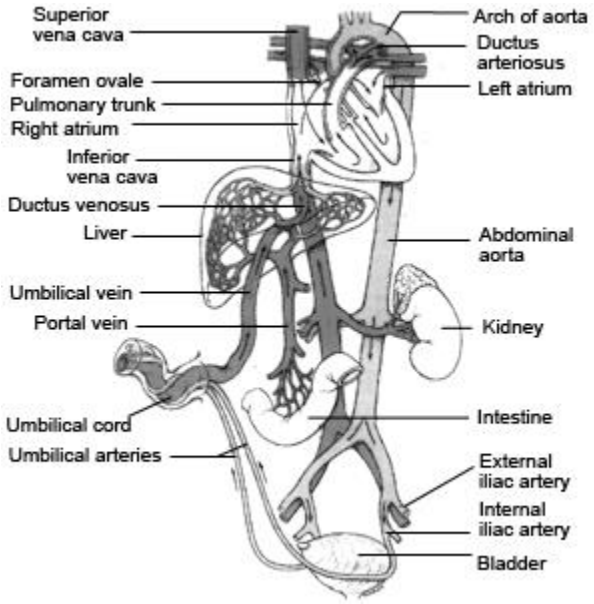
These two vessels branch off from the internal iliac arteries. They are known as umbilical arteries when they enter the umbilical cord.

All foetal blood passes through the placenta to get oxygen and nutrients and to eliminate waste. The course taken by the blood through the foetal circulation is as shown opposite.

The blood takes about half a minute to circulate. Oxygenated blood (50% saturated with oxygen) and nutrients flow through the placenta to the umbilical vein.

The umbilical vein takes the purified blood from the placenta and enters the baby's body at the umbilicus, then runs beneath the anterior abdominal wall to the under-surface of the liver (the liver gets the most

oxygenated blood in the foetus). Here it gives off two branches to the left lobe. A small branch is also given off to join the portal vein and takes blood to the right lobe.



The vein now becomes the ductus venosus and carries the blood to the inferior vena cava where it mixes with blood from the lower parts of the body. The blood then enters the right atrium and most of it passes through the voramen ovale into the left atrium. In this way, it bypasses the lungs.

The blood then passes through the mitral valve into the left ventricle and out through the aorta. The aorta gives out branches to the head, neck and arms. These, therefore, receive purer blood than any part of the foetal body except the liver.

Deoxygenated blood from the head, neck and arms passes through the superior vena cava to the right auricle and is directed through the tricuspid valve to the right ventricle. From the right ventricle the blood enters the pulmonary artery. A small branch takes a small amount of blood to the functionless lungs. The remaining blood passes through the

ductus arteriosus to the aorta to supply the remaining body organs and legs.

The internal iliac arteries lead into the hypo gastric arteries, which return blood to the placenta via the umbilical arteries. The external iliac artery supplies blood to the lower extremities and returns to the inferior vena cava.

The umbilical arteries then pass into the abdominal wall to the umbilical cord at the navel and so reach the placenta where the blood passes through the chronic villi for respiratory and metabolic exchange, ready to circulate through the foetus again.

Adaptation at Birth

At birth, the baby cries and the lungs expand and their vascular field increases. This draws blood to the lungs through the pulmonary arteries, which is then collected and returned via the pulmonary veins to the left atrium. Placental circulation ceases soon after birth reducing blood flow to the right side of the heart, while increasing blood flow to the left side. This causes the foramen ovale to close.

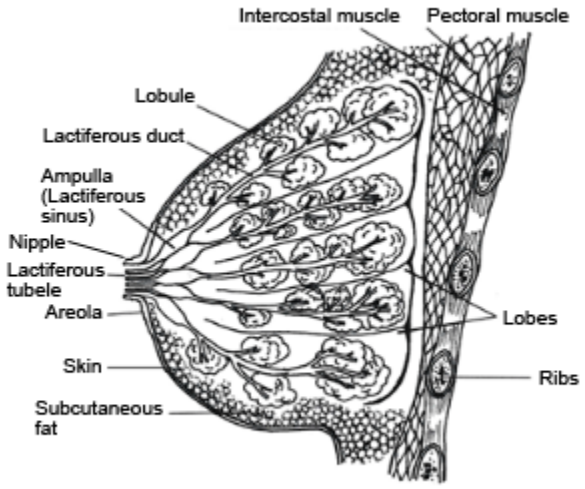
With the establishment of pulmonary respiration, the ductus arteriosus closes and the cessation of placental circulation results in the collapse and drying of the umbilical vein, the ductus venosus and the hypogastric arteries.

The umbilical vein becomes the ligamentum teres, the ductus venosus the ligamentum venosus and the foremen ovale becomes the fossa ovalis. The hypogastric arteries remain open as the superior vesical arteries.

The Breasts

The breasts are secreting glands composed mainly of glandular tissue arranged in lobes (about 20 in number). Each lobe is divided into lobules that consist of alveoli and ducts. The alveoli contain acini cells, which produce milk. The acini cells are surrounded by myoepithelia cells, which contract and relax to propel milk out.

Small lactiferous ducts, carrying milk from the alveoli, unite to form larger ducts. One large duct leaves the lobe and widens to form an ampulla (lactiferous sinus) which acts as a temporally milk reservoir. A lactiferous tubule emerges from each ampulla to the surface of the nipple. Each breast functions independently of the other.



The nipple is composed of erectile tissue, which is covered with epithelium and plain muscle fibres. These muscles have a sphincter-like action which controls the flow of milk. Around the nipple is an area of pigmented skin called the areola, which contains the Montgomery's glands. The glands produce sebum, which lubricates the breasts during pregnancy and throughout breastfeeding.

Blood supply is from the internal and external mammary arteries and branches from the inter-costal arteries. During lactation blood supply is increased. Blood, from the breasts, drains into the mammary and axillary veins. The lymphatic drainage systems of the two breasts communicate freely. This accounts for the rapid spread of malignant growth from one breast to another. The breasts have poor nerve supply and their function is controlled by hormones.

Physiology of Lactation

During pregnancy, oestrogen and progesterone hormones stimulate the growth and secretion of colostrum. Production of milk is inhibited by oestrogen. At the end of the third stage of labour, hormone production is reduced by the delivery of the placenta. This stimulates the anterior pituitary gland to release Prolactin, which initiates milk production. The sucking reflex by the infant stimulates the production of oxytocin by the posterior pituitary gland. The oxytocin is carried in the blood stream to the breasts where it causes the myoepithelia cells to contract and propel milk along the ducts.

Physiological Changes in Pregnancy

It is very important for you to understand the physiological changes that occur during pregnancy in order to appreciate their effects on the pregnant woman. This will enable you to manage her pregnancy appropriately.

Physiological changes in pregnancy take place in the following:

- The reproductive organs
- The cardiovascular system
- The respiratory system
- The renal system
- The gastrointestinal system
- Maternal weight
- Musculo-skeletal system
- The skin

Changes in the Reproductive Organs
Changes in the Uterus

The uterus provides a nutritive and protective environment in which the foetus will develop and grow. The uterine muscle fibre increases in size (hypertrophy) and in number (hyperplasia). The uterus continues to grow this way for the first 20 weeks, thereafter, it stretches to accommodate its contents. It increases in size from 60 grams - 900 grams.

By the eighth week of gestation it begins to generate small waves of contractions known as Braxton Hicks contractions, which are painless and continue throughout pregnancy. The blood supply to the uterus

increases to keep pace with its growth and also to meet the needs of the placenta.

In early pregnancy the uterus becomes globular in shape to accommodate the foetal growth, liquor amnii and placental tissue. This causes pressure on other pelvic organs.

For further reading, refer to Myles Textbook 13th Edition

Changes in the Cervix

The cervix acts as an effective barrier against infection. It also protects the pregnancy.

Under the influence of progesterone, the endo-cervical cells secrete mucus, which becomes a cervical plug known as operculum. This plug provides protection from ascending infection. In late pregnancy, the cervix softens in response to increasing painless contractions. Prostaglandins are thought to have a role in cervical softening in readiness for the onset of labour.

Changes in the Vagina

Oestrogen causes the vagina to become more elastic. These changes will allow dilatation during the second stage of labour to receive the descending foetal head.

There is an increased amount of the normal white vaginal discharge called leucorrhoea. The vaginal ph becomes more acidic to provide protection to some micro-organisms but also increases susceptibility to others such as candida albicans.

Changes in the Cardiovascular System

The cardiac output increases from 5 litres to 7 litres per minute by late pregnancy. This is caused by an increase in resting heart rate of about 15 beats per minute by the end of pregnancy and an increase in blood volume.

The red cell mass increases by about 18% by the end of the pregnancy. The plasma volume increases from the tenth week of pregnancy and

reaches its maximum level of 50% above
non-pregnant values by the 32nd to 34th week, and maintains this until term.

As the plasma increase is greater than that of the red cell mass, there is haemodilution effect. This results in lowered haemoglobin level. This effect is referred to as physiological anaemia. The mean acceptable HB level in pregnancy is 10 - 12 g/dl of blood.

Despite these changes the blood pressure remains normal. The increased cardiac output does not affect the blood pressure. It may drop slightly by mid-trimester and towards term it returns to the level of the first trimester.

Changes in the Respiratory System

The respiratory rate does not alter but the amount of air inhaled per minute increases from 7 to 11 litres.

Changes in the Renal System

Progesterone relaxes the walls of the ureters and allows dilation and kinking. This tends to result in a slowing down or stasis of urinary flow, making infection a greater possibility.

Changes in the Gastrointestinal Tract

There is increased salivation. Women often experience changes in their sense of taste, leading to dietary changes and food cravings. Craving for substances such as bricks/soil is known as pica.

Progesterone relaxes the smooth muscles. Gastric emptying and peristalsis are reduced in order to maximise the absorption of nutrients. Heartburn is common and is associated with gastric reflux due to relaxation of the cardiac sphincter. Constipation is also common due to sluggish gut motility. Nausea and vomiting occur mainly during early pregnancy as a result of raised hormonal levels.

Changes in Maternal Weight

There is continuous weight increase during pregnancy, which is due to the foetus and fat deposition. The expected weight gain is approximately 2 kilograms in the first 20 weeks followed by an average of 0.5 kilogram per week until term leading to 12 kilograms in total.

Changes to the Musculo-Skeletal System

Progesterone encourages relaxation of ligaments and muscles. This increases the capacity of the pelvis in readiness for labour. The unstable pelvic joints result in the rolling gait sometimes seen in pregnant women. In the multigravidae, this is likely to cause backaches and ligamental pain especially in the hip joint.

Changes to the Skin

During pregnancy, there is increased activity of the melanin-stimulating hormone causing deeper pigmentation. Some women develop deeper, patchy colouring on the face known as chloasma. Many develop a pigmented line running from the pubis to the umbilicus known as linea nigra. Others may develop thin stretch marks called striae gravidarum. The increased blood supply to the skin leads to sweating. Women often feel hotter possibly due to progesterone-induced rises in temperature of 0.45°C together
with vasodilation.

Changes in the Breast

The breast enlarges due to increased tissue growth, blood supply and fat deposition. Deposition of melanin toughens the nipple area in preparation for breastfeeding.

Pregnancy

management of normal pregnancy, the risk factors during pregnancy and how to manage them.

This unit is composed of two sections:

Section One: Management of Normal Pregnancy.
Section Two: Risk Factors in Pregnancy.

Unit Objectives

By the end of this unit you will be able to:

- Explain management of normal pregnancy
- Describe risk factors in pregnancy and their management

Management of Normal Pregnancy

Objectives

By the end of this unit you will be able to:

- Diagnose pregnancy
- Explain the routine management of a pregnant woman
- Differentiate the physiological changes from the minor disorders of pregnancy
- Familiarise yourself with the current obstetric pharmacology
- Describe treatment that midwives are allowed to prescribe in their professional capacity

Diagnosing Pregnancy

Diagnosis of pregnancy and definition some of the terms commonly associated with pregnancy.

- **Trimester** refers to a three month calendar period.
- **Gravidity** is the number of times a woman has been pregnant regardless of the outcome of the pregnancies.

- **Parity** refers to the delivery of a child that grew beyond 28 weeks (the age of viability) irrespective of whether the baby was born alive or dead.
- **A Primigravida** is a woman who is pregnant for the first time.
- **A Primipara** is a woman who has had only one delivery.
- **A Multigravida** is a woman who has had two or more pregnancies.
- **Multipara** refers to a woman who has had two or more deliveries.
- **Nullipara** is a term that refers to a woman who has never delivered.
- **A Grand multipara** is a woman who has had six or more deliveries.

If a woman keeps on aborting before the 28th week, she becomes a multigravida but will remain nullipara.

The average duration of pregnancy is 266 days. This is counting from the time the pregnancy started, which is after ovulation and approximately two weeks after the first day of the Last Normal Menstrual Period (LNMP). If the counting is made from the first day of the LNMP, then the duration is 280 days or forty weeks.

The duration of pregnancy can also be expressed in months. These can be calendar months or lunar months. A lunar month is the time from one new moon to the next. It is equal to four weeks or exactly 28 days. A calendar month is longer, usually 30 or 31 days. Therefore, on average, pregnancy lasts 40 weeks, that is, ten lunar months or approximately nine calendar months.

Diagnosis of pregnancy

Diagnosis of pregnancy is made on the basis of symptoms, signs and investigations of pregnancy. These can be conveniently divided into those of the first, second and third trimester.

Signs and Symptoms of Pregnancy
Presumptive
Probanle

Positive(FROM MARGRET MYLES)
The main symptoms and signs during the first trimester include:

- Amenorrhoea
- Enlargement and tenderness of the breasts
- Nausea
- Excessive salivation (ptyalism)
- Frequency of micturition due to the pressure of the gravid uterus on the urinary bladder
- Constitutional symptoms (that is, tiredness, weakness and sometimes depression)

As previously mentioned, a pregnant woman often experiences tiredness, general weakness and sometimes depression. The real cause of these symptoms is not established but may be hormonal. These symptoms usually improve by the 16th week after the
last menstruation.

As the pregnancy progresses more signs and symptoms are observed. You will cover each of these in a little more detail.

Enlargement of the Breasts

The nipple and the areola increase in size. Small nodules, known as Montgomery's tubercles, develop around the nipple. The areola darkens.

The Cervix

The cervix becomes bluish in colour, which is referred to as Jacquemier's sign, because of the increased vascularity and congestion with blood. It also becomes softer. When you perform a bimanual vaginal examination with two fingers inserted in the anterior fornix of the vagina, and the other hand placed behind the uterus abdominally, the fingers of both hands almost meet because of the softness of the isthmus. This is known as Hegar's sign. It is most marked between the 6th and 12th week of pregnancy. There is also an increased pulsation felt in the lateral fornices, which is known as Osiander's sign. The uterus is slightly enlarged.

Quickening

This is when a mother feels the first movements. Primigravidae recognise these movements at about the 20th week, and the multipara at about the 16th week.

Uterus Enlargement

This occurs around the 12th week. You should be able to feel the enlarged uterus abdominally just above the symphysis pubis. The fundus reaches the level of the umbilicus at about the 22nd week, and the xiphisternum by the 36th week.

Foetal Identification

You should be able to feel the foetal parts, for example, the head, from the 24th week onwards. You might be able to feel foetal movements while palpating the fundus. Foetal heart sounds can be heard around the 24th week. The rate varies from 120 to 160 beats per minute.

Investigations

Now that you are aware of the symptoms and signs of pregnancy, you will look at the investigations that may be carried out to confirm pregnancy.

When diagnosing pregnancy, it is not always necessary that you carry out investigations. However, it is important for you to know the kind of investigations that may be done.

Pregnancy Test

This depends on the Human Chorionic Gonadotrophins (HCG) secreted in the mother's urine. It is more likely to be certain when the urine is concentrated, that is, a fresh, clean, early morning specimen. With a sensitive test, HCG can be detected in maternal plasma or urine by eight to nine days after ovulation.

The Ultrasound

This is a scanner, which enables you to see the foetus and its cardiac activity, particularly if performed by the 6th week of pregnancy.

X-ray Method
By the 16th week, if an x-ray is performed, it will show foetal bones. This is an undesirable method of diagnosing pregnancy because in early or mid-pregnancy, the foetus is very susceptible to the adverse effects of radiation.

Signs and Symptoms of Pregnancy

SIGN	TIME OF OCCURRENCE (Gestational age)	DIFFERENTIAL DIAGNOSIS
Possible (presumptive) signs		
Early breast changes (unreliable in the multigravida).	3-4 weeks +	Contraceptive pill
Amenorrhoea	4 weeks +	Hormonal imbalance, Emotional stress, Illness
Morning sickness	4-14 weeks	Gastrointestinal disorders, Pyrexial Illness, Cerebral irritation etc.
Bladder irritability	6-12 weeks	Urinary tract infection, Pelvic tumour
Quickening	16-20 weeks+	Intestinal movement, ‘ wind’
Probable Signs		
Presence of hCG* in: Blood	4-12 weeks	Hydatidiform mole

Urine	6-12 weeks	Choriocarcinoma
Softened isthmus (Hegar's sign)	6-12 weeks	
Blueing of vagina (Jacquemier's sign)	8 weeks	
Pulsation in fornices (Osiander's sign)	8 weeks	Pelvic congestion
Uterine growth	8 weeks	Tumours
Braxton Hicks contractions	16 weeks	
Ballottement of foetus	16-28 weeks	
Positive signs		
Visualisation of foetus by:		
Ultrasound	6 weeks +	No alternative diagnosis
X-ray	16 weeks +	
Foetal heart sounds by:		
ultrasound	6 weeks+	
foetal stethoscope	20-24 weeks +	
Foetal movements:		
palpable	22 weeks +	
visible	late pregnancy	
Foetal parts palpated	24 weeks +	

Key

* Human Chorionic Gonadotrophin
\+ Onwards

Routine Management of the Pregnant Woman

Safe Motherhood and Child Survival Initiative

Objectives

By the end of the section you will be able to:

- Define safe motherhood
- Explain the safe motherhood initiative (SMI)
- Explain the eight pillars of the Safe Motherhood Initiative
- Explain the causes of maternal and perinatal morbidity and mortality
- Explain essential obstetric care

Definition of Safe Motherhood

Safe motherhood is a woman' s ability to have a safe and healthy pregnancy and delivery. Making motherhood safe requires action on three fronts simultaneously:

- Reduce the number of high risk and unwanted pregnancies
- Reduce the number of obstetric complications
- Reduce the cases of high fertility rate in women with complications

The Key Components of Safe Motherhood

- Focused antenatal care which research suggests lowers the rate of maternal morbidity and mortality

- Safe and clean delivery so that all women deliver under some type of supervised care, where referral systems are established to provide emergency treatment for life threatening complications of delivery
- Postnatal care that contributes to a woman's ability to enjoy sexual relations without pain and have safe pregnancy and delivery in future
- Safe, humane and cost-effective post-abortion care

Safe Motherhood Initiative

The Safe Motherhood Initiative (SMI) is a supportive effort, which was launched in 1987, in Nairobi, by WHO and its partners to focus the world's attention on problems related to pregnancy and childbirth. Lack of commitment to women's health problems by the government was seen as the major underlying cause of many maternal deaths. To address this problem, delegates to the Nairobi Conference in 1987 recommended the introduction of a Safe Motherhood Initiative (SMI) to be implemented by all countries.

Objectives of the Safe Motherhood Initiative

The conference described the Safe Motherhood Initiative as a global strategy aimed at reducing maternal mortality by half by the year 2000 by creating circumstances within which a woman is enabled to:

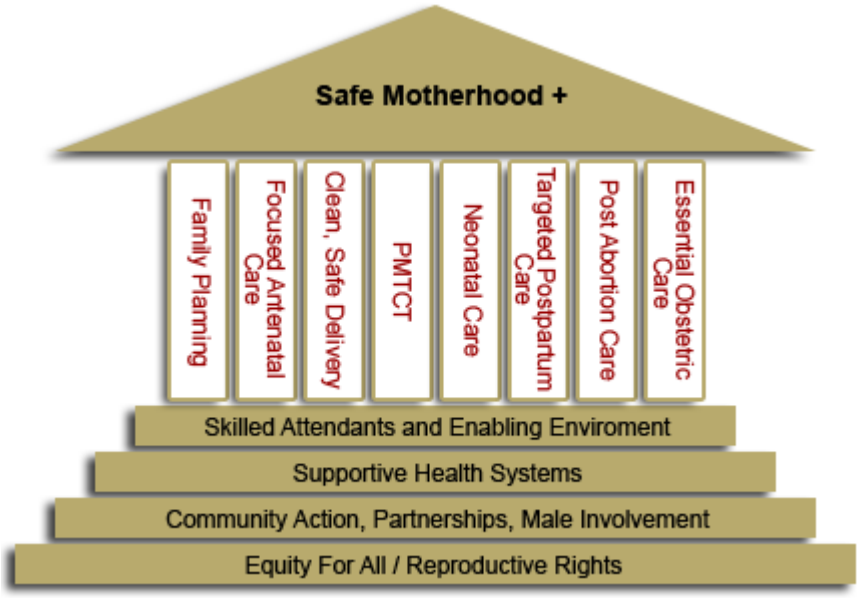
- Choose whether she will become pregnant
- Receive care for the prevention and treatment of pregnancy complications
- Have access to trained birth attendants
- Have access to emergency obstetric complications if necessary
- Have care after birth
- Avoid death or disability from complications of pregnancy and childbirth (Feuerestein, 1993)

In response, the Kenya government endorsed this plan of action to reduce maternal mortality and morbidity. The scope of the Safe Motherhood Initiative has advanced tremendously to encompass many action areas and now includes safe motherhood through human rights for women (Fathalla, 1997 and 2000; WHO 2001).

The SMI differs from other health initiatives in that it focuses on the well being of women as an end to itself. Thaddeus and Maine (1994) argued that, prevention of a death of a pregnant woman is considered to be the key objective, not because the death adversely affects children and other family members but because women are intrinsically valuable.

The Eight Pillars of Safe Motherhood

In order to reduce maternal morbidity and mortality, efforts should be focused on the eight pillars of safe motherhood as illustrated in the diagram below.



Family Planning

Good family planning ensures that individuals and couples have the information and services to plan the timing, number and spacing of pregnancies. For further reading, see unit four of
this module.

Focused Antenatal Care

This serves to prevent complications where possible and ensures that complications of pregnancy are detected early and treated appropriately. Four focused antenatal visits are recommended, which emphasise:

- Taking two doses of sulphapyremethane (SP) during pregnancy for malaria endemic areas
- Recognising signs and symptoms of malaria
- Recognising danger signs in pregnancy and where to go for help
- Drawing up an individual birth plan, which should include a mother/baby package, transport plans and funds/money. For further reading, see unit two of this module

Clean and Safe Delivery

Always ensure that all birth attendants have the knowledge, skills, positive attitude and equipment to perform a clean and safe delivery and provide postpartum care to the mother and baby. For further reading, see unit three.

Essential Obstetric Care

Ensure that essential care for high-risk pregnancies and complications is available to all women who need it. For further reading, see Units Two, Three and Five. In addition, post abortion care and prevention of maternal to child transmission (PMCT) of HIV are also key components of safe motherhood. For further reading, see units five and six of this module.

Post Abortion Care

Abortion is one of the major causes of maternal morbidity and mortality. Health care workers and facilities need to be well equipped to prevent and effectively manage complications that arise from the procedure. The patients psychological well being need to be handled by an experienced health care worker to cover trauma and suicidal tendencies as well its occurrence
in future.

Prevention of Mother to Child Transmission of HIV (PMTCT)

The government is in support of preventive measures that would ensure little or no transmission of HIV virus by any means. PMTCT is a programme that was initiated in the maternal child health care services to protect the unborn baby from contracting the virus.

Targeted Postpartum Care

Maternal deaths in many cases happen during the postpartum period. Close follow-up by skilled health care worker would ensure early detection, prevention and treatment of any pregnancy and delivery complications, which may not have been noted during pregnancy and delivery.

Neonatal Care

The neonatal period is very sensitive, surveys have shown that the majority of neonates in this country do not survive. In Kenya more than half of the women deliver at home and hence the need for closer neonatal follow-up and observation as this would lead to early detection and management of complications that may arise at this tender age.

Foundation Measures

These eight strategic interventions must be delivered through primary health care (PHC) and rest on a foundation of greater equity for women. This recognises the fact that the eight pillars of SMI can only prevent immediate causes of maternal death. Underlying causes of maternal death are often as a result of the poor socioeconomic

status of women and these issues require other strategies. In strengthening this foundation the Ministry of Health has indicated the need for:

- Skilled attendants and enabling environment to provide quality care
- Supportive health systems: effective systems of referral, management, procurement, training, supervision and health management information systems
- Community action, partnership, and male involvement
- Equity for all/reproductive rights

When strategising, countries were encouraged to design other non-health activities which could improve the socioeconomic status of women such as providing formal education for girls, giving women equal employment and business opportunities as well as the empowerment of women to make decisions within their own households. These concepts are also dealt with in the section on gender and reproductive health rights.

The health sector, through the concept of PHC (collaboration across ministries and sectors) should, therefore, involve other ministries and organisations in implementing a national and district safe motherhood initiative

The Aims of Antenatal Care

Antenatal care is the care you give to a pregnant woman to ensure that she reaches the end of her pregnancy both physically and psychologically healthy and that she delivers a healthy baby.

Good quality antenatal care always includes:

- Diagnosing the pregnancy before 24 weeks
- Regular blood pressure checks, testing for oedema, and urine examination
- Regular abdominal examination
- The recognition of high risk cases and their referral for special care
- Immunisation against tetanus to both the mother and unborn baby
- Treating of minor complications

Remember:
Good antenatal care must include the development of a relationship of trust between the health worker, the pregnant woman and, if possible, her family.

aims antenatal care

- Make the mother aware of the benefits offered by your clinic both during pregnancy, at the time of delivery, and afterwards.
- Advise the mother on how to look after herself and her baby. You should also advise on a balanced diet, and activities likely to improve and maintain her health and that of her baby.
- Prepare her psychologically and physically for delivery.
  Do this by allaying her fears and counselling on harmful beliefs and practices.
- Give prophylactic treatment against anaemia and vaccination against neonatal tetanus.
- Identify those 'at risk', that is, women who might have problems during pregnancy or labour, and correct the abnormalities or refer to hospital for management of the pregnancy or delivery.
- Help a mother to make an Individual Birth Plan (IBP).
- Help the mother prepare for, and learn how to take good care of the child physically, psychologically and socially.

Factors that influence the maternal and perinatal mortality rates.

Maternal mortality refers to the death of the mother during pregnancy or within 42 days after the termination of pregnancy. The cause may be related to or aggravated by pregnancy, labour or puerperium. Data from the 2003 Kenya Demographic Health Survey (KDHS) estimated maternal mortality ratio at 414 maternal deaths per 100,000 live births.

Perinatal mortality includes stillbirths, which is the death of the foetus after 28 weeks and neonatal deaths, that is, death during the first week of life.

A successful outcome of the pregnancy depends on the following two general factors:

- The reproductive efficiency of the mother
- The standard of obstetric care

The reproductive efficiency of the woman, in turn, depends on the following factors:

- The age of the mother

- Her parity
- Her physique and stature
- Her general state of health

Age of Mother

The optimum age for child bearing is between the age of 18 and 35 years. Pregnancy occurring below 18 years of age leads to a high incidence of prematurity and perinatal mortality rate. Since adolescent girls have not yet grown to their full stature, obstructed labour with all its disastrous results is very common.

After the age of 35, babies are usually considerably large, and the pelvic joints stiffer, thus they do not give room easily. Uterine dysfunction with slow dilatation of the cervix is common. Childbearing towards the end of the woman's reproductive life carries additional risk. Hypertension, other vascular diseases, and renal degenerative conditions begin to appear, leading to placental insufficiency.

Parity

The risks in pregnancy for the mother and child are relatively high in the first pregnancy. They then drop sharply in the second and third and then slowly rise in subsequent pregnancies. Therefore, by the sixth pregnancy the risks to this multipara exceed those of the primigravida and thereafter rise more steeply with each pregnancy.

A grand multipara is likely to get complications in pregnancy and labour.

Iron deficiency anaemia, which occurs because pregnancy and lactation deplete the woman's iron stores.
Malpresentation because of over relaxed abdominal muscles, that is, muscles that are not firm.
Uterine rupture due to obstructed labour and malpresentation.
Postpartum haemorrhage, which occurs because the uterus has fibrous tissues and is overstretched due to repeated pregnancies. This causes uterine atony. This occurs when the uterine muscle has lost the tone.
Cephalo-pelvic disproportion, that is, babies tend to be larger with each succeeding pregnancy. Disproportion may, therefore, occur after many subsequent pregnancies.

Remember:
As a health worker you should not unduly rely on the security of a good past obstetric history. If you do, you may easily overlook signs of trouble in pregnancy or labour in a multipara.

Physique and Stature

The maternal height is a very valuable measure of reproductive efficiency. In any community, the shortest height group has the highest perinatal mortality and the highest prematurity rate. Women below 150cms by height are at risk of cephalo-pelvic disproportion. On the other hand, women who are obese are more at risk of getting pre-eclampsia.

Maternal Health

The reproductive efficiency of the woman also depends on the woman's general state of health. If she starts off her pregnancy in poor health, she is likely to deteriorate throughout her pregnancy.

Factors that make a woman more vulnerable to a difficult pregnancy

- Low social status, which means the woman, may not be able to afford good nutrition or medical care. She, at the same time, is likely to live in a poor environment, conducive to infections.
- A large family to take care of, which is likely to increase stress and predispose her to other diseases such as high blood pressure.
- Poor nutrition because of frequent and closely spaced pregnancies, when a woman's body is depleted of nutrients. This is known as maternal depletion syndrome. Also, because of certain beliefs and taboos, some women regard some foods such as eggs as harmful to them during pregnancy.
- Infectious diseases, because immunity to infection is weakened during pregnancy. Infections such as AIDS, malaria, amoebic dysentery, and infective hepatitis, are particularly severe during pregnancy.

- Anaemia, which is caused by a number of factors such as hookworm infestation, is common in rural areas, especially where there are no latrines. You will learn more about anaemia in pregnancy in section two of this unit.
- Many women still deliver without the care of a skilled attendant. People who are unskilled and untrained still deliver many women in unhygienic conditions. There is a high risk of rupture of uterus and other complications.

Antenatal Care

FOCUSED ANTENATAL CARE(FANC)

It is a personalized care provided to a pregnant woman which emphasizes on the woman,s overall health, her preparation for child birth and readness for complications.It is timely, friendly , simple and service to a pregnant woman.

Antenatal care is the care you give to a pregnant woman to ensure that she reaches the end of her pregnancy both physically and psychologically healthy and that she delivers a healthy baby.

Aim of FANC

To achieve a good outcome for the mother and the baby and prevent any complications that may occur in pregnancy, labour ,delivery and postpartum.

Qualities good antenatal care

- Diagnosing the pregnancy before 24 weeks
- Regular blood pressure checks, testing for oedema, and urine examination
- Regular abdominal examination
- The recognition of high risk cases and their referral for special care
- Immunisation against tetanus to both the mother and unborn baby
- Treating of minor complications
- WHO RECOMMENDATIONS
- Women can benefit from just a few antenatal visits as long as those visits are thorough
- Ideally women should receive at least four(4) thorough comprehensive, personalized antenatal visits spread out during the entire pregnancy
- Always view each visit as if it is the only one the woman may make.

The four comprehensive, personalized antenatal visits

1st visit: <16 weeks

2nd visit: 16-28 weeks

3rd visit: 28-32 weeks

4th visit: 32-40 weeks

OBJECTIVES OF FANC

1. Early detection and treatment of problems
2. Prevention of complications using safe and simple and cost effective interventions
3. Birth preparedess and complication readness
4. Health promotion using health messages and counseling
5. Provision ofcare y skilled attendants

1. Early detection and treatment of problems

Service provider should identify existing medical, surgical or obstetrical conditions during pregnancy such as;

- Severe anaemia (Hb <7gm/dl
- Vaginal bleeding
- Pre-eclampsia
- STI, HIV/AIDS, TB and malaria
- Chronic disease (diabetes ,heart disease, kidney)
- Decreased or absent foetal movement
- Foetal malpresentatio after 36 weeks

2. Prevention of complications using safe and simple and cost effective interventions

The service provider should ensure prevention and protection of complication by providing:

- Tetanus toxoid to prevent maternal and neonatal tetanus
- Iron /folate supplement to prevent malaria /anaemia
- Ensure environmental hygien to prevent intestinal worms

3.Birth preparedess and complication readness

Service provider discuss components of birth plan which include

- Place of birth Skilled attendant
- Transportation
- Funds
- Birth companion
- Item for clean and safe birth and for the newborn
- Knowledge of danger signs
- Emergency funds
- Blood donor

Discuss Birth partner /companion

May be the father of the baby, a sister, mother in law, mother or aunt

Birth partners should be involved in making individual birth plan

Can provide support to the woman during pregnancy, at the antenatal clinic and during delivery.

Individual birth plan ensure that:

Knows when the baby is due

Identifies a skilled birth attendant

Identifies a health facility for delivery or emergency

Can list danger signs in pregnancy and delivery and knows what to do

Identifies a decision-maker incase of emergency

Has a transport plan incase of emergency

Has a birth partner or companion for the birth

Has collected the basic supplies for the bith

MOTHER-BABY PACKAGE

- A pair of sterile rubber gloves (clean plastic bags that can be worn over the handswhen gloves are not available.
- Soap
- Cotton
- Clean unused razor
- Thread or string
- Clothing for baby and mother
- Money to for hospital fee and transport
- Sanitary towel, napkin

DANGER SIGNS IN PREGNANCY

Any vaginal bleeding in pregnancy (APH, Abortion)

Severe headache or blurred vision (High bp, eclampsia)

Convulsons or fits

High temperature (infection)

Laboured breathing (pneumonia heart problem, severe anaemia)

Premature labour pains

Noticed the baby is moving less or not at all (fetal distress IUFD)

Others include

Feeeling very weak or tired (anaemia, severe diseae, multiple pregnancy)

Vaginal discharge

Abdominal pains (STI,early labour)

Genital ulcers (STI)

Painfull urination (UTI)

Persistant vomiting (severe malaria)

DANGER SIGNS DURING LABOUR AND DELIVERY

Severe headache/ visual disturbances

Severe abdominal pains

Convulsions

High temp with or without chills

Foul vaginal discharge

Labour pains more than 12 hours

Raptured membranes wiyhout labour for more than 12 hours

Excessive bleeding during delivery

Cord, arm or leg prolapse

MINOR DISORDER/AILMENTS IN PREGNANCY

Mirning sickness

Experienced by about 50% of all pregnant women btw 6-12 wks

There is mnausea and vomiting when the client gets up in the morning. Its unpleasant but if the urine is free from ketones , its not serious.Patient should take an apple or dry biscuits before getting up then a cup of tea later.

If vomiting persists, and there is dehydration and ketosis and medical attention should be sought.

2. Heartburn

It is a burnind pain resulting from regurgitation into the oesophagus of acid stomach contents. It occurs because the cardiac sphincter of the stomachis relaxed during pregnancy.

Mother should avoid fried and fatty foods and have small frequent meals.

At night should have extra pillows keeping the head high.

3. Costimpation

It occurs due to the relaxation of muscles by progesterone

Roughage, extra fluids and vegetables can help overcome it.

4. Frequency of micturation

Occurs during the first 12 wks due to pressure from the growing uterus on the bladder .

It recurs in late pregnancy when the fetaihead descends into the pelvis.

5. Pruritus valvae This is irritation of the valva which may be due to lack of hygiene or glycosuria.

6. Vaginal discharge

There is increase in secretion from the cervical glands and it is normal .It is sufficient to cause a slight non irritating mucoid discharge.

6. Cramps
7. Usually in the legs due to vitamin B1, calcium and salts

Night cramps may be due to ischaemia of leg muscles.

Oedema of the legs

May arise because of pressure from the weight of the uterus on the veins at the pelvic brim which interferes with the venous return.

9. Varicose veins

Develops or worsen due to high levels of progestron circulating that relaxes the veins leading to ineffective venous return leading to blood overfill.

Haemorrhoids in the rectum

Varicose veins of the valva

10. Backache

It is partally due to the relaxation of ligaments and partly due to posture adopted by many women to balance weight of the fetus. The back is hollowed and abdomen pushed forward

11. Insomnia

Common in late pregnancy owing to discomfort of fetal movements, frequency of micturation and difficulty in fiding a comfortable position.It could also be as a result of anxiety and fear.

12. Headache

Could be a symptom of re-eclampsia

13. Abdominal pain

Due to stretching of round ligaments or could be associated with abortion, ectopic pregnancy or appendicitis which are fetal

HEALTH PROMOTION USING HEALTH MESSAGES AND COUNSELLING

Encourage dialogue on the following:

Nutrition

Rest and hygien

Safe sex

Care of common discomforts

Use of IPT,INT AND LLINS

Drug copharaance

Family planning/Health timing and spacingof pregncies

Early and exclusive breastfeeding

Newborn care

PROVISION OF SKILLED CARE AT BIRTH

By 2015, it is expected that ¾ of pregnant women should receive skilled care at bith.

Skilled attendant will offer services either at health facility or within the community

FANC provides an opportunity to measure skilled care

Role of the father in antenatal care

Support and encourage women throughout pregnancy.

Ensure that mother do not get STI or HIV

Ensure that they remain painful (or use condoms consistently and correctly)

Encourage mothers to attend antenatal clinic

Accompany their wives (partners to the health facility and during child birth)

Factors influencing pregnancy outcome

A successful outcome of the pregnancy depends on the following two general factors:

- The reproductive efficiency of the mother
- The standard of obstetric care

The reproductive efficiency of the woman in turn depends on the following factors:

- Age of the mother
- Her parity
- Her physique and structure
- Her general state of health

I. Age of the mother The optimum child bearing age is 18-35

- Pregnancy bwelow 18 years leads to high incidence of prematurity and perinatal mortality rate
- Since adolescent girls have not yet grown to theie full stature, obstructed labour with its complications is very common.
- After 35 years , babies are usuallty considerably large and the pelvic joints stiffer , thus they do not give room easily.

- Uriterine disfunction with slow dilation of the cervix is common
- Hypertension and other vascular diseases and renal degenerative conditions begin to appear leading to placental insufficiency.
- ii.Parity
- The risks in pregnancy for the mother and child are relatives high on the first pregnancy.
- They then drop sharply in the second and third and then slowly rise in subsequent pregnancy the risk to this to this multipara exceed those of the primigravida and thereafter rise more stedily with each pregnancy.
- A grand multipara is likely to get complications in pregnancy and labour
- Iron deficiency anaemia which occurs because pregnancy and lactation depletes the woman of iron stores
- Malpresentation because of the overrelaxed abdominal muscles that is muscle that are not firm.
- Uterine rupture due to obstructed labour and malpresentation
- Postpartum haemorrhage occurs because because the uterus has fbrous tissue and overstetched due to repeated pregnancies causing uterine atonny
- Cephalopevic disproportion: Bbies tend to be large with each succeeding pregnancy. Disproportion may occure .

iii. Pysique and stature

In any community , the shortest height group has the highest perinatal moratlity and the highest premaruty rate

Women below 150 cm by height are at risk of cephalopelvic disproportion

On the other hand ,women wh are obese are more ar risk of getting pre-eclampsia

iv. Maternal Health

The reproductive efficiency of the woman also depends on the woman,s general state of health.

If she starts off her pregnancy in poor health, she is likely to deteroriate throughout her pregnancy

FACTORS THAT MAKE A WOMAN MORE VULNARABLE TO DIFFICULT PREGNANCY

Low social status may not be able to afford good nutrition and medical care. Likely to live in poor environment,condusive for infections

- A large family to care for, which is likely to increase stress and predispose her to other diseases like high blood pressure

- Unskilled attendant
- Poor nutrition, because of frequent and closely spaced pregnancies which leads to the woman,s body depleted of nutrients leading to a condition known as maternal depletion syndrome.Also due to somebelifs and taboos which regard some foods as harmfull.
- Infectious diseases because immunity to unfections is weakened during pregnancy
- Anaemia, caused by a number of factors eg hookworm infestation

Activities at the First Antenatal Visit

The first antenatal visit should take place as early as possible, preferably in the first trimester. It is an opportunity to collect baseline data about the mother, for example, weight, blood pressure and so on. This baseline data is important because it forms a basis for comparison during later visits. Also, during the first visit, any other abnormalities can be detected and treated before they have a detrimental effect.

The activities of the first visit include:

- Registration
- Height and weight measurement
- History taking
- Physical examination
- Laboratory examination
- Management of complaints
- Immunisation
- Health Education

Registration

Every pregnant woman that comes to the antenatal clinic should be registered and given an antenatal card.

Weight and Height Measurement

Measure height and weight and record them on the card. A woman with a height below 150cms is likely to have cephalo-pelvic disproportion. Excessive weight gain, that is, more than 1kg per week indicates accumulation of fluid in the tissues (oedema). A lack of increase in weight or weight loss may mean malnutrition.

History Taking

When you take the history you should include the following:

- Particulars of the mother, which include the name, age, marital status, religion, and address.
- **History of the present pregnancy**, which includes the date of the first day of the last normal menstrual period, the parity and gravidity. From this, calculate and record the Expected Date of Delivery (EDD) by adding seven days to the first day of the last normal menstrual period and subtracting three months from that month. For example, if her last period started on 18th June, 18 plus 7 gives you 25. Then June minus three months, (6-3) will give March. So the EDD is March 25th of the following year.
- **Gynaecological history**, which will include the menstrual history, any past operations for gynaecological complaints and Sexually Transmitted Infections (STIs).

- **Past obstetric history,** for which you should ask the mother about the outcomes or complications of each of the previous pregnancies. Inquire into whether she delivered at home or at a hospital. Ask for the birth weights of the children, whether they were breastfed and whether they are alive or not.

General Medical History

Ask about any serious medical diseases likely to affect pregnancy and labour such as heart diseases, diabetes mellitus, renal diseases, tuberculosis and sickle cell disease.

Surgical History

Find out about injuries to the pelvis and spine, operations on the abdomen and blood transfusion.

Social economic history

Know herlifestyle , like drugs , alcohol, source of income.

Physical Examination

A thorough examination is made at the first visit. This is divided into a general examination and an obstetric examination. The general examination should include:

- **General appearance**, namely the nutritional status, whether weak or sick looking. Note the gait and if she walks with a limp.
- Height, noting that any woman below 150cms in height is likely to have cephalo-pelvic disproportion.
- **Weight**, that is, a pregnant woman on average gains 2kg every month. The total weight gain by the end of pregnancy is about 10-20kg. Excessive weight gain indicates accumulation of fluid in the tissues (oedema). Lack of increase in weight or loss may mean malnutrition. Obesity may lead to an increased risk of gestational diabetes.
- **Blood pressure**, which is taken in order to ascertain the normal and provide a baseline for comparison. A pressure of 140/90mm/Hg at booking is indicative of hypertension and could cause damage to the placenta.
- Signs of anaemia in conjunctiva, hands and tongue.
- Check for oedema of face, hands and ankles
- Observe type of breathing and chest generally for abnormalities.

Breast Examination

Palpate gently with the flat of the hand to feel for any lumps. Check if the nipple is protractile. Educate the woman on how to examine the breasts by herself.

Procedure

Ask the client to lie on her back

For accessibility ask the client to raise hand her hand behind the neck of the furthest side to allow the breast to lie flat on the rib cage

Cover the nearest breast , then divide the furthest breast into four quandrants by drawing imaginary lines

Use the pads of the three middle fingers to palpate each quandrant which promotes effectiveness and ensures no mass is left out

Support the breast with the left hand

Feel for any masses or lumps, nodels or change in breas tissue. Palpate the nipple and areola to the axilla and palpate for axillary nodes to rule out any breast masses.

Move to the other breast and do the same and teach the client self breast examination following the same procedure and let her do a return demonstration.

Give the client feedback of the examination and findings andassist her to dress

Obstetric Examination (Abdominal)

An obstetric examination aims at:

- Observing for signs of pregnancy
- Assessing foetal size and growth
- Assessing foetal health
- Diagnosing the location of foetal parts

- Detecting any deviation from normal

Preparation

The client is asked to empty her bladder and then to lie on her back on a couch with the arms by her sides.

Inspection

Inspect the abdomen for the shape, size, scars and foetal movements,Any abnormality detected is referred for further investigations.

Palpation

Pelvic palpation

Lateral palpation

Fundal palpation

In order to determine the height of fundus, the midwife places her hand just below the xiphisternum pressing gently and mones the down the abdomen until you feel curved upper border of the fundus noting the number of finger breadths that can be accommodated btw the two.

Pelvic palpation

Grasp the lower portion of the abdomen , just above the symphysis pubis, between the thumb and fingers of one hand(PAWLIK,S MANOEUVRE)

Aims at finding the presenting part of the feotus, the size of the presenting part and determines if the presenting part isengarged or not in the pelvis.

The head feels hard and round and is easily movable or ballotable

The breech (buttocks) feels soft , triangular and continous with the body.

Fundal palpation

Determine the presence of breech or the head on the fundal part of the uterus

It helps in diagnosing the lie and presentation of the foetus

Lateral palpation

Used to locate the foetal back in order to determine position

Hands are placed on either side of the uterus at the level of umbilical cord.

Auscultation This listerning to the foetal heart at where you have located the baqk.

Estimate the height of the fundus and compare it with the weeks of amenorrhoea. This helps you to assess foetal growth and detect any deviations from the normal. Check for varicosities at the

back of the leg. Ask the woman to remove any tight clothing at the leg. At this time it is also important to check for phlebitis by looking for any reddened areas.

Palpate the sides of the abdomen to locate the foetal back in order to determine the position. You do this by facing the patient and then supporting the uterus with your right hand. Keep pushing the foetus with your left hand towards the right. Reverse the order to feel the left side of the uterus.

Palpate the lower pole of the uterus, just above the pelvic brim. Ask the mother to bend her knees slightly in order to relax the abdominal muscles and ask her to breath steadily with her mouth open. Facing the foot of the bed, mark the brim of the pelvis with your hands and cup what presents between them. If the head is presenting, a smooth surface will be felt. If you do not find the head in the pelvic brim or at the fundus, suspect a transverse lie. This will be significant only after the 36th week of gestation.

The foetal heart sounds are listened to last, so
as to assess the foetal wellbeing. The Pinard's foetal stethoscope is commonly used to hear
the foetal heart.

As you perform the physical examination, talk to the mother and check her facial reaction as you palpate the abdomen. When you complete the procedure reassure the mother.

Findings of Abdominal Examinations

All these are recorded upon completion of the exercise and they include:

- Gestational age, which is estimated as per the size of
  the fundus.
- Lie, which refers to the relationship between the long axis of the foetus and that of the mother and can either be longitudinal, transverse or oblique.
- Attitude, which refers to the relationship of the foetal head and limbs to its trunk. It is most
  commonly flexion.

- Presentation, which means the foetal part that is lying at the pelvic brim or in the lower pole of the uterus and can either be vertex, breach, face, shoulder or brow. The most common is the vertex. Note that vertex/brow/face all refer to head presentation.
- Denominator is the name given to the presenting part for example, occiput for vertex, sacrum for breech and mentum for face.

- Position, which refers to the relationship between the denominator of the presentation and the landmarks of the pelvic brim.

I. LOA- Left occipital anterior
II. ROA- Right occipital anterior
III. LOL- left occipitallateral
IV. ROL- Right occipitallateral
V. LOP-left occipitall
VI. ROP-Right occipitalposterior
VII. DOA-Direct occipital anterior
VIII. DOP- Direct occipital posterior

Laboratory Investigations

- Haemoglobin estimates
- Urine testing for proteins, sugar and microscopy
- Stool examination for ova and cysts
- Blood test for syphilis, usually VDRL
- Blood group and Rhesus factor
- Elisa for HIV after pre-test counseling
- Random blood sugar btw 24^{th}- 28^{th} week of pregnancy
- Sputum for AAFB
-

Health Education

Immunisation

The first dose of tetanus toxid (0.5mls) should be given at first contact or as early as possible during pregnancy. The rest of the doses (four) are given as per schedule on the immunisation card.

Antenatal Clinics

The antenatal clinic visits are an ideal time to educate mothers about a variety of health issues pertaining to their health and that of their children. The best way to ensure that every mother gets maximum health information is to have a regular schedule of topics to be covered at each antenatal visit.

When you are giving health information, you should emphasise on the following:

- Keeping antenatal and immunisation cards safely.
- Visiting antenatal clinic as planned, that is, before sixteen weeks, between 16-24 weeks, between 24-34 weeks and after 34 weeks, unless complications arise.
- Taking a balanced diet and plenty of rest.
- Avoiding drugs, unless prescribed by a health worker. You should emphasise the dangers of smoking and alcohol consumption.
- Maintaining good personal hygiene.
- Seeking medical advice in case of ailments.

Nutrition

A balanced diet is emphasised for the health of the woman and the developing foetus. A balanced diet contains protein, carbohydrates, fat, fibre, vitamins and minerals.

Preparation for the Newborn

Prepare the mother for delivery. Advise what clothing to prepare for the coming baby, as well as on how to prepare for her changing role as she becomes a mother. She should also be ready for delivery in a hospital or health centre.

Care of the Newborn

Educate the mother on exclusive breastfeeding, keeping the baby warm, cord care and warning signs of infection such as septic cord, fever, and refusal to breastfeed.

Breastfeeding

The socio-cultural changes that discourage mothers to breastfeed need to be detected and dealt with promptly.

Employers and the society at large need to support the mothers in the breastfeeding endeavour.

The Advantages of Breastfeeding

- Breast milk is clean, while powdered milk usually gets contaminated by the water used to mix it or by being put into a dirty bottle. This may lead to diarrhoea and death.
- Breast milk is a balanced food for the baby, while powdered milk often results in fat or thin babies.
- Breast milk is always available while powdered milk is imported and expensive.
  Thus, breast milk is cheaper.
- Breast milk contains protective antibodies while powdered milk, if badly handled, will contain bacteria.
- Breastfeeding brings close body contact between mother and baby. There is psychological satisfaction and the mother and baby develop a strong relationship, which leads to good social adjustment later in life. Tell the mother to put the baby to the breast immediately after birth.
- Breast milk is at the right temperature all the time.
- Breast milk contains a substance that promotes absorption of iron from the baby's gut.

Care of Breasts and the Newborn

Advice on the care of the breasts is particularly important in any primigravida. Check if the woman has inverted or 'turned in' nipples and check for any cracks. The idea of teaching mothers to do nipple stretching exercises and massaging nipples to push out inverted nipples is no longer recommended. This is because this can damage the nipple and sometimes causes uterine contractions and premature labour .

After delivery, if the baby is very reluctant to suck, the mother should express the milk into a clean container and feed the baby with a cup and teaspoon.

Many women deliver at home due to poor road communication to the health facilities. In such circumstances, you should emphasise the need to cut the cord with a new razor blade fresh from its wrapping and, therefore, free from tetanus spore contamination.

You should discourage the use of cow dung and similar local medicament on the umbilical stump.

A discharging or red eye is a serious problem in the newborn and needs medical attention.

Immunisation

Educate the woman on the immunisations she is to receive during her pregnancy period, for example, tetanus toxoid, and their importance. this It is also necessary to inform her about the immunisation the baby will receive, at what age, duration and their importance.

Complications of Pregnancy

These include excessive vomiting, vaginal bleeding, excessive swelling of the ankles and face and persistent frontal headache among others. Highlight the importance of seeking early
medical attention.

Sexually Transmitted Infections

Underline the importance of having safe sex and the effect of sexually transmitted infections to the unborn child. Inform the woman of the signs and symptoms of some of the most common STIs, and the importance of seeking treatment, together with her partner.

Family Planning

The importance of family planning should also be emphasised. The available methods and their effects should be outlined, so that she is able to decide on the method of her choice immediately after delivery.

Alcohol and Smoking

Alcohol gives rise to foetal problems. Therefore, a woman is best advised to stop drinking prior to conception, or immediately she realises she has conceived. Smoking, likewise, has adverse effects to both the mother and the unborn child, and should also be avoided.

Sexual Intercourse

Sometimes, sex during pregnancy is feared to have adverse effects on the baby. It is important for a midwife to advise the couple that sex is safe except in special conditions, for example, if a woman has had frequent miscarriages.

While giving the health education, let the woman or couple raise their fears or concerns, as different people perceive pregnancy differently.

Follow-up Antenatal Visits

The main aim of follow-up visits is to check the general health of the mother and to ascertain the rate of growth and welfare of the foetus. You would also check the lie and presentation of the foetus so as to determine the expected mode of delivery. It is also an opportunity to allay any anxiety or fears in the mother about the pregnancy or labour.

The wellbeing of the foetus is indicated by an increasing mater weight that is proportional to the increasing uterine size and is compatible with gestational age, regular foetal movement follow a regular pattern, and foetal heart rate of between 110-150 beats per minute.

During follow-up visits, your activities should include the following:

- A short history should be taken in which you ask how she has been, ask about her appetite, sleeping habits, vaginal discharge or bleeding, headaches which are persistent and swelling of the feet.
- Estimate the fundal height; determine the foetal lie, position and presentation. Auscultate the foetal heart rate and note its rhythm.
- Treat any minor ailments and refer major ones to hospital. Give ferrous sulphate and folic acid as prophylaxis for anaemia.

- Give health information at every visit. Always give the woman information about her present condition and a return date for the next visit.
- Give malaria prevention treatment, that is, sulphur based drugs, with the first dose during the second trimester and second dose during the third trimester.

As you carry out the activities previously covered, you will also need to be able to identify women who fall in the high-risk and low-risk groups in your health facility.

Unit Objectives

By the end of this unit you will be able to:

- Describe the process of normal labour
- Describe the management of mother during puerperium
- Describe the management of the newborn during neonatal period
- Identify neonatal complications, their management and prevention
- Apply the knowledge acquired in the management of a woman during labour and puerperium

Normal Labour

Introduction

Your role as a midwife demands clinical expertise in supervising, caring for and supporting the pregnant mother during pre-pregnancy, pregnancy, labour and puerperium. You should be able to conduct deliveries on your own, and be ready to intervene when complications arise. It is also your responsibility to recognise and act promptly should you be presented with an abnormal condition, for example: mal-presentation, obstructed labour, or obstetric and neonatal emergencies.

In order to recognise and deal with complications of pregnancy, delivery, and the puerperium, you as a health worker must first be thoroughly familiar with the characteristics of normal pregnancy, delivery and puerperium.
A mother, who is psychologically well prepared during pre-natal care, will go through labour and delivery with ease. Research has shown that if a woman in labour has confidence in her caregiver she will experience a considerably lower level of labour pains. Professionalism, calmness and a ‘ matter-of-fact’ manner on the part of the caregiver is a greater tranquilliser to the mother who is in pain than medicine (Leeder: 1994). Therefore, that a midwife’ s behaviour and attitude towards a mother in labour makes the difference between painful and less-painful labour. A relaxed mother will usually have a shorter period of labour than a tense mother.

Objectives

By the end of this unit you will be able to:

- Define labour
- Explain the onset of labour
- Identify the three stages of labour
- Describe the physiological changes that occur during labour
- Describe the management of normal labour

Labour

Labour is described as the process whereby the foetus, placenta and membranes are expelled through the birth canal after 28 weeks of gestation. Labour, can be either normal or abnormal.

Normal labour has several important characteristics

- Duration - completed within 18 hours
- Occurs at term between 38 and 40 weeks
- Is spontaneous
- The foetus presents by the vertex
- Has no complications to either mother or baby
- The newborn child requires minimal or no resuscitation

The Onset of Labour

A midwife should ensure women have sufficient information to assist them to recognise the onset of true labour.

Some young women, especially the primigravidae (those pregnant for the first time), may fail to recognise true labour. It is important that you help them differentiate between false and true labour signs. The contractions of true labour are regular and intense. In false labour, the contractions are sporadic (Braxton-Hicks contractions). False contractions occur during the last weeks of pregnancy. The following table outlines some factors that can help to differentiate true and
false labour.

The presence of the following signs and symptoms will give evidence that the mother is in labour:

- **Contractions of the uterus**, which are increasingly strong, painful and regular
- **The cervix** is taken up into the lower uterine segment causing dilatation of the cervix
- **There is a mucoid blood** stained discharge, which is called show
- Sometimes there is rupture of membranes with drainage of liquor amnii (amniotic fluid)

The Contrast between True Labour and False Labour

Factors	True Labour	False Labour
Contractions	Regularly spaced	Irregularly spaced
Interval between contractions	Gradually shortens	Remains long
Intensity of contractions	Gradually increases	Stays the same
Location of pain	Back and abdomen	Mostly lower abdomen

Effect of analgesics	Do not abolish the pain	Often abolish the pain
	Progressive effacement and dilatation	No changes

Causes of labour

The causes that trigger the onset of labour are not known. However, many theories have been offered which indicate that both hormonal and mechanical factors play a big part.

Hormonal Factors

It is believed that close to term progesterone levels in the body fall, while at the same time levels of oestrogen (which is responsible for sensitising the uterine muscles) rise. The fall in progesterone levels is important because it has effect on muscle contractions. The rise in oestrogen levels meanwhile triggers the release of oxytocin, which causes uterine contractions. The foetal hypothalamus is believed to produce releasing factors, which stimulate the anterior pituitary gland to produce adrenocorticotrophic hormone (ACTH). ACTH stimulates the foetal adrenal glands to secrete cortisol, which causes relative levels of placental hormones to rise. These cause further uterine contractions.

Mechanical Factors

Uterine activity can also result from the mechanical stimulation of the uterus and cervix. This may be due to over stretching, as in the case of multiple pregnancy and polyhydromnios, or pressure from the presenting part, when it is well applied to the cervix.

It appears that there is a combination of hormonal (from both mother and foetus) and mechanical factors that set labour in motion.

Pre-Labour or Premonitory Signs of Labour

This is the period two to three weeks prior to the onset of labour when a number of changes take place such as:

Lightening

Two to three weeks before labour, the lower uterine segment expands allowing the foetal head to sink deep. The descent of the head and the body of the baby gives space to the lungs, heart and stomach, which enables these organs to function easily.
The symphysis pubis widens and the pelvic floor softens and becomes more relaxed, allowing further descent of the uterus into the pelvis.

Frequency of Micturition

The descent of the foetal head increases pressure within the pelvis. This limits the capacity of the bladder, which can cause irritation. The laxity of the pelvic floor muscles gives rise to poor sphincter control causing a degree of stress incontinence. This pressure results in the congestion of circulation to the lower limbs. Additionally the relaxation of the pelvic joint may give rise to backache.

Taking up of Cervix

The cervix is taken up gradually and merges into the lower uterine segment..

Contractions

The contractions of the uterus are coordinated by two pacemakers in the region of the cornua. These are located where the fallopian tubes join the uterine body. The muscle contractions start at the top corner of the uterus, spread to the fundus, and then downward. During normal pregnancy, the uterus contracts intermittently but the contractions are not strong enough to overcome the resistance of a normal cervix and do not lead to its dilation. The contractions of pregnancy become more frequent towards full term and get more painful
and noticeable.

A multipara may have such 'false pains' for some days before the onset of true labour. They may come to hospital too early thinking they are in established labour. This is what is referred to as 'false labour'.

The Stages of Labour

Labour is divided into four stages, although in real practice, the process is a continuous one and change from one stage to the other may not be clearly obvious. The four stages of labour are known as First stage, Second stage, Third stage and Fourth stage.

The First Stage

This is known as the stage of cervical dilatation. This stage begins when regular, painful uterine contractions start and is detected clinically by the thinning and effacement of the cervix, followed by its dilatation. The normally thick cervix becomes thinned out and stretched over the presenting part. The first stage is completed when the cervix is fully dilated and the presenting part starts being expelled. This stage has two phases, known as the latent and the active phase.

The contractions of the uterus dilate the cervix. The dilatation of the internal Os causes the separation of the chorion from the decidua closest to it. A small bag of membranes is formed and is forced into the internal Os by the intrauterine pressure. At the beginning of each contraction, a little more amniotic fluid is forced into the bag of membranes. The head of the foetus then comes down like a ball valve and separates the amniotic fluid above it from that in the bag. The bag of membranes may remain intact until nearly the end of the first stage. However, even if the membranes rupture early the cervix will still become dilated as it is drawn up over the presenting part by the retraction of the upper segment.

During the first stage, the foetus does not move downwards to any great degree. When a certain amount of fluid has left the uterus after the membranes have ruptured, a new form of pressure comes into play, namely foetal axis pressure. The upper pole of the foetus, normally the breech, is pressed on by the fundus of the uterus, while the lower pole is pressed down onto the lower segment and cervix. Should the membranes rupture early, foetal axis pressure will operate at an early stage. In modern practice, the membranes are often deliberately ruptured during labour because this is believed to encourage more efficient uterine action and shorten labour. You should be cautious carrying out this procedure in this
era of HIV.

The duration of the latent phase of labour need not be defined too accurately. Dilation of the cervix from 0 to 3cm can take six hours, but slower progress may be normal and is perfectly acceptable provided that the woman is comfortable and in no way distressed. Between 3 and 10cm dilatation (that is in the active phase of labour) the cervix should dilate at a rate of about 1 cm per hour, giving a theoretical duration of seven hours for this phase of labour in both primiparous and multiparous women. During the early part of the latent phase the pains may not be very severe but towards the end of the active phase they are often very distressing, constituting the most painful part of labour. Vomiting and reflex shivering are common at the end of the active phase of the first stage of labour.

By now the membranes have ruptured. If the membranes remain intact when the cervix is fully dilated, the onset of the expulsive stage may be delayed. This is because the cervix does not receive the pressure of the head, which helps to stimulate the uterus to increase its activity. If the membranes remain intact after full dilatation, they should be ruptured with toothed forceps or a sterile plastic amnihook during a contraction.

Second Stage

This starts with the full dilatation of the cervix and the expulsion of the presenting part and finishes with the complete delivery of the baby. As you know, there may be very little descent of the foetus during the first stage. However, in the second stage,

the resistance offered by the lower uterine segment and the cervix has been overcome and the presenting part can be pushed down onto the pelvic floor. The resistance of the pelvic floor then has to be overcome by uterine contractions, aided by the action of the voluntary muscles of the abdominal wall and the diaphragm.

In the absence of an effective epidural block, full dilatation of the cervix is accompanied by a bearing down sensation during contractions and women are usually encouraged to push. As the contraction comes on, the woman takes a deep breath, then holds it and subsequently bears down with all the force of her abdominal muscles. These partly voluntary, partly reflex expulsive efforts place the foetus under additional stress and pushing should, therefore, not be allowed to continue for more than one hour. If delivery is not imminent, assistance in the form of Ventouse extraction, forceps delivery or even a Caesarean section may be necessary.

Third Stage

This stage commences immediately after the birth of the baby. It includes the delivery of the placenta and membranes as well as the control of bleeding. At this stage the uterus contracts down to follow the body of the foetus as it is being born. As the cavity of the uterus becomes smaller, the area of the placental site is diminished. The placenta is then cut off from the spongy layer of the decidua basalis. Further uterine contractions expel the placenta from the upper segment into the lower segment and through the vaginal vault. This process, whereby the placenta leaves the upper segment to the lower segment and through the vagina, is referred to as separation and descent.

Fourth Stage

This is the period from the delivery of placenta and membranes to the end of the first hour postpartum. The uterus is firm at level of two fingers breadth above the umbilicus. Restoration of physiological stability is established. During this period myometrial contractions and retraction, accompanied by vessel thrombosis, operate effectively to control bleeding from the placenta site. Failure of this mechanism could result in excessive blood loss (postpartum haemorrhage (PPH)) that could be life threatening. The mother should be closely observed for haemorrhage, urine retention or hypotension. The mother and child relationship should be initiated and encouraged, as it has an effect to the subsequent quality of their relationship and bonding.

PHYSIOLOGY OF THE FIRST STAGE OF LABOUR

Factors influencing of Duration

Parity

Brth interval

Psychological state

Presentation and position

Pelvic shape and size

Character of uterine contractions

Uterine Action

By the end of pregnancy, the uterus is divided into two anatomically distinct segments, known as the upper and the lower uterine segments.

The upper uterine segment is a thick muscular, contractile area from where the contractions begin. The longitudinal fibres retract, pulling on the lower segment and causing it to stretch, pushing the head down.

The lower uterine segment is thinner and develops from the isthmus of the uterus about eight to ten centimetres in length and is prepared for distension and/or dilatation. The lower segment stretches when being pulled by the longitudinal fibres. The force applied by the descending head or breech also aids the stretching.

The retraction ring which is an imaginary ridge, forms between the upper and the lower uterine segment. It is present in every labour and is perfectly normal as long as it is not marked enough to be visible above the symphysis pubis.

Fundal Dominance

During a contraction the uterus feels hard to touch. At the beginning of the process, contractions are painless and involuntary, and are controlled by the nervous system under the influence
of endocrine hormones.

The contraction starts at the upper part of fundus, spreading across, and by the time they reach the lower fundus, they last longer and are very intense. The peak of the

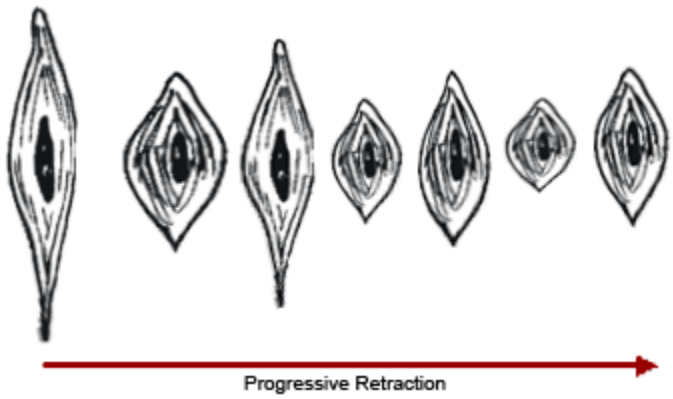
contraction is reached simultaneously over the whole uterus and fades from all parts together. This pattern allows the cervix to dilate and the contracting fundus to expel the foetus.

Polarity

Polarity describes the neuromuscular harmony between the two poles or segments of the uterus throughout labour. The upper pole contracts strongly and retracts to expel the foetus. The lower pole contracts slightly and dilates to allow expulsion of the foetus to take place.

Contraction and Retraction

When labour starts, approximately 280 days from the first day of the last menstrual period, the contractions change in character. They become regular and more painful. Labour contractions differ from those of pregnancy in that they are followed by retraction. This is characteristic of uterine muscle in labour.
The contracted muscle does not return to its original length when the contraction passes off. Each succeeding contraction leads to further shortening of the muscle fibres so that the uterine cavity becomes smaller and smaller. This is what makes the cervix dilate. This process is illustrated in the figure below.



When talking about contractions, you as a midwife are concerned with three factors, namely the strength, the duration and the frequency of the contraction.
When you talk of the strength of a contraction, you identify it as one of three categories: weak, fair or fairly strong, and strong. The strength of a contraction is measured according to the time it has taken. Thus, a contraction which takes 10 to 30 seconds is said to be weak, one that takes 30 to 40 is said to be fair or fairly strong and one that lasts for 40 to 60 seconds is said to be strong.

The duration refers to the time taken by a contraction, for example a weak contraction lasts for 10 to 30 seconds.

Frequency, on the other hand refers to the number of intervals between one contraction and the next. If a mother has one contraction after every 45 minutes, the frequency is written as 1:45.

Formation of upper and lower uterine segment

By the end of pregnancy the body of the uterus has divided into two segments which are anatomically distinct.The upper uterine segment is mainly concerned with contraction and is thick and muscular while the lower segment is prepared for distension and dilation and is thinner.When labour begins, the retracted longitudinal fibres in the upper segment pull on the lower segment causing it to stretch, this is aided by the force applied by the descending head.

The retraction ring(bandl,s ring)

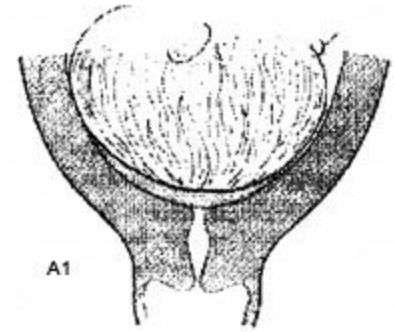
A ridge forms btw the upper and lower uterine segment.The normal retraction ring gradually rises as the upper uterine segment contracts and retracts and the lower uterine thins out to accommodate the descending fetus.

Cervical effecentment

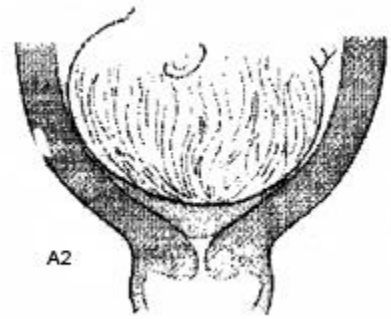
This refers to the inclusion of the cervical canal into the lower uterine segment.The muscle fibres surrounding the internal os are drawn upwards by the retracted upper segment and the cervix merges into the lower uterine segment.The cervical canal widens at the level of the internal os while the condition of remains unchanged.

The Shortening and Dilation of the Cervix

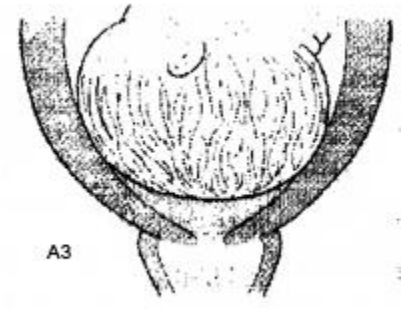
Before labour begins, the cervix of a primagravida is a thick hard cone which protrudes into the vagina. The canal is at least one inch long. When labour begins the strongly contracting upper segment of the uterus starts retracting and getting shorter, while the thinner lower segment of the uterus gets pulled away from the presenting part. This stretches the lower segment. The latter, in turn pulls the internal Os. This dragging away of the internal Os from the presenting part starts dilating the upper part of the cervical canal. This goes on until the canal is shorter and shorter and finally there is no canal at all. The canal becomes part of the uterine cavity with only the undilated external Os and the thinly stretched cervix separating this cavity from the vagina. When this happens, we say the cervix has been 'effaced' or 'taken up'
Cervical canal before effacement



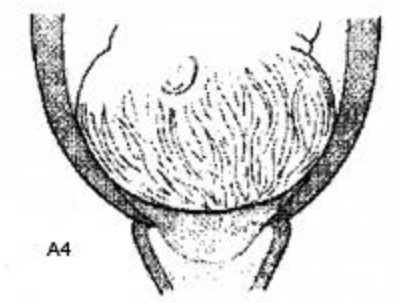
Partial effacement



Effacement almost complete



Effacement fully complete



In a primigravida the cervix usually becomes almost fully effaced before any dilation takes place, while in multiparous women the two processes take place together. The cervix of a multipara might be already effaced and be dilated enough to admit a finger up to the internal Os even before labour starts. These signs of labour are assessed by doing a vaginal examination, though with experience, you can also get a good idea by doing a rectal examination.

> ***The way you guide a mother has a great influence on the progress of her labour.***

The Show

Throughout pregnancy the cervical canal is sealed by a plug of mucus known as an operculum. Together with the intact membranes this prevents organisms ascending into the uterine cavity.

When labour starts, the internal Os is pulled away from the foetal membranes and the canal is opened up. This releases the mucous plug which oozes out of the vagina mixed with a little blood. This is called the 'show'.

Mechanical factors
Formation of fore waters
There is separaton of the bag of waters into two the the fetus
-Water infront of the fetus is fore water
-Water behind the fetus is hind water and prevents transmission of pressure to the fore water thus keeping the bag intact, which in turns acts as defense in the first stage of labour.
-General fluid pressure
This facilates the descent of the fetus and at the same time helps to keep the waters intact.It is advisable not to rapture the membranes in the first stage of labour , but incase the client is in advanced first stage nearing second stage, membranes are raptured to facilitate the escape of the head.

Rapture of membranes
The uterine contractions apply increasing pressure, and the membranes may rapture.
Fetal axis pressure
During each contraction the uterus rears forward and the force of the fundal contraction is transmitted to the upper pole of the fetus, down the long axis of the fetus and is applied by the presenting part to the cervix.

This is the stage of dilatation of the cervix. On average, it lasts eight to twelve hours in a primigravida and six to eight hours in a multipara. It should not go beyond 14 hours in either. This stage is characterised by the uterus doing an immense amount of muscular work in the form of contracting and relaxing. Contractions are involuntary in that they do not come on through voluntary effort of the woman nor can they be voluntarily stopped. They are peristaltic and regular.

Contractions at the start of labour come every 10 to 15 minutes and last between 30 to 45 seconds. They increase in frequency and strength as labour progresses until they are separated by a minute or two. Towards the end of the first stage they last for one minute. The relaxation phase during which the muscles remain retracted also shortens.

Each contraction begins with a gradual build-up towards a peak of intensity. This is followed by a relaxation phase. During the relaxation phase, the muscle recovers and gets ready for the next contraction. This relaxation phase is important to both the foetus and the mother during the first and second stages of labour.

During a contraction the circulation through the uterine wall is reduced and the foetal heart rate is slowed but regains its normal rate as soon as the contraction has passed. If there is increasing foetal tachycardia between contractions or if the bradycardia is prolonged after each contraction, then foetal distress sets in. If the uterus contracts continuously the foetus dies from lack of
oxygen (anoxia).

The mother is also able to relax during the relaxation phase. However, if the uterus contracts continuously, the mother also gets very exhausted because the uterus uses up a lot of energy during contractions. If this goes on for too long, as is the case during prolonged labour, her energy stores become depleted and maternal distress sets in.

As the mother will not be able to eat or absorb much by mouth, she should be given supplementary carbohydrates intravenously. In a normal first stage, oral fluids to which additional sugar has been added are sufficient.

As the uterus contracts and retracts more and more, the upper muscular part becomes progressively thicker. The less muscular lower segment is pulled upwards over the

presenting part and becomes thinner. The cervix becomes effaced. The effacement is followed or accompanied by progressive dilation of the cervix until full dilatation when the uterus becomes a continuous cavity with
the vagina.

A fully dilated cervix is 10 cm dilated. During the first stage the uterine cavity gets progressively smaller but the foetus moves down very little. The presenting part helps in dilating the cervix. During this stage the woman should not use her voluntary efforts to bear down as this will exhaust her unnecessarily and may cause oedema of the cervix and/or foetal distress.

Management of Normal Labour in the Admission Room

The proper management of labour is essential, if you are to avoid problems or to detect them early when they occur.

> ***No labour should be assumed normal until the fourth stage has successfully concluded.***

Admission

Take the patient's personal history, conduct a physical examination and carry out tests/investigations.

Check the woman's antenatal card for any identified risk factors. It will also help you to see if there were any abnormalities during her pregnancy. The records will also have information on her medical and obstetric history. If she has not been attending an antenatal clinic, this is the time to take detailed history .Once this information has been established, find out more about the present labour. Take her history, do an examination and carry out the necessary investigations to establish the stage of labour and the state of the mother and the foetus. The steps you should take will be covered on the following pages.

History Taking

A detailed personal history should have been taken during pre-natal care. However, if this has not been done, this is a good time to get it recorded. Make sure the names are correctly spelled because this can eventually result in problems when registering the baby. Review the last day of menstruation to calculate the expected date of delivery. Check her age, parity and contraceptive history. Assuming that a detailed personal history had been taken during pre-natal care, you should now take information about the following:

- Any presence of show
- Presence or absence of contractions
- Onset of contractions and
  their characteristics
- Activity of the foetus

- Rupture of the membranes
- Any treatment given
- Food taken in the last four hours

Taking observations Assess the general condition and progress of labour in the mother, as well as vital signs and blood pressure. Test urine for protein, glucose and ketones and report any abnormalities.

Thorough physical and vaginal examination.

Head to Toe Physical Examination

you should start by explaining to the mother that you want to examine her. The health care provider should appreciate the psychological aspect of a woman in labour, respect her feelings and the need for company or privacy. They should support the woman and her partner or family during labour, birth and the immediate postpartum period. Failure to do this has contributed to many women delivering at home, a place where they are appreciated but without an assured clean and
safe delivery.

Examination of the Mother Systematically

When examining her, check on her general condition. Check if she is exhausted, anaemic, in great pain, dehydrated, or with generalised oedema. You should also check her height. This will enable you to exclude any risk factors.

Take vital measurements including her blood pressure, pulse, temperature, and respiratory rate.

Conduct an abdominal examination checking for:

- Height of fundus
- Over-distension of the abdomen, scars or other abnormality
- Over-distension of bladder
- Possible presence of twins or multiple pregnancy
- Contractions - frequency, length, type and strength
- Lie of foetus - this is the relation of the long axis of the foetus to the long axis of the uterus (it can be longitudinal, oblique or transverse)
- Rate and rhythm of the foetal heart

Check on the presentation. Which part of the foetus is at the pelvic brim? Is it a head (cephalic) or the buttocks (breech)? Check the attitude; whether the head is well flexed or extended. A well-flexed head presents the smallest diameter and delivers easily. A deflexed head presents a larger diameter and causes delayed or obstructed labour.

Check the position of the relation of the foetal parts to the mother. This is confirmed through a vaginal examination by checking the position of the foetal occiput relative to the mother. The position of the foetal spine is the same as that of the occiput.

Vaginal Examination in Labour

This is an important examination as it can give you a lot of information, which you might not get from an abdominal examination. On the other hand, if you do it often it is uncomfortable for the woman and you might introduce an infection into the uterine cavity, especially if the membranes have ruptured. To avoid infections, you should scrub and put on gloves as you would for any other sterile procedure. Then thoroughly swab the perineum of the woman with an antiseptic solution such as Savlon or Hibitane, or boiled water if these are not available.

- A vaginal examination is necessary to:
- To identify the presentation
- Determine the engagement of the head
- Detect state of membranes
- Asses cervical dilation
- To determne the position of the presenting part

  - Check if the patient is in labour and what stage of labour (this is done on admission of the patient)
  - Assess the progress of labour (this is done every four hours during the first stage of labour)
  - The degree of effacement and dilatation of the cervix and the station of the head relative to the ischial spines will give you the necessary information
  - Check that there is no prolapse of the cord when the membranes rupture

Remember: Do not do a vaginal examination if the mother has an ante-partum haemorrhage, because if there is placenta praevia, severe haemorrhage will occur.

Nb A vaginal examination is contraindicated if the mother has ante-partum haemorrhage unless it is performed in an operating theatre. In case of pre-eclampsia, the procedure should be performed only after giving a sedative.

Vaginal Examination

- Arrange your vaginal examination pack with cheatle forceps and pour solution.
- Scrub your hands for at least five minutes.
- Glove yourself methodically to prevent contamination.

- Explain the semi-lithotomy position that should be maintained during the examination
  to the mother.
- Swab the vulva and drop the swab methodically (used swabs should be decontaminated in jik before disposal).
- Ask the mother to breathe in and out while you perform digital examination.
- With the right hand, gently insert the fingers obliquely inside the vagina with the thumb, facing the symphysis pubis. Your left hand should be on the mother' s abdomen.
- The fingers to be introduced are held on a higher level than the vaginal orifice during insertion to avoid contact with the anus. Fingers should not be withdrawn until the required information has been obtained.
- The fingers are directed along the anterior wall of the vagina. The wall should feel soft and dilatable while the vagina should be warm and moist.
- The fingers are then directed upwards to the position of the cervical Os.
- At times the Os is not felt readily, the fingers should then be directed backwards
  and upwards.

While performing a vaginal examination, you should observe the mother' s non-verbal communication.

The Vagina

The Cervix

The Cervix

- Is it bruised or oedematous?
- Is it firm or soft?
- Is it taking up, that is effaced?
- How much is the Os dilated?

Do not insert more than two fingers in the cervical Os.

The Membranes

The Membranes

After deciding the state of the cervical Os, check for presence of membranes. Note the following:

- Are they ruptured or intact?
- If intact are they bulging?

The Cord

The Cord

- Is it presenting or prolapsed?
- If prolapsed is it pulsating?

The Presenting Part

The Presenting Part

Next, determine the level of the presenting part. You should ask the following questions:

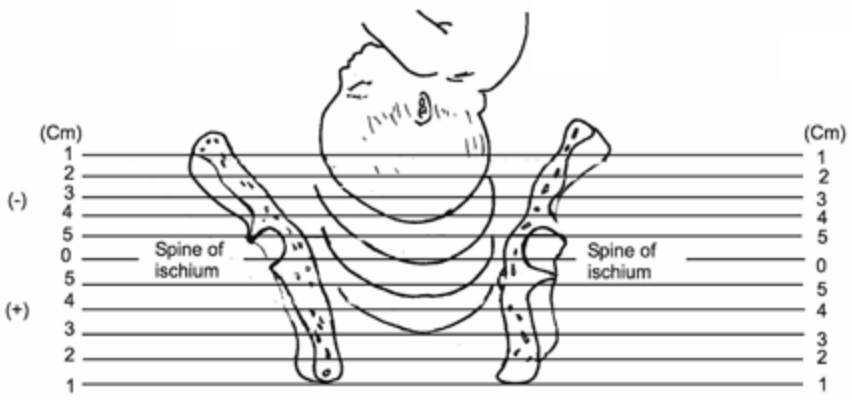
- Is it fitting the pelvis and cervix well?
- If it is the head, can you feel a suture or fontanel? Which one?
- Is it well flexed?
- If the head is at the brim it, will not be felt vaginally unless you push it down with your left hand which is on the mother's abdomen
- If the head has just engaged, it can be touched or just be tipped
- If the head is deeply engaged, the head is felt at the level of the ischial spines

The Presenting Part

The station or level of the presenting part is the level to which the presenting part has descended in the pelvis. The level of the presenting part is expressed in relation to the easily palpable ischial spines. You can also state if it is above the brim, at the brim, in the cavity or at the outlet.

Remember that if the presenting part is at the brim then it is at station -5. As the head descends down in to the cavity of the pelvis it decreases from -5, -4, -3, -2, -1. By the time it is at the ischial spines, it is said to be at 'zero station'. It reappears from the pelvic outlet into the perineum, which is classified as +1, +2, +3, and +4. By the time it is seen at the perineum it is at station +5.

The Station of the Foetal Head



Observe the position of the presenting part.

This is the position of the foetal parts in relation to the parts of the pelvis. A point on the foetus, such as the occiput in a vertex presentation, is usually used as a reference point.

To get the position right, you have to palpate the sutures and fontanel to determine their position relative to the pelvis. This can be confirmed by abdominal examination.

In a breech or a face presentation, the reference points on the foetus are the sacrum and the chin or mentum respectively. A soft mass is felt. Foetal genital parts or the anus may be felt with the examining finger. The position is determined by the position of the sacrum in relation to the side of the mother's pelvis. The left side is expressed as left sacro-anterior (LSA) or the right side, which is known as right sacro-anterior (RSA).

In a vertex presentation, when the occiput is persistently posterior, this causes prolonged labour. In a cephalic presentation, you will feel the hard head sutures and fontanel. Determine whether it is the anterior or posterior fontanel by its shape. If it is the posterior fontanel, then the position is occipito-anterior. If it is the anterior fontanel then the position is occipital-posterior.

Face presentation is important as the chin is the facial landmark. Note how the position of the chin is related to the mother's right thigh (RT) or left thigh (LT), side of the pelvis and the anterior and posterior position expressed as RMP (right mento posterior). You should also note the brow or sinciput presentation on vaginal examination (VE). You should be able to feel the brow, frontal sutures and possibly the posterior fontanel. The extension is usually a temporary presentation, which converts to face or occiput presentation during labour. However, at times it persists and in such instances, a caesarean section is usually called for.

Illustration of baby in mothers womb showing normal presentation

Note whether the long axis of the body of the foetus is perpendicular to that of the body of the mother. A left acromiodorso posterior (LADP) indicates that the baby' s lower shoulder is to the mother' s left and its back is towards her back. A compound presentation is when the hand or occasionally a foot lies alongside the head.

The Pelvis

Next check for moulding or caput succedaneum.

What is moulding?

Moulding is when the diameters of the foetal skull are reduced in size. During labour the bones of the foetal skull tend to overlap at the sutures so that the head can easily pass through the birth canal. During a vaginal examination this is how you should check for moulding:

- In cephalic presentation, run the finger on the head feeling for the sutures
- Judge the degree of moulding by feeling the amount of overlapping of skull bones
- Check for caput

The pelvis is assessed to check if it is adequate).
The following factors should be checked:

- Is it roomy?
- Are the sidewalls well spaced?
- Can you touch the promontory of the sacrum easily?
- Is the pubic arch wide enough?

- After checking for moulding, direct the fingers behind the head and make an effort to reach the sacro-promontory. The palm of the hand should be facing upwards. Promontory of the sacrum should not be reached.
- With the palm facing downwards run the two fingers down along the hollow of the sacrum and determine the shape. The hollow of the sacrum should be curved.
- The two fingers are then moved to where the ischial spines are located on either side of the pelvis. Run the finger along this area to determine whether or not the ischial spines are unduly prominent. Or else you can stretch your fingers to see if the spines are prominent. The ischial spines should not be prominent.
- As you move the fingers with the palm facing upward, on reaching the pubic arch check if it can accommodate two fingers. The apex usually should accommodate two fingers.
- Make a fist facing downwards then place the fist between the ischial tuberosities. The Intertuberosity should accommodate four knuckles. Check if it does.

The Discharge

Withdraw the fingers and check if there is:

- Any vaginal discharge
- Any smell
- Any liquor or meconium staining
- Any bleeding

The following steps should be taken as part of your investigation:

- Take a urine sample for albumin and sugar
- Check for acetone, especially if the patient is in prolonged labour
- Take blood for haemoglobin and cross matching if the patient is anaemic or might need an operation

By this time you will have gathered enough information as to the stage of labour and whether the patient belongs to the ‘ at risk’ category and needs referral or not.

-Reporting on the findings of the mother on a partgraphS

Management of First Stage of Labour (1 of 5)

When managing the first stage of labour, you should keep to the following procedure, making sure you record your findings in a partogram:

- Admit the patient to the waiting room, reassure her and introduce her to other patients
- Reassure her and explain what is being done at every stage

- Give her an enema only if she is in early labour (this will reduce the risk of faecal soiling and infection at delivery)
- The patient may have a warm bath and change into a hospital gown
- Encourage her to walk about and empty her bladder frequently
- Give her plenty of fluids with sugar or glucose as she has to work hard and needs the energy
- Do not allow any solid foods as the stomach takes a long time to empty in labour

Should she need an operation and anaesthesia, the emptying of the stomach will be difficult and she might vomit and inhale the vomit.
If she is in much pain and the delivery is still far off, give her a sedative.

Check the following regularly:

- Check the foetal heart rate half hourly or more often if you suspect distress
- Check uterine contractions (strength, type, frequency and duration) as well as maternal pulse, BP and temperature
- Check the urine output and check for albumin and acetone if indicated every two hours
- Every four hours check the level of the presenting part and the degree of dilatation of the cervix
- Constantly check the woman's reaction to labour and be aware of her needs, especially for pain relief. You can repeat pethidine 50 mg IM if cervical dilatation is still 5 cm or less. Do not give more pethidine if delivery is imminent as it depresses the baby's respiration
- Towards the end of the first stage, she can rest on her side, or in any position she finds comfortable, for example, squatting
- Discourage pushing or bearing down before the cervix is fully dilated
- Early pushing only exhausts the woman and will cause oedema of the cervix and interfere with normal dilatation
- If the bladder is full and she cannot empty it on her own, catheterise her using aseptic technique
- When the membranes rupture, usually at the end of the first stage, check the colour of the liquor for meconium staining, the foetal heart rate and do a vaginal examination to exclude prolapse of the cord

Write down the observations you are supposed to record in the partogram?

- Vital signs
- Blood pressure

- Details of vaginal examination
- Contraction strength and number of contractions in ten minutes
- Fluid balance
- Urinalysis
- Drugs administered

When observing the contractions, you should note the following:

- Uterine contraction duration, strength and frequency
- In early labour the contractions are mild, lasting 20 to 30 seconds and are infrequent
- As labour progresses, the contractions become stronger, lasting 40 to 50 seconds and are about three contractions per ten minutes
- The uterus should always relax between contractions
- The cervix dilates progressively from 4cm at a rate of approximately 1cm and 1.5cm hourly in primigravida and multigravida respectively
- The descent of the presenting part can be noted by abdominal palpation or vaginal examination. Avoid unnecessary vaginal examination

Remember to allay the mother's fears and reassure her throughout your examination and indeed throughout labour. A mother in labour needs to feel loved, cared for and to be treated with dignity.

Prevention of Infection

To prepare for clean delivery you should:

- Give an enema or suppositories
- Avoid shaving the pubic hair, given current HIV/AIDS prevalence rates
- Allow the mother to have bath whenever she wishes as it is soothing during labour
- Practice aseptic techniques through labour
- Ensure a clean environment within and around the ward

After conducting a thorough examination of the mother and recording your observations in the partogram, there are a number of things you can do to make her feel comfortable during her labour i.e. allow her to change position and move around, use back massage, have a chosen companion with her during labour, allow her to take fluids as required and return the placenta to parents if so desired and directed by the culture. However do not forget to check on the foetus especially if you suspect foetal distress.

Write down any signs of foetal distress that you can think of.

If you diagnose foetal distress what steps might you carry out?

The Second Stage of Labour (1 of 18)

As mentioned earlier, the second stage of labour begins with full dilatation of the cervix. It is the stage of descent and expulsion of the baby. It normally lasts from one to two hours on average in primigravida, and half an hour in multipara. If this stage goes beyond two hours it is considered abnormal. The contractions become stronger, lasting 40 to 60 seconds, with a one-minute
recovery interval.

The retracted and contracting uterus pushes the foetus down into the pelvis. During the relaxation phase the pelvic floor pushes the presenting part up again but the retracted uterus does not allow all the progress achieved to be lost. Progressively the presenting part moves down until it reaches the pelvic floor. The presence of a foreign body in the vagina makes the woman want to bear down even against her will. The voluntary muscles of her abdomen and diaphragm help the uterus in the pushing. As a contraction comes the mother should be instructed to take in a deep breath, hold it and then bear down.

> These expulsive efforts are partially voluntary. The vagina widens to accommodate the baby. It is now a continuous cavity with the uterus. The presenting part may push out faeces from the rectum as it goes through the vagina. When the presenting part reaches the pelvic floor it starts stretching the vulva, causing much pain, especially in the primigravida. For some time it keeps popping out during a contraction and receding back during the relaxation phase. After some time it can no longer slip back. This is known as 'crowning'. The head will have passed through the bony outlet of the pelvis. The perineum becomes stretched and paper-thin and it is at this stage that an episiotomy should be performed if necessary. The next contraction normally expels the presenting part.

Mechanism of the Second Stage of Labour

The mechanism of labour refers to a series of movements the foetus has to make to pass through the birth canal.

Lie

Lie means the relation of the foetus to the long axis of the uterus. It may be longitudinal, oblique or transverse.

Presentation

The presenting part of the foetus is that part which is in or over the pelvic brim. Its position is examined in relation to the cervix. It could be vertex, face, or a breech. However, 95% of all presentations are cephalic, and the presenting part is usually the vertex.

Position

The position describes the relationship of a selected part of the foetus to the maternal pelvis. For example, in a vertex presentation the selected part is the occiput. With face presentation it is the chin, and with a breech presentation, it is the sacrum.

Attitude

he pelvis is a curved passage with different diameters at the inlet, mid-cavity and outlet as you saw in unit two. The foetus, therefore, has to adapt itself to the shape, size, and curve of the pelvis at different levels as it descends.

To be able to manage labour skilfully, you need to understand the natural movements made by the baby so that, when assisting in delivery, you can follow the movements rather than oppose them.

The factors, which influence the mechanism of labour, are known as the three 'Ps': power, passage, and passenger.

Power

The stronger the contraction in a well prepared mother, the better the outcome of labour.

Passage

The size, shape and resistance of the birth canal including the bony pelvis, cervix,

vagina and pelvic floor may speed up or slow down the process of delivery. A gynaecoid pelvis and a fully dilated cervix speed up the process.

Passenger

This refers to the size, lie and presentation of the foetus, as well as the placenta and membranes. For the foetus, a vertex presentation makes labour shorter as the presenting part fits well on the cervical Os and stimulates the cervix to dilate faster.

It is important to remember that descent occurs throughout and as mentioned earlier, ninety five per cent of all presentations are cephalic, and the presenting part is usually the vertex. This areas boundaries include the bregma or the anterior fontanel, the perietal eminences and the posterior fontanel. The presenting diameter is, therefore, the smallest - 9.5cm. In order to present with the smallest diameter, the head must be well flexed on the neck with the chin touching the chest. As the leading part meets resistance of the pelvic floor it rotates 1/8th forwards until it comes under the symphysis pubis.

The mechanism of labour in a cephalic vertex presentation includes the following steps:

- Engagement and descent
- Internal rotation
- Birth by extension of the head
- Restitution and external rotation

You will now look at each of these steps in detail.

Engagement and Descent

Engagement is the descent of the presenting diameter through the pelvic brim. The head usually engages late in pregnancy in the primigravida while in the multipara it does not engage till labour starts. The head enters the pelvic brim in oblique diameter with sub occipital frontal diameter (10.5cm). With good uterine contraction, there is more flexion of the head. The head engages with sub occipital bregmatic (9.5 cms) oblique diameter of the pelvis brim.

Internal Rotation

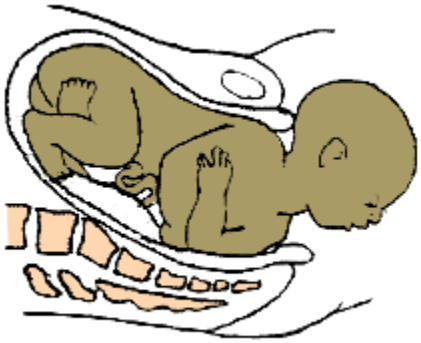
The head rotates 1/8th of a circle. Such a rotation is achieved by the action of the uterine muscle pushing downwards. The pointed vertex presents on the broad levator ani muscle. When the vertex reaches the perineum, the occiput turns from the posterior to the anterior position. Anteriorly there is more room for further descent. When the occiput is below the symphysis pubis, crowning takes place.

Internal rotation of the foetus

Birth By Extension of the Head

Once the occiput has escaped from under the symphysis pubis, the head extends forward. The nape of the neck is pressed firmly against the pubic arch. This extension of the head causes the anterior part to stretch the perineum gradually. Further extension allows the sinciput, face and chin to escape the perineum and the head is born by extension. Extension is the result of action from two forces. The abdominal and thoracic muscles exert downward pressure. The pelvic floor and perineum resist this pressure and push the head forward and upward through the weak area, which is the vagina.

Sinciput and face delivered



Restitution

The head turns 1/8 of the circle to the left, back to where it was before. This rotation takes place to undo the twist, which occurred during the previous internal rotation. This 'undoing of the twist' is known as restitution.

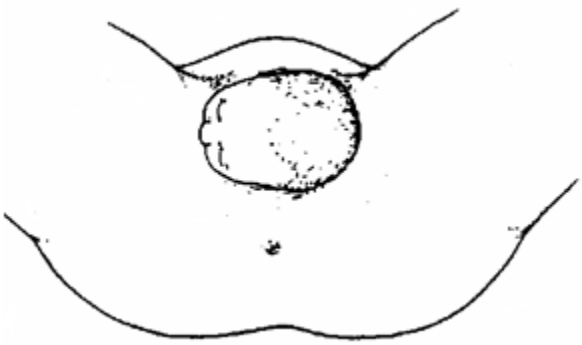
Internal Rotation of the shoulder

When the head is passing through the level of the ischial spines and the outlet in anterior posterior position, the shoulders enter in the oblique diameter of the pelvis and rotate forward 1/8 of a circle. The shoulders are now in the anterior posterior diameter of the outlet. The anterior shoulder escapes the symphysis pubis while the posterior shoulder sweeps the perineum.

External Rotation of the Head

As the internal rotation of the shoulders takes place, the head, which has already been born, rotates 1/8 of a circle as in restitution. The head now lies in the lateral position.

External rotation of the head



Lateral Flexion

Following these movements the body bends sideways to follow the curve of the birth canal.
The anterior shoulder escapes under the symphysis pubis and the posterior shoulder sweeps the perineum. The body of the baby is born by lateral flexion.

To recap, the cardinal movements of labour in a vertex presentation are:

1. Engagement
2. Descent
3. Flexion
4. Internal rotation
5. Extension
6. External restitution of the head
7. Expulsion

An easy way to remember these movements is by use of the mnemonic device - '**E**very **D**ecent **F**amily **I**n **E**urope **E**ats **E**ggs'.

Management of the Second Stage of Normal Labour
Before you begin, try to remember the probable signs of the second stage of labour. Write them down on a piece of paper.

- Expulsive uterine contraction. This may happen in occipital posterior or when the head is deeply engaged with fully loaded rectum (in a case where the mother is not in
  second stage)
- A trickle of blood
- There may be no bleeding while the cervix is fully dilated
- Pouting and gaping of the anus
- Gaping of the vulva in primigravida. The vulva of multiparous will gape even in premature pushing
- Tenseness between the anus and coccyx
- Bulging of the perineum usually means delivery is imminent

Management of the Second Stage of
Normal Labour

Can you recall the equipment you will need during the second stage of labour?

You will need a trolley with a top and bottom shelf.

On the top shelf make sure you have:

- Sterile delivery pack
- Small bucket with 0.5% jik for decontaminating instruments
- Bucket with 0.5% jik for
  decontaminating linen
- A bucket with plastic bag for used swabs and gloves

On the bottom shelf you should have the following:

- Suturing pack
- Antiseptic solution
- Draw sheet and mackintosh
- Syntocinon drawn, in a receiver
- Lignocaine
- 5% dextrose solution 500mls
- Needles
- Branulars
- Syringes (for emergency)
- Sterile gloves

The following steps are suggested in the management of the second stage of labour:

- Explain the procedure to the mother and reassure her
- Ask your assistant to open and arrange the delivery pack while you scrub up
- Gown and glove yourself methodically
- Instruct your assistant to put the patient in the dorsal position
- Swab the mother methodically
- Lubricate your two fingers and perform vaginal examination to confirm second stage
- You should also instruct your assistant to check the foetal heart beat after every contraction, the mother's pulse after every ten minutes and to administer syntometrin after the delivery of the anterior shoulder

Flexing of the head and guarding of the perineum

The Management of the Second Stage of Labour

- Tell the patient to wait for a contraction. When it comes, she should take in a full breath, close her mouth and bear down as strongly as she can, then quickly take in another breath and bear down again.
- She should be able to make at least two efforts during each contraction and relax between contractions. Encourage her all the time and explain the progress being made towards the birth of her baby.
- Place the baby towel on the bed, with the scissors and two forceps for clamping the cord. Prepare two pieces of cotton wool for wiping the newborn' s eyes, some gauze for cleaning the airway and for a covering when cutting the cord.
- At this stage the head might start distending the perineum. The anus starts dilating and the head is seen at the vulva. It keeps receding between contractions.
- When the head distends the perineum check if the perineum is stretching well.
- Place the left hand on the advancing head with fingers spread equally over the vertex towards the bregma to stop any sudden explosive effort during and after crowning of the head. With the right hand guard the perineum, holding it with the pad.
- Check if the perineum is stretching. If not, give an episiotomy at the height of a contraction if there is any indication that the head is about to crown.

Crowning of the Head

Next is the crowning of the head. The parietal eminences pass through the bony outlet. At this stage the head no longer recedes between contractions.

Tell the mother to stop pushing as this might lead to a rapid delivery of the head and consequent brain damage. Ask her to pant. Research has shown that a series of short pushes are more effective than a long push. Encourage her as she pushes.

> ***It is really hard work! So keep encouraging the mother with kind words and warmth!***

Extension of the head

Assist the extension by grasping the parietal eminences with your left hand. Let the head come out slowly and naturally. Feel for the cord around the baby's neck. If it is there, slip it from the baby's neck over the head. If it is too tight, place two artery forceps on the cord and cut it between them. When the nose and mouth come out, wipe away the mucus with a sterile swab. By this point the whole head should be out.

The head will have restituted and rotated spontaneously to face the mother' s left or right thigh. This shows you that the shoulders have descended and rotated to the

anterior
posterior diameter.

Delivering the Shoulders by Lateral Flexion of the Body

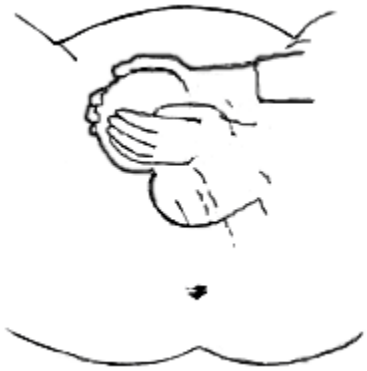
The following procedure should be followed when delivering the shoulders by lateral flexion of the body:

- Place one hand above and one below the foetal head
- Depress the head gently toward the anus/neck, making sure it is neither twisted nor bent sideways till the anterior shoulder is free

The delivering of anterior shoulder

- Remind your assistant to give syntometrine 0.5mg intramuscularly (in a single dose)
- Guide the head upwards in the direction of the mother's abdomen

The delivering of posterior shoulder



- The posterior shoulder will escape smoothly over the perineum
- The rest of the body will be born by lateral flexion
- Ask your assistant for the time and note the time of birth
- Place the baby at a slight slant to drain the mucous
- Put the baby on the baby towel, clamp and cut the cord
- Give the APGAR score to the baby
- Show the baby to the mother to identify the sex of the baby
- Ask your assistant to continue with the immediate care of the baby
- Continue with the delivery of the placenta by using control cord traction
- Check the placenta for completeness and/or malformation.
- Measure blood loss
- Do the first examination of the baby
- Weigh the baby
- Do a post natal examination and record all the findings
- Give the mother a hot drink and transfer her to the postnatal ward

APGAR Score

Can you remember how to give an APGAR score?

Once the baby is out into the world, your work has just begun. You will need to assess the
baby periodically.

After delivering the baby, an assessment of the general condition is done after one minute and again after five minutes. This involves the consideration of five specific signs and the degree to which they are present or absent. The factors assessed are:

- **A**ppearance - Colour
- **P**ulse - Heart rate
- **G**rimace - good grimace
- **A**ctivity - Muscle tone
- **R**espiratory efforts – vigorous crying

A score of 0, 1, 2 is awarded to each of these signs in accordance with the APGAR Score Chart.

APGAR Score Chart

Sign	Score 0	Score1	Score2
Appearance	Pale or blue	Body pink, extremities blue	Pink all over
Pulse/ heart rate	Absent	Less than 100/min	More than 100/min
Grimace	None	Slight	Good

Activity (tone)	Limp	Some flexion/movement	Spontaneous movements/active
Respiratory effort	None	Weak or slow/gasping	Good/vigorous cry

A normal infant in good condition at birth will achieve an APGAR score of 7 to 10. A score of 0 to 3 is severe birth asphyxia and 4 to 6 is moderate birth asphyxia, both of which require immediate resuscitation of the baby.

Immediate Care of the Baby

Clear the airways by sucking mucus from the mouth and nostrils and give oxygen if necessary. Ligate the cord and make sure the ligature is very tight before you cut the cord. Wipe the baby' s head and the body and wrap to keep warm. You should record the following information about
the baby:

- Label the baby with the mother' s name and I.P. number
- Write the date and time of delivery
- Sex of the baby
- Birth weight

After handing the baby over to your assistant, you will have to continue to deliver the placenta using control cord traction. At this point you should remind yourself about the process of the third
stage labour.

Principles of the Third Stage of Labour (1 of 12)

Mechanism of the Third Stage of Labour
Physiology of Third Stage

Assuming that all the aforementioned factors are well taken care of, you will now look at the physiology of the third stage of labour, starting with the mechanical factors.

The Mechanical Factors

During the third stage, the following mechanical factors come into play:

- The uterus reduces in size 2.5cm below the umbilicus, or 15cm above the symphysis pubis after the expulsion of the foetus
- The contraction and retraction of the uterine muscles continues
- The placental site is reduced to half

- Since the placenta is inelastic, it does not contract, so it detaches from the shrinking uterine wall
- The placenta is pushed further to the lower uterine segment by the weight of the retro-placental clot. This is the accumulated blood from the separated placenta
- With the next contraction the placenta is pushed into the vagina and expelled

You will know that the placenta has separated and has been expelled from the upper uterine segment into the lower segment or into the vagina when you have noted:

- Elongation of the cord which does not recede on pressing at the symphysis pubis
- A gush of blood
- The uterus contracts like a cricket ball.

The placenta is expelled either with maternal side exposed, known as the Mathew-Duncan method or the foetal side exposed known as the Shultz Method.

Click here to view the Mathew Duncan method.
Click here to view the Shultz method.

Control of Bleeding

The following steps should be taken to ensure the control of bleeding:

- The uterine muscle' s contraction and retraction causes the placental site to reduce into half. Criss-cross fibres control bleeding by compressing the blood vessels. These fibres are also known as ' living ligatures'
- Clotting of blood takes place in the sinuses sealing the bleeding points a few hours later when uterine contractions are less vigorous.

The time interval between the delivery of the baby and delivery of the placenta is a dangerous period, in which one of the greatest complications of pregnancy and labour can occur.
This complication is excessive bleeding or postpartum haemorrhage (PPH). You should never leave the mother alone even for a short while during this stage.

The third stage of labour can be managed either passively or actively. You will now study each of these two modes of management in detail.

The Passive or Natural Method of Managing the Third Stage of Labour

The passive or natural method occurs naturally, that is without any interference. For example, in a normal delivery, if oxytoxic drugs are not used, the uterus generally

remains inactive for a few minutes after the delivery of the baby, after which regular contractions then begin again. Physiology of the third stage takes place, the placenta is expelled and bleeding is controlled.

Giving Oxytocic Drugs

Oxytocin, ergometrine or syntometrine stimulate uterine contraction. Ergometrine 0.5mg given IM causes a uterine contraction to occur five to seven minutes after the injection. Given intravenously it acts within 45 seconds. Syntometrine is a mixture of oxytocin and ergometrine 0.5ml given IM acts within two to three minutes. Usually sytrometrine is given with the delivery of the anterior shoulder while ergometrine is given at the crowning of
the head.

Controlled Cord Traction

The uterus must be firmly contracted before this method can be used. It is not necessary to wait for signs of placenta separation.
Place the left hand above the symphyis pubis, push the uterus upwards and backwards with the right hand and pull the cord downwards and outwards. Apply traction steadily without jerking, see the illustration on the right. When the placenta is visible at the vulva, direct the cord upwards. The placenta will follow the curve of the birth canal. Receive it with both hands and rotate the placenta. This will twist the membranes. You can then deliver the membranes with up side movements, which enable them to be drawn out
without breaking.

Maternal Effort

This method is not commonly used. When the placenta has separated and descended, the palm is placed downwards on the mother' s abdomen to provide a backup that the mother can push against. During a contraction, the mother should be asked to push down. The placenta will be pushed out of the vagina. This method is useful in the event of a macerated birth.

Do not apply downward fundal pressure while doing cord traction as this can lead to inversion of the uterus.

The other method that can be used to deliver the placenta is the fundal pressure method.

Fundal Pressure

This method should be used in case of a macerated or pre-term baby as the strength of the cord is reduced. You should wait for the following signs of placental separation:

- The fundus feels hard like a cricket ball
- There is a gush of blood due to placenta separation
- The cord lengthens and doesn't recede with pressure on the symphysis pubis

Procedure

Make sure the bladder is empty. Instruct the mother to breathe through an open mouth slowly and quietly. When there is a contraction, grasp the uterus with your left hand fingers behind the uterus. Thumb in the anterior surface. Apply pressure to the pelvic inlet in downward and backward direction. Receive the placenta with both hands. If the membranes do not slip out, turn the placenta around and deliver the membranes slowly with an upward movement. Rub the uterus and expel the clots.

Once the placenta is out, you will need to examine the birth canal.

- Explain to the mother that you need to check if she has any tears, warn her it will be a bit painful but the worst part has passed, you will be very gentle and quick and that she needs to cooperate
- Change the gloves, roll gauze over pointing and middle fingers of the right hand
- Insert middle fingers of left hand facing upwards pushing the upper vaginal wall
- With the right hand press down the lower vaginal wall exposing the cervix
- Check the cervix for bleeding, oedema or tears
- Check for any tears with the two fingers of your right hand, mop both sides of the vaginal wall, finish with the fourchette
- Reassure the mother in case there is any tear for suturing
- Cover the perineum with the folded pad into a half
- Wipe the buttocks from the fourchette towards the rectum cover the perineum completely
- Collect any blood loss from the bed
- Change the bed linen with the help of an assistant
- In case of episiotomy or a tear, scrub your hands while your assistant is setting a sterile suturing pack and repair the tear
- Ask the mother to lie on her back with her legs crossed on each other
- Ask the assistant to hand over the baby to the mother
- Leave the mother to rest while you go to examine the placenta

Procedure

Write down any reasons you can think of, for examining the placenta.

You now know why we examine the placenta. But how do you go about it?

The Fourth Stage of Labour

The fourth stage starts after the delivery of the placenta and lasts for one hour. The nurse or midwife should observe the mother for blood loss, monitor vital signs, reassure her and let the mother hold the baby. The nurse should also record notes in the patients file, fill in the baby notification form and after the hour is over escort the mother to the maternity unit.

Examination of the Baby

As mentioned earlier, once the baby is delivered, a thorough first examination is done. Can you remember at what time interval?

A thorough physical examination is done one hour after birth with the aim of assessing maturity and excluding obvious congenital abnormalities and injuries at birth. In order to carry out this examination, you need to have with you the following equipment in a tray:

- Tape measure
- Second hand watch
- Gloves
- Weighing scale
- Clinical thermometer
- Lubricant
- Swabs
- Stethoscope

Examine the baby systematically in the following manner:

- **Vital signs** - heart rate (120-160/min), respiration (20-60 average 44/min), and temperature (36-37 degrees centigrade).
- **Head** - Check the shape to see if there is excessive moulding, caput succedaneum or depressed fractures to exclude head injury, microcephalus or hydrocephalus. Take head circumference (Approximately 33-37 cm).
- **Ears** - Check position. If they are low set, this may indicate Down's syndrome or Mongolism. Check for any missing lobes or cartilage.
- **Eyes** - Check for presence of eyeball injuries, discharge or jaundice.

- **Mouth** - Check for harelip, cleft palate, tongue-tie or false teeth, septic spots, thrush, cysts.
- **Nostrils** - Check for patency with no polyps or flaring.
- **Neck** - Check for congenital goitre or enlarged glands.
- **Upper limbs** - Check for equality, free movement, fractures, webbed fingers, extra digits and any bony tissues. Extra digits can be ligated with silk and will fall off (with the parents permission). Check for Erb's palsy.
- **Chest** - Check for continuity of sternum and the shape of rib-cage, respiratory rate, enlarged breast or absence of breast tissue .
- **Abdomen** - Should be intact and firm, check for umbilical hernia and exomphalus (protrusion of abdominal organs through a defect in the anterior wall). Abdominal distension is present in hydrops foetalis. Check for blood oozing from the cord and clamp again if necessary (cord shrivels within 24 hours, falls off 6-10 days).
- **External genitalia** - Confirm the sex of the baby to rule out pseudo-haemophrodism or intersexes. In males check for undescended testes, hypo/hyperspadias and phimosis. In females, check for bleeding from urethral and vaginal orifice. Vaginal bleeding may be due to excessive hormones from the mother

Neurological Assessment

This entails the checking of reflexes, which deal with the function of the baby’ s nervous system as well as physical and behavioural assessments. At the beginning of the examination, observe the baby’ s movements. These movements involve all extremities and should be random and
symmetrical but never stereotyped. Sometimes jitteriness or tremors will be noted. The first time you notice these movements they may look like fits. To determine the difference between the two, hold the affected limb. If it is the former the tremors should stop.

Neurological assessments include the following, click the links to reveal the details of each:

Moro Reflex

Support the baby’ s head and body in supine position about a centimetre from the cot. Allow the head to drop back. Look at the baby’ s response. The baby throws out his arms extending the elbows and fingers with embracing movements of the arms. What is the significance of the Moro reflex?

The Moro reflex is symmetrical in a normal baby at birth and disappears after three months. It is incomplete in the pre-term baby and absent in the baby with inter cranial drainage. If brain damage is not severe it returns after three to four days. If it disappears some hours after birth, you should then suspect increasing cerebral oedema or slow intra cranial haemorrhage.

Tonic Neck Reflex

A fencing position is assumed, that is, the baby lies on the back, head rotated to one side with one arm and leg partially or completely extended. The opposite arm and leg are flexed. This is a manifestation of the immaturity of the newborn’ s nervous system.

Rooting Reflex

To test for the rooting reflex, gently touch the corner of the baby’ s mouth with clean fingers. The baby will open his mouth turning towards the stimulus in anticipation of the mother’ s nipple. To check for sucking reflex place a clean finger in the baby’ s mouth noting the sucking strength. The sucking reflex is poor in pre-term babies.

Stepping Reflex

The stepping or dancing reflex is present at birth but disappears soon after. Once this reflex diminishes, the infant does not attempt a stepping motion until he/she starts to walk. Hold the infant up, with the feet touching a surface. The infant will attempt to make some steps or pressing movements.

Grasp Reflex

It is amusing to learn that a newborn baby can grasp. At birth, the grasping reflex of both hands and feet is present. The infant will grasp any object you place in their hand, and then let it go. They are able to hold on to a finger so securely, that you can lift them to a standing position. Stroking the soles of the feet causes the toes to turn downwards trying to grasp. By applying traction to the baby's wrists raise them to a sitting position. A full term infant will offer a strong resistance while a pre-term does not resist the pull.

Protective Reflex

Other reflexes include protective reflexes such as:

- The blinking reflex, which protects the eyes from bright light
- Sneezing and coughing reflexes used to clear the infant' s throat
- The yawn reflex, which draws additional oxygen
- Cry reflex, which helps to withdraw from painful stimuli

All of these reflexes either diminish or strengthen as need be, influencing behaviour patterns, which become more complex.

Once this examination is completed, the baby can be placed on the cot for transfer to the nursery or given to the mother.

After completing the delivery of the baby, you should transfer the mother to the postnatal ward where she will rest.

Physiology of Third Stage

What changes take place in a woman who has just delivered during puerperium?

The puerperium period covers six to eight weeks following delivery or abortion and is characterised by:

- General organs return to their pre-gravida state
- Initiation of lactation
- Recuperation

Have you talked to friends about how they felt during their puerperal period? You will be surprised! Some say that whenever the midwife asked them any questions, they felt irritated for no good reason. Others felt like crying when their partners were late to visit. Some felt like screaming when the baby cried and wanted to cover it with a pillow to suffocate the innocent precious baby!

The Psychology of the Mother During Puerperium

During the puerperium the mother is subjected to emotional turmoil and you must be supportive and observant. She should be allowed to cuddle her baby and express her love as she wishes. This maternal instinct is at times delayed.

The midwife should be kind, patient, and compassionate towards the mother and give her the necessary education concerning her and the baby. Each mother should be

taken as an individual based on her maternal experience, educational background, maturity and parity. Mothers should be given all the information necessary to ensure they know how to care for their babies.

Rooming is the term given when a hospital plans for the mother to stay with the baby for most of the 24 hours in a day. It is highly recommended because it has been seen to have great psychological advantages for both mother and baby. Bonding commences immediately and demand breast-feeding can be successfully practised. Most baby-friendly hospitals in this country encourage rooming in.

Postpartum Tears or Fourth Day Blues

This condition is characterised by mild depression and mood swings due to a temporary endocrine hormonal imbalance following childbirth. It occurs in fifty percent of post-natal mothers on around the fourth day. A midwife should try to prevent the 'blues' by educating the mother during the pre-natal period on how to take care of herself and the baby to build up her confidence. Involve the partner in these teachings so that the partner can give moral support. Teach the mother how to check for minor discomfort and the relevant remedies to reduce the feeling of anxiety that the baby is ill whenever they cry.

It is a time of great physiological change, accompanied by some anatomical and psychological changes as well. This is a time of change in the body in general with the exception of the breasts.
The breasts continue to develop so as to establish and
maintain lactation.

The other changes that take place in the mother are outlined on the following pages.

General Involution

Every system in the body is affected during this process, including the heart and circulatory system. With the cessation of the utero-placental circulation, the work done by the heart decreases. The quantity of blood required also gradually returns to normal. The renal and musculo-skeletal systems also return to normal.

Involution of the Uterus

The size of the pregnant uterus is 30 x 22 x 20cm and it weighs 100gms at the end of labour. It is 15 x 11 x 7.5cm by the end of puerperium. Involution takes place, by which point it measures 7.5 x 5 x 2.5cm and weighs 60gms. Involution is the return of the uterus to its normal size, position and tone and is brought about by autolysis and ischaemia.

Autolysis is a process by which muscle fibres are digested by the proteolytic hormone. The muscle fibres have to dissolve a large amount of their protein in order

to achieve this reduction in size. This means that a great deal of nitrogen is excreted by the body in the urine together with the excess fluid retained during pregnancy. This is why a lot of urine containing large amounts of nitrogen is excreted during the first few days after delivery. In addition, the epithelial lining of the uterus, other cellular debris, and red blood cells are expelled as lochia from the uterus.

Ischaemia is localised anaemia of the uterus, which occurs when the placenta is expelled. Blood vessels are constricted, which results in the reduction of the blood supply to the uterus. The phagocytes dispose of the redundant muscle fibre and elastic tissue. The vagina, ligaments of the uterus and muscle of the pelvis also return to their pre-gravida state. If not, prolapse of the uterus may occur later.

Onset of Lactation

Lowered oestrogen levels trigger the production of prolactin from the anterior pituitary gland, which initiates lactation. The maintenance of lactation depends on putting the baby on the breast, but secretion of milk commences on the third to fourth day. The baby should be put on the breast immediately, which leads to oxytocin release and assists in keeping the uterus well-contracted. (You should revise the anatomy and physiology of the breast in unit one).

Management of Normal Puerperium

The aim of managing the puerperium is to:

- Maintain the mother’ s good health
- Aid involution of the pelvic area
- Promote breast-feeding
- Prevent infection and other puerperium complications
- Educate the mother on the proper care of her own health and the baby

The mother and the baby should be examined daily and if any abnormality is noted, the doctor should be informed. When noting the mother’ s general condition, you should check for the
following points:

- Assess happiness, sadness, worries and fears and address them appropriately.
- Ambulation is important to prevent deep venous thrombosis.
- Take her temperature, pulse, respiration and blood pressure twice daily.
- Check the breasts and if she is not lactating, express colostrum.

- Increase expressing on the second day and milk should be established on the fourth day.
- Advise the mother on how to feed the infant. When fixing the baby on the breast she should put the whole areola in the baby’ s mouth.
- She should initially breast feed the baby for three minutes to prevent cracked nipples and empty the breast in cases where the baby does not feed a lot. This is especially important in the first days to prevent engorgement.

Measure the fundal height and record the measurement daily. Assess whether the involution is taking place satisfactory. The fundal height should reduce by 0.5 - 1 centimetre daily.

Check on lochia loss, noting the colour. This should change as per the schedule we noted earlier. If there is persistent red lochia, this points to the need for further investigation. Offensive lochia odour denotes infection.

You should also check the perineum to see if there was episiotomy and note its state. Advise the mother to wash the episiotomy at least four times a day with salt water and change the pad as soon as it is soiled and after she goes to the toilet.

Check on the calf muscles and exclude any pain that may indicate deep venous thrombosis. You should also exclude oedema and anaemia. Ensure that the mother gets enough sleep and rest. If she cannot sleep, she should be given a sedative.

Take note of any pain and administer analgesics. Ask the mother to report if lochia is heavy. Also encourage her to pass urine when her bladder is full. Encourage her to continuously check on the baby's cord and to report any bleeding, especially in the first 12 hours.

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heavy. Also encourage her to pass urine when her bladder is full. Encourage her to continuously check on the baby's cord and to report any bleeding, especially in the first 12 hours.

Can you think of any minor and major complications of puerperium?
Major Complications

- Venous thrombosis
- Pulmonary embolism
- Retention of urine or retention with overflow
- Urinary tract infection
- Puerperal sepsis and pyrexia
- Engorgement of the breasts
- Cracked nipples or mastitis
- Puerperal psychosis

Minor complications

Post Natal Examination

This is carried out during the sixth post-partum week. You should inquire about the general health of the mother and baby. You should also do a haemoglobin estimate and if you find that it is low, embark on treatment.

You should inquire and note any gynaecological symptoms. Examine the mother's general condition, with specific emphasis on the breasts. Find out if the breasts are active. Examine the abdomen for tone of muscle and any masses. Also examine the vulva and vagina to ascertain the healing of the repaired episiotomy or tear. Pass a speculum (sims) to see the state of the cervix and if there is any discharge. Do a Pap smear at this stage. If possible, you should carry out a bimanual examination of the uterus to ascertain that the uterus has involuted to its normal size. Finally, remind the mother of the various family planning methods discussed and re-emphasise the importance of attending maternal and child health clinics**.**

Section 2:
The Neonate

Introduction

In this section you will focus on the new life, that is the neonate, who is now an independent being outside the mother' s womb.

' Neo' means, new, hence the term ' neonate' means newborn.

The neonatal period is the first four weeks after birth. A neonate can be classified as, preterm, full term or post term.

Objectives

By the end of this section, you will be able to:

- Describe the physiology of the neonate
- Explain the care of the neonate
- Describe the management of the high risk neonate
- Describe the management of a neonate with abnormal conditions
- Describe the management of neonatal emergencies
- Describe the management of birth traumas
- Describe the management of congenital abnormalities

Physiology of the Newborn (1 of 10)

Knowledge on the physiology of a newborn is necessary to ensure appropriate care of the neonate. In the first section of this unit, you learnt about the management of the second stage of labour and the examination you should carry out on the newborn baby.

Try to think of three main physiological adjustments in a neonate at birth.

Immediately at birth, there are three main adjustments that take place involving the lungs, the cardiovascular system and the temperature regulating centre to allow for the independent existence of the newborn baby.

You will now look at each of these adjustments in turn starting with those involving the respiratory system.

Changes in the Lungs

The onset of respiration in a newborn confirms life. The start of pulmonary respiration is due to physiological and mechanical reasons. Lack of oxygen and high levels of carbon dioxide in the circulation occur when placental circulation ceases. This stimulates the respiratory centre in the medulla to initiate normal respiration.

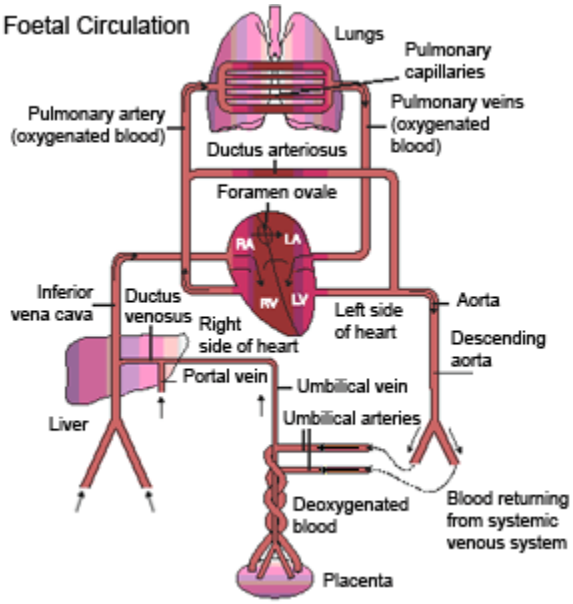
Mechanically, respiration is stimulated when the chest wall, which was compressed during the passage of the baby in the birth canal, allows the fluid to drain from the lungs. Consequently, the cool air on the baby' s face and handling during birth will stimulate the baby to cry as soon as they are born. After the baby takes in their first breath, the blood vessels in the lungs expand to initiate respiration.

At first the baby' s breathing may be rapid and irregular. It is mainly abnormal at a rate of 40 - 50 respirations per minute.

Circulatory Changes

You will recall that in unit two you studied foetal circulation. If you have forgotten what you covered, please refer to that section again. In summary, you noted that:

- Foetal type of circulation ceases as the respiration commences
- Normal circulation starts when the temporary structures stop functioning



What are the four temporary structures in foetal circulation?

I hope you thought of the following structures:

- Foramen ovale
- Ductus arteriosus
- Ductus venosus
- Umbilical vein and hypogastric arteries

As the placental circulation ceases soon after birth when the umbilical cord is ligated, the blood flow to the right side of the heart decreases and the blood on the left side increases causing the foreman ovale to close.

With the establishment of pulmonary respiration, the ductus arteries close. Complete closure happens within eight to ten hours of birth.

The cessation of placental circulation will result in the collapse and subsequently drying of the umbilical veins, the ductus venosus and the hypogastric arteries.

Remember:
Persistence or reopening of the ductus may occur if pulmonary vascular resistance is high. Cyanosis or cyanotic attacks will be evident as a result. This is a common problem of preterm neonates with Respiratory Distress Syndrome.

Anatomical closure by fibrous tissue occurs within two to three months, resulting in the formation of the ligamentum teres, ligamentum venosum and obliterated hypogastric arteries.

Cardiopulmonary adaptations, which take place at birth, are interdependent. This means that failure to establish respiration and satisfactory tissue oxygenation presents a life threatening situation to the neonate.

Thermo (Heat) Regulation

The neonate leaves a thermo constant environment of 37.1 degrees Celsius, where they have survived for nine months and enters a much cooler atmosphere at delivery. This affects the neonate in various ways.

Firstly, heat regulation in the neonate is poor because of their inefficient heat regulating centre. The subcutaneous fat layer of the neonate is thin and provides poor insulation, allowing the transfer of core heat to the environment and also cooling of the baby’ s blood. In addition to evaporation, further heat will be lost by conduction when the baby is in contact with cold surfaces, by radiation to cold

objects in the environment and by convection
caused by currents of cool air passing over the surface of their body. Incidences of the latter may be substantially increased by air conditioning systems in some of our modern delivery rooms. Since the neonate' s temperature regulating centres are not very efficient, there is a risk of either overheating or chilling.

Other Physiological Changes In a Newborn

In addition to the three physiological changes discussed above there are other changes that occur as described below.

Liver Function

Physiological jaundice is usually seen in 50% of normal neonates from the third to the sixth day of life. This is due to excessive break down of red blood cells resulting from a high haemoglobin level (Hb of 14 - 18mgs/100mls).

The process of breaking down red blood cells leads to formation of bilirubin. The liver is not able to conjugate the excess bilirubin to enable its secretion through the kidneys. This leads to jaundice. You will see more details on conjugation later in this section.

Digestion

The neonate is capable of passing the first stool, known as meconium, within the first two to three days of life. This is because the foetus swallows liquor amnii in utero. Thus, their sucking and swallowing reflexes are usually present at birth.

The colour of the meconium is dark greenish and later changes to a mustard (yellowish) colour. The bowels may be opened three to five times daily.

Weight

The average normal birth weight ranges from 2.5 - 3.5 kilograms. During the first three days of life, the baby loses approximately 10 - 20% of their birth weight but regains it again within one to
two weeks.

What are two possible reasons for weight loss in a newborn?

Your answer should include the following:

- Due to tissue fluid loss during the heat loss when the baby is born
- When the baby opens their bowels, the meconium which was present in the gut is lost, leading to weight reduction

- Poor sucking on the breast due to tiredness incurred during the baby's passage through the birth canal during labour will affect the baby's weight since they are not getting enough fluid intake

Skin

The skin of a newborn is covered with vernix caseosa in utero to protect and help retain heat and also act as a lubricant
during delivery.

The sebaceous glands cease to produce vernix after birth, which may lead to dryness of the skin. The vernix caseosa will peel off within three days of delivery if left alone. There is also plenty of fine hair (lanugo) on the skin which falls off in the first month of life.

Care of a Newborn

Neonatal care is designed to provide an environment conducive to the well being of the baby and to prevent complications.

As a midwife, you should realise that the neonatal period is a very hazardous period. Statistics show that two thirds of infantile deaths occur in the neonatal period. More than half of these deaths occur in the first 48 hours and three quarters in the first week of life.

Therefore, the midwife's responsibility is to minimise these deaths through efficient management of the infant.

Immediate Care of a Newborn (1 of 4)

During the delivery of the baby's head, excess mucus may be wiped gently from the mouth.

Immediately the baby is born, they should be held slanting with the head at a lower angle for a short period to allow drainage of mucus and liquor amnii, which may have been swallowed.

The baby is stimulated to cry in order to take its first breath (refer to the discussion on management in the second stage of labour).

Remember:
Gentle handling while stimulating the baby to cry during delivery is essential. The practice before was to hold baby upside down and vigorously hit the soles of the feet. However, this causes injuries to the internal organs and also means a lot of pressure is applied to the chest cavity because all organs gravitate down when the baby is held upside down.

How to hold a newborn after birth

How not to hold a newborn after birth

The baby is laid across the mother' s abdomen as the cord is clamped, ligated and cut. The timing of the clamping of the cord is not crucial unless asphyxia, prematurity or rhesus incompatibility
is present.

Wrap the baby with a towel and place them in a warm cot with their head to one side. The head should be lower than the body in order for the secretions to drain and not block the airway. Ensure that the baby has an identification wristlet, which should be put on before the baby leaves the delivery couch/bed.

Leave the baby to rest for an hour in order to recuperate from the strain of labour and birth. Frequent observations should be made during this period to ensure that the baby' s respiration is normal, and that they are not bleeding or haemorrhaging from the cord.

The first examination of the newborn is performed after one hour.

Assessment of the newborn is done by scoring at one minute after birth. Repeat at five minutes and then ten minutes. This is known as the APGAR score. Can you remember how to score the baby?

Try to write down four vital signs that are assessed in the APGAR scoring

In 1953, Dr Virginia Apgar designed a chart which gives an index of the infant' s degree of depression (if any) at birth, determining their need for help through five easily observed signs: heart rate, respiratory effort, muscle tone, reflex response, and colour.
These five vital signs are each given a score of 0, 1 or 2 points.

Each vital sign is represented by a letter, forming the word APGAR that is:

A Appearance
P Pulse or apex beat
G Grimace
A Activity
R Respiration

Have a look again at the table from section one, which shows how a score is awarded.

A normal baby has an APGAR score of ten at one minute and ten at five minutes. A score between seven and ten is considered to be normal. Approximately 70% of newborns score seven or better.

Sign	Score 0	Score 1	Score 2
Appearance	Blue, pale	Body pink, extremities bluish	Pink all over
Pulse/heart rate	Absent	< 100/min	> 100/min
Grimace	None	Grimace	Cry
Activity	Limb	Some flexion	Spontaneous movements
Respiration	Absent	Hypoventilation/gasping	Vigorous crying

Remember:
A score at five minutes gives a more accurate prediction regarding survival. A low score at five minutes is, therefore, more serious than a low score at one minute after birth. Notify paediatrician if score is six or below at five minutes.

Subsequent Care (1 of 8)

You need to be familiar with the daily management of a neonate and what nursing activities are undertaken.

Try to list the principles of daily care of a neonate.

The principles of management of the neonate include:

- Maintenance of the established respiration
- Provision of nutrition
- Prevention from infection
- Provision of warmth
- Protection from injury
- Assessment of the progress of the baby
- Education of the mother as to the further care and management of the baby

You will now go through these principles in more detail.

Maintenance of the Established Respiration

A normal baby should continue to breathe and maintain a good skin colour without medical intervention.

A baby who tends to produce a lot of mucus should be closely watched and the airway cleared frequently, because this may tend to interfere with breathing by blocking the airway. The head of the cot should also be lowered in such circumstances. Measures should be taken to avoid suffocation from the pillow, clothes covering the baby or mother lying over the baby.

Provision of Nutrition

Breast feeding is an accepted and ideal means of providing nutrition to a neonate. The neonate should be put on the breast immediately, as long as their condition allows this. Demand feeding (baby led breast feeding) is ideal and should be advocated. Encourage the mother to breast feed exclusively in order to avoid the need for the addition of other fluids. The mother' s milk has adequate water to meet the needs of the infant. Therefore, there is no need to give the baby additional fluids (contrary to the belief of some mothers that babies require water).

To ensure that the baby gets both fore and hind milk, the mother needs to breast feed the baby on one breast until completely empty. This ensures that the baby has all the

nutrients, because foremilk contains proteins and hind milk is high in calories. Bring up wind before offering the second breast to the baby. If the baby is not able to suckle the second one until it is completely empty, then the mother is advised to express milk, in order for fresh milk to be released to the breast. The nipples should be cared for to avoid complications such as sore nipples that will affect the baby's breast feeding.

Provision of Warmth

The baby should be kept at a comfortable temperature. Care should be taken not to overheat the baby, as is sometimes the habit of mothers.

Mothers in the tropics, for instance, often tend to overdress the neonates. Mothers should be taught about appropriate clothing for varied climates. They should dress the baby according to the change of environmental temperature.

Baby wraps should be loose enough to allow for free movement of the legs and arms.

Protection from Injury and Infection

Injuries may be inflicted by the long nails of the mother, midwife, the baby itself, or sharp instruments, for example, the safety pin used to secure nappies. Injuries from falls, scalding and burns are not unusual.

The midwife should instruct the mother on how to handle her baby, and teach her how to wrap napkins without using safety pins.
She should also be instructed to keep her nails short.

Prevention from Infection

Infection, especially cross infection, can be minimised by encouraging mothers to handle their own babies. Anybody in contact with the child should be encouraged to wash their hands before handling the baby.

Visitors should be controlled, especially in a lying in ward.
This helps control infection. Midwives or other attendants with a cold or infections foci, should not work with babies. Babies born at home should be nursed indoors, away from visitors for the first eight days.

Immunisation should be administered to protect the neonate from certain preventable diseases. BCG and oral polio should be given within the first 24hrs after delivery. One of the advantages of breast feeding is that it protects the baby against childhood diseases since the breast milk is rich in immunoglobulins.

The cord is one of the sources of entry for micro-organisms in an infant. The aim of cord care is to prevent haemorrhage, while getting the cord to dry up and separate. To this end, you should check on the cord hourly, because bleeding may occur if the ligature slips off or as the Wharton' s jelly shrinks. This is why a thick cord is more likely to bleed. If there is bleeding, then it should be legated.
The cord should then be observed more closely.

The cord is best left exposed and mothers should be advised not to use any remedies on the cord since it predisposes to infection.
The midwife should discourage mothers from touching the cord.

When the dry cord breaks off, it may leave a raw area. This should be cleaned with spirit and dressed with 1% Gentian violet. Use spirit because it leaves the site dry. Other antiseptics leave the place damp, making it ideal for the multiplication of micro-organisms.

Remember:
If the cord fails to drop off by the sixth day, it may mean that there is an infection.

Skin Care

The neonate' s skin is fragile and easily bruised. Therefore, irritants such as antiseptics, fabric softeners and starch are discouraged.

Creased hard fabrics, stool and urine may interfere with the skin integrity. To prevent damage to the baby' s skin, liquid paraffin preparations may be used because they serve as good cleansers.

Remember:
You should report any abnormalities observed on the umbilical stump such as redness, unpleasant odour or bleeding because these are signs of infection.

Assessment of Baby' s Growth

The midwife should be able to determine that the baby is healthy and thriving. A baby who is healthy and is growing is active, feeds well, is free from infection and gains weight steadily. In order to observe these, it is necessary to examine the baby thoroughly at least once a day during bath time.
The following daily observations should be recorded in order to determine the baby' s health status:

- General appearance and activity
- Exclude any discharge from the eyes and ears which may be an indicator of infection
- The skin should be checked to detect the presence of jaundice, pallor or cyanosis, septic spots or sore buttocks

- Check the mouth to exclude oral thrush
- The umbilical cord should be examined to ensure that it is drying up and is not septic
- Weigh the baby to determine weight gain

Other general care measures include:

- Observations, especially on respiration
- Feeding patterns
- Crying
- Urinary output
- Character of stool

Depending on what is observed, document and report to the doctor if necessary. In this way, abnormalities will be detected and corrective measures taken early enough.

Education of the Mother

This should start during the antenatal period. Emphasis should be laid on the following:

- Personal hygiene and general cleanliness
- How to care for the baby (especially for the primigravidae)
- Exclusive breast feeding
- Attendance of post-natal clinic, family planning and infant welfare clinics

You have now come to the end of the subsection on the normal neonate and how to manage them. This started with immediate care then subsequent care. The health or well being of the neonate depends on how the environment has been modified for its survival.

In the next subsection you will focus on high risk neonates. Some of the conditions you are going to cover include circumstances you may meet in the labour ward, post-natal ward or newborn unit. The neonate may not be sick but it may be at a potential high risk both physically, psychologically and socially.

The High Risk Neonate

In this subsection, you will begin looking at neonates at risk. You will then move on to neonates found in abnormal circumstances, for example, babies born before their due date and those who are abandoned.

Usually, maternal conditions may predispose a neonate to be at high risk of developing the disorders you are about to cover. The high risk groups of neonates require early diagnosis so that the disorders can either be prevented or appropriate measures instituted early enough.

Classification of High Risk Neonates (1 of 7)

Try to list at least five types of high risk neonates due to maternal conditions.

You should have included the following:

- Low birth weight (this category includes babies weighing less than 2500gm regardless of the estimated period of gestation)
- Post term babies
- Diabetic infant
- Rh negative mother (see Jaundice)
- HIV/AIDS positive mother
- VDRL positive mother
- Hepatitis positive mother
- Neonatal sepsis

The Premature Infant (Preterm)

A preterm infant is a baby born before the 37th completed week of gestation.

A high percentage of premature births occur with female births and pregnancies with multiple foetuses. This is most often due to the early over distension of the uterus, which leads to the foetus being born prematurely. Premature births also occur more frequently in low socio economic and illiterate groups in the population, largely as a result of the poor nutritional intake of the pregnant mother. Additionally, they tend to be more common when there is concurrent maternal metabolic or systemic disease, for example, hypertension and renal disease.

Try to list two causes of prematurity.

You should note that in many instances the cause of premature birth is not known. However, some of the causal factors are thought to be:

- Multiple births (twins or more), which causes early distension of the uterus hence early birth
- Hypertension associated with the pregnancy leading to early induction of labour, for example, preeclampsia and eclampsia
- Premature rupture
-
- of membranes due to physical or psychological stress

Prematurity is also associated with:

- Polyhydramnios which causes over distension
- Trauma leading to premature rupture of membranes
- Chronic infections or diseases in the mother, such as syphilis, tuberculosis, chronic nephritis, cardiac disease, diabetes and thyroid disease, may lead to premature labour
- Acute infections in the mother, like pneumonia, influenza, rheumatic fever and malaria could induce premature labour
- Physical stress caused by non obstetric surgery may lead to premature labour if the mother has this procedure while pregnant
- Congenital malformation of the foetus
- Habitual abortion owing to incompetent cervical OS or uterine malformation

You should remember that premature labour can be prevented.

Prevention of Premature Birth

There are a number of things you can do to prevent a premature birth. Can you remember them? Try to recall what you covered in unit two.

State two ways you can prevent premature births.

One way to prevent premature births is to give early and continued prenatal care with stress on dietary and general hygienic education to the expectant mother. This will also ensure immediate treatment of those complications of pregnancy likely to cause, or be associated with, premature labour.

Sometimes it is also possible to postpone or inhibit uterine contractions in some cases of premature labour through the use of certain pharmaceutical agents such as:

- Those that act by preventing the release or synthesis of a known uterine stimulant, for example, prostaglandin inhibitors, non steroidal anti inflammatory drugs like aspirin, endomethacin, declofenac
- Those that act by the direct effect on the myometrial cells, for example, beta adrenergic receptor stimulants like retodrine, fenoterol, salbutamol

Remember that inhibition of preterm labour is contra indicated in the case of certain conditions, where inhibition may compromise the life of the pregnant woman. These conditions include:

- Eclampsia
- Severe preeclampsia
- Antepartum haemorrhage, especially abruptio placentae

- Chronic renal disease
- Severe chronic hypertension
- Advanced cardiac disease
- Foetal distress
- Chorioaminionitis
- Foetal death
- Foetal growth retardation

Remember:
Inhibition of preterm labour should not be considered routine in all cases of suspected premature labour because it may be detrimental to the mother' s or infant' s survival.

Other ways to prevent premature birth include:

- Prolonged bed rest should be encouraged, especially where the mother has any of the conditions that predispose to preterm labour
- Use of sedatives during preterm labour to ensure complete bed rest
- Avoidance of strenuous exercise and calming the mother, because any strain or stress may aggravate preterm labour

Remember that there is still a lot more research to be done on causation of premature labour.

Physical Characteristics of Prematurity

Generally the characteristics depend on the gestational age. The generalised description is that the baby may appear pink or dark red, hands and feet may be cyanosed and may be jaundiced early.

Wakefulness
When the infant is awake, the lower extremities are rarely extended. There may be slow prolonged contraction of the facial muscles, quivering movements or transient smiles. There may also be fine movements of the fingers and toes. These may be confused with convulsions but they are not.

Cry
The cry is feebler than that of a full term infant. In fact, a premature infant usually cries very little, if at all.

Skin and Appendages
The skin is covered by a small amount of vernix caseosa. Lanugo is present on the sides of the face and on the extremities and the back. There is scanty hair on the head and the eyebrows are usually absent. The nipples and areola are inconspicuous. The nails are soft.

Generalised oedema is apparent at birth and later the tissue fluid decreases, leaving the skin loose and wrinkled. Blood vessels can be easily seen under the skin because subcutaneous tissue is thin.

Neck and Thorax
The thorax is cone shaped and the rib cage is weak, owing to immature osseous calcification. Obstruction to the free flow of air causes marked sternal retraction, a rapid heart rate and respiratory noises. Occasionally, cardiac murmurs are heard. A change in position may cause periods of apnoea. Very small infants will not open the mouth to breathe. The nose should therefore be checked for occlusion frequently.

Favourable Prognostic Signs
The premature neonate has a higher chance of survival if:

- Birth weight is more than 1500g
- There is no persistent cyanosis and there is some activity on stimulation
- Gagging and swallowing reflexes are fairly active
- Skin is not wrinkled and subcutaneous fat is present
- Body temperature is stable
- There are no signs of abnormal conditions such as jaundice, pallor and/or sternal retraction

Management of a Premature Baby (1 of 20)

Management of a premature infant

- Avoid depression of the foetal respiratory centre
- Sedatives of opium derivatives should not be used during premature labour
- Shorten the perineal phase during delivery of a preterm baby by performing an episiotomy. As this will reduce the possibility of intracranial injury
- Transfer a woman in premature labour to a well equipped hospital for adequate resuscitation and care of the premature infant

Care of a premature infant
The efficient care of the premature infant is equally important. You should take the following steps:

- Clear the airway using a fine mucus extractor/catheter
- Administer oxygen at 1 litre per minute till respiration is well established and colour is satisfactory
- Put the infant in an incubator or cover with warm towels and transfer to a special baby care unit as soon as practicable

- Ideally infants weighing less than 2 kilograms that have been delivered in a health centre or in the home should be transferred to a well equipped hospital with nursery for baby care

Remember:

Incubators may be lacking in some of the health facilities. The midwife must, therefore, learn to improvise on how to keep the baby warm.

Further management aims of a premature infant

Once immediate steps have been taken to ensure the well being of the premature infant, further management aims at:

- Maintenance of respiration and good colour
- Provision of warmth
- Prevention of infection
- Ensuring good progress and growth
- Educating the mother to take care of her infant
- Ensuring baby gets adequate nutrition

Maintenance of Respiration of the Preterm Baby

You should assist in the establishment of respiration since the respiratory centre in the medulla is immature. The lungs tend to be atelectatic and are not well developed due to inadequate surfactant. The diaphragm and chest muscles are weak, therefore, the baby is constantly asphyxiated. This means that the airway should be repeatedly cleared. The infant should be laid with its head to one side and the foot of the cot should be slightly raised to aid with the drainage of mucus. You should also watch the infant closely for signs of respiratory distress and cyanosis.

Remember:
Respiratory distress can be recognised by the rapid, irregular respiration with periods of apnoea, in-drawing of the chest walls and sternal recession and expiratory grunt with cyanosis of body and face.

Give oxygen in such cases (avoid high concentrations of oxygen) to the premature infant. The recommended dosage is 30 - 40%. Note that prolonged administration of a high concentration of oxygen may lead to the development of fibrous tissue behind the lens, which results in a condition known as retrolental fibroplasia leading to blindness in the newborn.

Provision of Warmth and Maintenance of Body Temperature

The midwife should do her best to ensure that the baby' s temperature is prevented from reaching very low levels. Remember that the heat regulation centre in premature babies is underdeveloped. Small babies weighing less than 1.5 kilograms should ideally be nursed in an incubator with temperature of about 30 degrees Celsius and relative humidity of 65%. If there is no incubator available, they should be nursed in warm towels (which may be warmed with hot water bottles). You can also make an improvised cot out of a wooden box raised off the floor where there are no cots.

> ***Remember:***
> ***Use of cotton wool as a means of keeping infant warm has been condemned, since it deprives the skin of air and there is danger of infection and overheating of infant.***

Loose flannel clothing is recommended for infants nursed in cots (woollen material may cause a skin rash and is also cumbersome). The infant should not be exposed to direct sunlight. If the premature infant can maintain its body temperature at 36 degrees Celsius, its condition is likely to improve and it may be weaned off the incubator.

Feeding

Breast milk is ideal because of its digestibility, nutrients and the immunity it gives to the newborn. The practice of withholding feeds or fluid for 24 hours or more before feeding is
considered unnecessary.

If the stomach content is aspirated before the first feed, regurgitation and inhalation of stomach contents are not likely.
The first feed should be small and ideally given per tube.
Five percent glucose water may be given, which has the advantage of counteracting acidosis and provides fluid and energy.

If the infant can tolerate it expressed breast milk should be offered next. The amount of feeds given depends on the size of the infant and its tolerance levels. However, 10mls is usually offered for the first few feeds. Infection control and prevention measures are highly recommended with regard to handling expressed milk.

Artificial milk, that is half strength cow' s milk, lactogen and so on, may be resorted to only if the mother is in poor condition. The recommended amount is 90mls of milk per kilogram of body weight per day for the first week of life. This is followed by 150mls for the second week and 180 - 210mls per kilogram of body weight during the third week. To avoid over distension of the stomach, vomiting and subsequent

inhalation, small feeds, of greater concentration, are given at one to two hourly intervals.

Remember:
Try always to treat each infant individually and give the amount of milk the individual infant needs, depending on their appetite, tolerance to feeds and general condition.

Method of feeding

The method of feeding is determined by the infant's size, general health and presence of sucking and swallowing reflexes.

Breast feed as soon as the infant's condition allows. Infants of 1.8 kilograms and over, with good sucking and swallowing reflexes, may be spoon fed. In cases where neither of the aforementioned options is possible, naso-gastric tube feeding is preferred because once instituted it can be left for a week before it is changed and carries less risk of bronchial aspiration. The latter is often associated with oro-gastric feeding, especially if the tube is not well pinched when being withdrawn.

Naso-gastric method of feeding

Should you decide to use the naso-gastric method of tube feeding the following points should be taken into consideration:

- A small size polythene tube (polytex) should be used for feeding infants weighing 1500g or less. A rubber catheter FG10 can also be used.
- Although the tubes come in pre-sterilised packets, it is advisable to boil them for a few minutes before use to make them supple and easy to pass.
- The arms of the infant are wrapped and the head of the cot raised.
- The nostrils should be cleared with wet cotton swabs.
- The required length of the tube to be passed is determined by measuring from the bridge of the infant's nose to its sternum. It should be marked before boiling (polytex tubes are already marked).
- When the tube is passed, the stomach contents are aspirated and tested with blue litmus paper. Red discolouration means the tube is in the stomach.
- The aspirate colour and amount should be noted and recorded.

- If the aspirate consists of clear milk it should be returned and the feed decreased by same amount.

- If the aspirate is blood or bile stained discard and replace by equal volume of normal saline in the intravenous fluids.
- The barrel of a syringe is used as a funnel for giving the feeds which should be allowed to flow by gravity and not pushed by a syringe piston.
- The amount of feed the infant has taken is recorded.

- After feeding, the baby is left to rest quietly on their back with the head turned to one side or made to lie on the right side for 15 minutes.

General Feeding Steps to be Taken

The following steps should generally be taken when feeding the baby:

- Cleanliness must be observed. Feeding utensils should be decontaminated and soaked in a solution of jik (1:6) for 10 minutes then dried.
- Wind should be brought up by raising the infant to sitting position or gently rolling them against your hand or rubbing their back with your right hand. Naso-gastric feeding infants do not require this.
- The baby should be put on the right side after feeding with the head of the cot raised to allow any vomited milk to run out of the mouth.
- You should always have an aspirator at hand to remove regurgitated milk from the naso-pharynx.
- Record the actual amount of feed.

Supplements of vitamins A, B, C, D, folic acid and iron are usually given to the premature infant because they have no store of iron, vitamins and mineral salts before birth. Artificial feeds cannot provide all the nutritional needs of an infant.

- Staff in baby care unit should be in good health and have no foci of infection or colds.
- Staff should be meticulous in cleanliness and should be proficient at resuscitation of the baby.
- Frequent hand washing is imperative in a premature baby nursery. Principles of infection prevention should always be practiced (see module one).
- Visitors should not be allowed into the premature unit because they may bring in micro-organisms.
- Only the parents should handle the infant if nursed at home or maternity centre.
- The infant should not be brought out into the open until it can maintain its body temperature.

Prevention of Infection

Preterm infants are very susceptible to infection, therefore:

- In hospital, the parents are only allowed to view their babies through the glass windows of the incubator. The mother should be taught how to handle the baby because her touch is important for development of the mother/baby relationship.
- The nursery must be kept clean. Damp dusting or mopping is preferred to sweeping and dry dusting to minimise spread of micro-organisms.
- Avoid direct draughts in the nursery by keeping the windows shut.
- Infants in lying-in wards or maternity centres must sleep under a net. Infectious babies should be isolated and potentially infected babies should be given prophylactic antibiotics.
- The incubator should be cleaned every day and the water changed and disinfected because an incubator provides an ideal environment for organisms to multiply.

Try to write down at least four observations you need to make to monitor the progress of the premature infant.

1. Respiration of the infant, that is, do they exhibit laboured breathing and periods of apnoea. The respiration rate should be taken and recorded four hourly or more frequently, in case it is unsatisfactory.
2. The temperature should also be recorded four hourly since fever and hypothermia are bad signs. A premature neonate who is progressing should be able to maintain their body temperature.
3. Auscultation of the heart and recording of the heart rate (Apex beat).
4. Observe closely for colour changes like jaundice occurring within 24 - 36 hours of birth. This is a serious occurrence, which must be reported. Other colour changes include cyanosis, pallor and greyness are also significant and should also be reported.
5. Rashes, discharge from the eyes or moist umbilical cord, grey colour and constantly low temperature are usually signs of infection and should also be reported.
6. Note the amount of feed taken by the infant, the method of feeding and any vomiting of feeds.
7. Abdominal distension and oedema of the face, abdomen and legs should be reported if severe.
8. Note if the infant is passing urine well. Absence of urine in the first 24 hours must be reported. Frequent stools also are noted. Loose stools may indicate infection.
9. The neonate should be weighed 12 - 24 hours after birth. Thereafter, weighing is usually done twice weekly because weight gain is usually slow. Weight loss in a premature infant should not alarm the midwife, provided the infant' s general condition is satisfactory and there is no vomiting.
10. The haemoglobin level should be estimated at birth and thereafter on a weekly

basis to exclude anaemia.

11. The general behaviour of the infant with particular attention to its activity should be noted.

Response to Noise

A premature infant responds to noise in a similar way to a mature baby. There is evidence that excessive noise is detrimental to the development of normal hearing and can be stress provoking for the sick baby.

The midwife should, therefore, be aware of these possible deleterious effects and take steps to reduce noise levels where possible. During periods of quietness, it is customary to dim lights. Longer quiet sleep patterns are related to better weight gain.

Education of the Mother

Time and patience are necessary to reorientate the mother, whether she is a primipara or multipara.

The mother may see the infant as a fragile little being and is often scared of handling them. It is necessary to introduce the mother gradually to handling, feeding and general care under supervision before discharge. In some hospitals, the mothers stay in a mother' s home and come up to the premature unit every three hours to feed and nurse their infants under supervision.

Mothers should be allowed to look after infants whose weights are 1.8 kilograms and over. Breast feeding should be encouraged and if the baby is on artificial feeds for any reason, the midwife should ensure that the mother is able to prepare the feeds.

When the baby is ready for discharge, an arrangement should be made for the mother to room in for two to three days to enable her to undertake the 24 hour responsibility of care. It is advisable to discharge the infant when they are 2kg or over, have a constant temperature and are able to feed well.

You should educate the mother on feeding, winding and bathing the baby and how to avoid gastroenteritis and respiratory infections. Immunisation should be given when the child attains a weight of 2 kilograms and should be followed up in a paediatric special clinic until the developmental milestone is passed. The mother should also be encouraged to attend follow up sessions in a child welfare clinic until her child is five years old.

As a health worker, you should be aware, and you should make the mother aware, of the fact that a

premature baby is prone to the following complications:

- Cyanotic attacks
- Cerebral haemorrhage
- Heart failure and pulmonary oedema
- Jaundice
- Anaemia
- Infection
- Poor mental and intellectual development in later years
- Respiratory Distress Syndrome

The baby' s care giver, both in and out of the hospital environment, should maintain constant vigilance for any symptoms of the aforementioned conditions.

Next you will look at the other type of low birth weight infant.

The Small for Gestational Age Infant

The small for gestational age (SGA) infant may be a full term infant who appears small for their age. The clinical appearance of this infant may be of several types. The first type is:

- Low weight for gestational age
- Typically long and thin with apparently disproportionately large head
- With skin that is often dry and peeling and there is abundant palmar and plantar skin creases
- Described as looking like ' worried old men' (it has been suggested that having been starved in utero, they are worried that this pattern is going to continue)
- Active in behaviour, indicating from early age that they are hungry

Despite their low weight for their gestational age, the length of this type of baby is less affected and the occipito frontal head circumference may well be within normal range for a term infant. This group demonstrates an asymmetrical growth pattern.

The second group of infants are apparently small for their gestational age but growth retardation is symmetrical. These are likely to be totally normal infants whose size is consistent with ethnic and genetic expectations, for example, small bodied parents may give birth to small babies.

A third group comprises those whose growth has been stunted in utero by the teratogenic effects of infection, drugs or alcohol abuse. In this group, all parameters such as weight, length and head circumference are compromised. This last group is

likely to present a variety of problems in the neonatal period, due to the effects of these drugs/substances.

In summary, therefore, the main causes of small for gestational age infants includes:

- Maternal diseases such as hypertensive disorders
- Placental transfer of inappropriate substances which have teratogenic effects such as nicotine, alcohol, cocaine or infective agents
- Extremes of maternal age, that is those at either end of the childbearing spectrum, for example, very young or old parent
- Socio-economic factors, including poor nutrition of the mother during pregnancy
- Parity and number of foetuses in utero all impinge on the normal growth pattern

Management of the Small for Gestational Age Infant

Neonatal management is planned to redress the balance or at best minimise the effects of intrauterine deprivation.

Immediate Care
There is no significant difference in management at delivery from that described for the normal infant except perhaps that the small for gestational age infant would be more susceptible to hypothermia. The delivery room should, therefore, be kept warm and the infant dried and wrapped in a warm blanket or wrap.
Nutritional Needs
Since these babies have been starved in utero, as soon as they are born they are very hungry. They suck at the fingers and early and frequent feeding is called for. Since successful initiation and establishing of lactation operates by the law of supply and demand, mothers who are breast feeding may encounter a few problems, where the demand far exceeds the supply. Breast milk is ideal because in the first few days it contains high proteins and immunoglobins that the SGA infant needs. If for reasons beyond the mother' s control, she should have to use formula milk, the child' s caloric requirements should be calculated at a higher rate.

Lack of subcutaneous fat and liver glycogen stores compromise the nutritional reserves of the SGA infant. Feeds are, therefore, calculated at a rate of 90mls/kg/day increasing by 10 - 15ml/kg/day to a maximum of 200ml/kg/day. Blood sugar should be monitored six hourly for 48 hours. Loss of weight is minimal in these infants, who will soon exhibit rapid weight gain.

Temperature Control
The infant has a relatively mature temperature control mechanism but lack of subcutaneous fat makes them more susceptible to hypothermia from fluctuations of the environmental temperature.

A thermal neutral environment should be provided and the infant' s temperature should be monitored regularly.

Skin Care
Particular attention should be paid to those infants with dry, cracked and peeling skin.

Ensure the infant is kept clean and dry to prevent infection. After bathing the infant, apply Vaseline oil to the skin. Encourage the mother to massage her baby, which offers the additional benefits of enhancing the mother
baby relationship.

Complications Associated with the SGA Infant
The following complications are associated with the SGA infant:

- Asphyxia incidence is high but respiratory distress syndrome (RDS) rarely occurs
- Hypoglaceamia may occur due to delayed or low glucose feeds
- Hypothermia is common, especially if the environmental warmth is inadequate
- There is a substantial mortality risk although the rate is lower than in preterm infants

You have finished looking at the first group of high risk neonates. You have seen that they include preterm and small for gestational age infants.

The table below will enable you to make a quick comparison of the characteristics associated with each high risk group.

Preterm	**Small for Gestational Age**
Skin red and shiny, lanugo, plentiful	Skin dry and wrinkled
Skull bones soft, sutures and fontanelles wide	Skull bones firm
Plantar creases not visible	Plantar creases are well defined from toes to heel
Most of the reflexes e.g. swallowing, moro absent	Moro and traction reflexes present
Pinna of ears soft and flat	Pinna of ear has cartilaginous ridges and firm
Born before 37 weeks gestation	Born at term
Eyes always closed	Eyes wide open (worried look)

The Post Term Infant (1 of 10)
You will now look at the characteristics of a post term infant.

Try to list several characteristics of a post term infant.

A post term infant is a baby born after 294 days, that is, 40 weeks of gestation. Accurate dating and calculation of the gestation period is important. The main characteristic features of a post term
infant include:

- Skin is loose, dry and disquamating (peeling off)
- Skull bones are hard and firm
- Small fontanelles and narrow sutures
- Nails are overgrown hence long

This infant is at risk of developing complications because:

- The placenta starts diminishing in its functions and hence the foetus may not get enough nutrients and oxygen. This will lead to asphyxia in utero and passing of meconium which will affect the infant' s life.
- Since the bones of the skull are firm, moulding is not effective and this may lead to a difficult delivery.

In managing the infant, care should be taken to resuscitate the baby first in the same manner as with a preterm infant.

Due to inborn errors of metabolism the post term infant will not thrive, will be irritable, may have changes in stool and will suffer from colic or vomiting with weight loss. Any infant not doing well on the usual formula or breast milk should be evaluated for some type of inborn error of metabolism.

The two common causes of metabolic disorder in newborn post term infants are:

- Hypoglycaemia and Hyperglycaemia
- Hypocalcaemia and Hypercalcaemia

Hypoglycaemia

This is a condition of low blood glucose in the body. Criteria for hypoglycaemia are:

Full term infants - blood sugar < 2.2mmol/l (40mg/dl)
Premature infants - blood sugar < 1.1mmol/l (20mg/dl)

Symptoms of hypoglycaemia in the newborn can be divided into major and minor symptoms. Major symptoms include apnoea, convulsions and coma. Minor symptoms include jitteriness, irritability, tremors, apathy, cyanotic spells and
temperature instability.

Many babies may remain asymptomatic. It is unusual for a newborn with hypoglycaemia to have an autonomic nervous system response with sweating, pallor and tachycardia as occurs in adults. It is, therefore, not possible to confidently

diagnose neonatal hypoglycaemia clinically as the symptoms are so similar to infection.

Remember:
Low blood sugar detected by a stick test (Dextrostix or BM sticks) should be checked by a laboratory blood essay for glucose.

There are several causes of hypoglycaemia. These include:

- Decreased substrate (a substance upon which an enzyme acts) availability, for example, in small for gestational age infants and premature infants
- Increased glucose utilisation, for example, inborn errors of amino acid metabolism, glycogen storage disease, and galactosaemia
- Infants of diabetic mothers and large for gestational age infants are also at risk of developing hypoglycaemia
- Miscellaneous factors like birth asphyxia and endocrine deficiencies in growth hormone and cortisol

The major aim of management is to prevent hypoglycaemia from developing. However, if it does occur, it should be detected early, before symptoms are fully apparent.
The following steps should be taken:

1. Monitor blood glucose frequently depending on previous blood glucose levels.
2. Early and frequent feeding leads to good prognosis in asymptomatic hypoglycaemia. In diabetic infants hypoglycaemia can be prevented.
3. Treatment should be initiated without any delay and plasma glucose level rechecked directly to ensure that the problem is resolved.
4. 10 - 20% dextrose should be administered intravenously and carefully monitored because should it stop suddenly, because of extravasation into the tissues, there is risk of reactive hypoglycaemia.
5. If there is difficulty or delay in starting the infusion, then intramuscular glucagon can be given.

Prognosis

Infants with asymptomatic hypoglycaemia are usually normal at follow up assessment. Some of the babies with major symptoms of hypoglycaemia die or have a severe neurological handicap at follow up. The problems they may have include:

- Mental retardation
- Convulsion
- Spasticity and microcephally

Hyperglycaemia

This is usually defined as blood sugar levels greater than 9 mmol/l at which level glycosuria may occur.

It frequently occurs in an infant who is receiving 10% dextrose infusion or parenteral nutrition. Hyperglycaemia usually responds to decreasing the glucose concentration or the infusion rate. Hyperglycaemia must be considered to be a sign of septicaemia. In management, soluble insulin 0.1 units per kg body weight should be given intravenously and repeated as necessary to keep blood sugar below 9 mmol/l.

Next you will look at other deficiencies closely related to hypoglycaemia and hyperglycaemia.

Hypocalcaemia

This is usually defined as a serum calcium concentration of less than 1.8 mmol/l (7.5mg/dl). The newborn rarely develops symptoms unless the plasma calcium is lower than 1.7 mmol/l. The condition usually occurs within 72 hours of life in the following situations:

- Premature neonates
- Associated with RDS
- Birth asphyxia
- Infants of diabetic mothers
- Neonatal sepsis

The reasons why it occurs are not fully understood but persistent hypocalcaemia is due to hypoparathyroidism.

This is a rare condition and may be inherited in either x-linked or autosomal recessive manner. Late hypocalcaemia is often referred to as neonatal tetany and occurs after the first week of life. In the past it was commonly a result of feeding the infant on unmodified cow’ s milk. Late hypocalcaemia, which is rare, is due to maternal hyperparathyroidism.

Hypocalcaemia can cause tetany, jitteriness and convulsions, as well as seizures, which may be identical to those due to hypoglycaemia or other cerebral causes. Occasionally bradycardia and apnoea may also result from hypocalcaemia.

The condition can be prevented by giving 10% Calcium Gluconate in intravenous infusion to ill infants, who are not taking oral feeds. Observe the infusion site carefully as extravasation may cause severe tissue injury.

Severe and resistant hypocalcaemia such as that which occurs in congenital parathyroidism may require Vitamin D supplementation. Some cases of

hypocalcaemia will not respond to calcium gluconate infusion and require magnesium sulphate.

Prognosis

Most infants recover completely with no adverse neurodevelopmental consequences. Severe dental caries may be seen in the primary dentition of some infants with tetany due to hypocalcaemia. Remember that calcium is essential to the development of bones including teeth.

Hypercalcaemia

This may occur as a complication of calcium overdose. Usually, serum calcium is greater than 2.75mmol/l, which is often due to excessive use of calcium gluconate in intravenous fluid therapy.

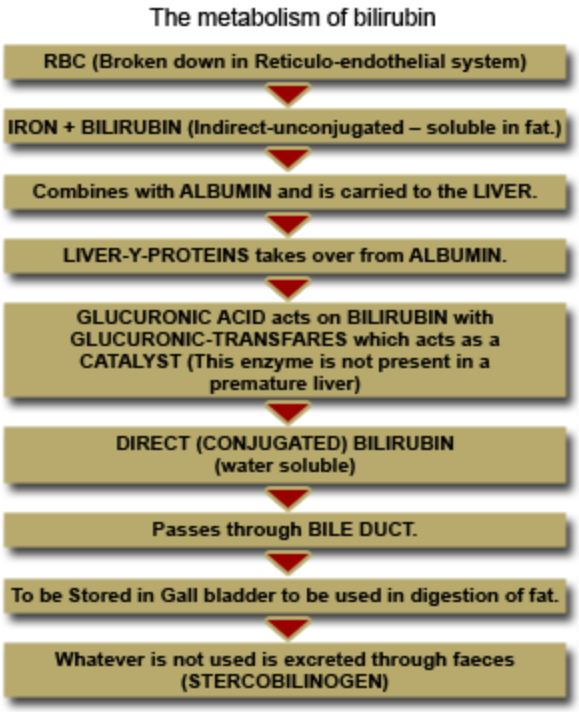
Other causes include:

- Renal failure
- Inappropriate anti-diuretic hormone secretion
- Hyperparathyroidism
- Vitamin D intoxication

Neonatal Jaundice (1 of 20)

This is one of the most common problems encountered by the newborn. Elevated levels of unconjugated bilirubin lead to the most common form of neonatal jaundice. If this passes through the blood brain barrier it can cause permanent brain damage, with chronic disability.

Jaundice is a condition in which there is yellow discolouration of skin, mucus membranes and body fluids occurring during the first 28 days of life due to deposition of bilirubin.



Due to obstructions in the liver, the bile is forced back into circulation. It may also be recirculated if there is a delay in the excretion of stercobilinogen. Bilirubin from the blood circulation is excreted through the kidneys and is called urobilinogen. Obstructive jaundice stool is pale and may occur as early as the second week of life of the infant.

Try to list three causes of neonatal jaundice.

I hope your answer included some of the following causes:

- Physiological changes
- Rhesus incompatibility
- ABO incompatibility
- Infections
- Obstruction in the bile duct or liver

Next you are going to look at the different types of jaundice.

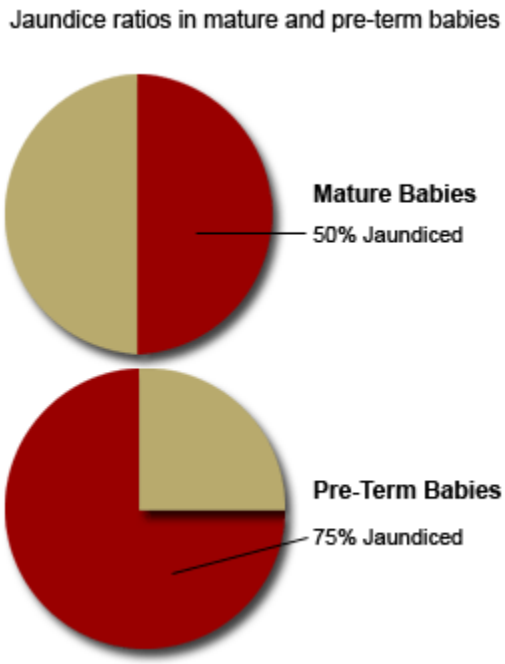
Physiological Jaundice

Jaundice is found in 50% of mature babies, while 75% of pre-term babies are affected.

The condition is common in a newborn especially the preterm, particularly after oxytocin stimulated labour and when breast feeding is initiated (it has been shown that some women excrete a steroid, known as pregnanediol, which inhibits liver conjugation). During foetal life in utero, the Hb is high (14 - 18 mg/100mls). The

excess red blood cells are no longer required by the body after birth and hence are destroyed. The Hb is reduced when the red cells are broken down. However, the liver cells are not mature enough to cope with the breakdown rate and, therefore, there is a high level of bilirubin in the blood.

This condition occurs between the third to sixth day of life and disappears within the seventh to tenth day of life. It may take longer in
premature babies.



Physiological jaundice does not do any harm to the child in the majority of cases. In rare cases, where the jaundice is marked, there may be a little sluggishness or refusal to feed on the part of the infant for some time.

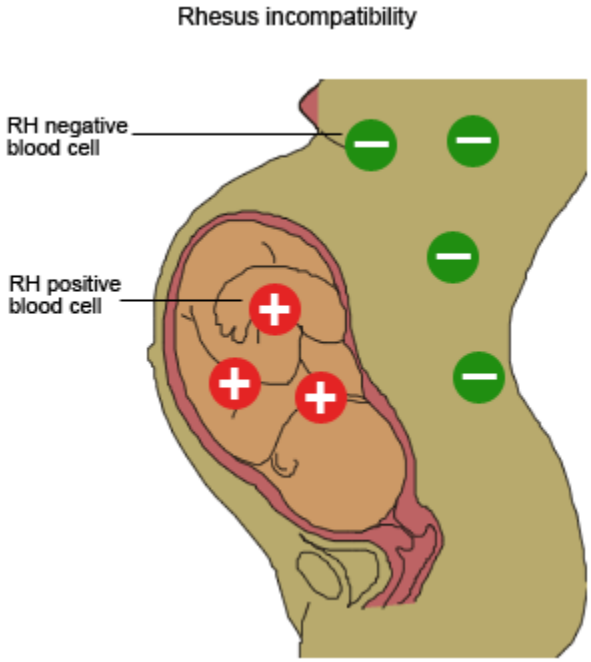
The infant should be given extra fluids with glucose and the mother should be encouraged to breast feed. If the condition persists then further investigations are recommended, although it normally disappears without any treatment.

Jaundice Due to Rhesus Incompatibility

This is also known as haemolytic disease of the newborn. The Rhesus factor is an antigen found in the red blood cells of about 83% of the population. Approximately 17% of the population is said to be rhesus negative. Problems arise if a Rhesus negative mother and a Rhesus positive father have a child who inherits the Rhesus positive traits of the father.

In this case, the child will receive a chromosome with the recessive gene 'd' from the Rhesus negative mother and another with the dominant gene 'D' from the Rhesus

positive father. The later chromosome can be problematic.
The chromosome is foreign to the mother, and should the foetal blood escape into maternal circulation, it will stimulate the formation of antibodies by the mother.



The first born is not usually affected unless the mother had previously undergone an abortion.

During the third stage of labour, when the placenta is being delivered, the maternal and foetal blood mixes, and the mother' s body is sensitised against the baby' s blood. There are antibodies circulating in the mother' s blood due to this sensitisation.

If the mother conceives again and the foetus is Rhesus positive, then the antibodies circulating in the mother' s blood will cross to attack the Rhesus positive genes in the foetus. The blood cells are destroyed, causing anaemia and excess bilirubin in the blood of the baby. The baby will consequently be born with jaundice, known as Kernicterus gravis neonatorum, which is normally seen 12 - 24 hours after delivery. Sometimes the neonate may not appear jaundiced, but the amniotic fluid will be golden and the cord is yellow.

Remember:
The most important gene in Rhesus incompatibility is the dominant D. Persons possessing this gene are commonly termed Rhesus positive. When it is absent from both chromosomes and its place is occupied by the recessive d, the individual is termed negative.

Since early detection may save the infant from developing more serious complications, it is important to understand how the condition presents.
The classic presentation of Kernicterus in a newborn is:

- Progressive development of lethargy
- Rigidity
- Opisthotonus (a form of spasm in which the head and the heels are bent backwards and the body bowed forward)
- High pitched cry
- Fever and convulsions
- In 50% of affected infants, death follows
- At autopsy, there is bilirubin staining and necrosis of neurons, especially in the basal ganglia, hippocampus and subthalmic nuclei

For those infants who do survive, kernicterus will often present with:

- Cerebral palsy
- High frequency deafness
- Mental retardation
- Paralysis of upward gaze (parinaud' s sign) where the baby looks upward permanently

Preterm infants may manifest more serious bilirubin brain damage.
High frequency hearing loss is the commonest feature of the bilirubin encephalopathy syndrome and is most commonly seen in premature infants. Acidosis, asphyxia, prematurity and drugs which compete for bilirubin binding sites, predispose infants to kernicterus possibly by opening the blood brain barrier to bilirubin molecules.

In the most severe form of jaundice, the baby is oedematous, has fluid retention in the body and may have cardiac failure. This baby is not usually saved. The term ' hydrops foetalis' is used to describe this foetus, which is usually a dead macerated infant. The placenta is usually large and oozing a lot of fluid.

Management

The aim of management is to save the unborn baby.

During antenatal care, profile blood is taken for grouping and Hb and the following steps should also be taken:

1. A mother who is Rhesus negative should be closely observed and at 26 - 28 weeks gestation blood is taken for Coomb' s test, which is repeated at 34 - 36 weeks.
2. Antibody titre is estimated. If it continues to rise, then labour is induced.
3. Blood transfusion exchange can be done in utero (this is possible in more developed countries).

Care During Labour

Labour may be induced by the 36th - 37th week. Sedatives and anaesthetic drugs should be given with restraint, since this is a high risk baby. Preparations should be made for blood
exchange transfusion.

Care At Birth

The cord blood is taken immediately at birth for Haemoglobin (Hb) and Coomb's test and serum bilirubin. A bilirubin level of above 4 mg/100mls and Hb of below 14g/100 mls is an indication that a severe haemolytic process has already started. Blood exchange is urgently necessary. Normal bilirubin is 2gm/100ml.

The cord should be cut as soon as possible after birth to prevent further increase of blood from the placenta. The length of the cord should be at least 3 - 4 inches (7.6 - 10.2cm) to facilitate its use for blood exchange transfusion. Wrap the cord with gauze soaked in saline solution to prevent drying. Weigh the baby when it is born as this will guide you in the calculation of dosages of drugs and blood for exchange.

Note the following points, which will guide you on when blood transfusion exchange is needed:

- Bilirubin level rising at the rate of 1mg per hour where the mother is Rhesus negative
- A drop in Hb of 1mg per hour or 13mg or below at birth
- If the bilirubin level is 10mgs, the baby should be put under phototherapy and exchange transfusion should be organised

Early feeding reduces the incidence of jaundice by preventing dehydration and the elevation of free fatty acids. In addition, feeding will overcome bowel stasis, minimise the effects of the enterohepatic bilirubin circulation and increase the excretion of bilirubin.

Exchange Transfusion

The purpose of a blood exchange transfusion is to remove toxic bilirubin in exchange for fresh blood. The main aims of the
procedure are:

- To remove toxic unconjugated bilirubin which has
  already accumulated
- To remove the sensitised red blood cells of the neonate to prevent further haemolysis
- To correct anaemia

- To remove the anti Rhesus antibodies from the neonate' s circulation

The exchange transfusion aims at reducing the levels of bilirubin and correcting anaemia. Please note that the donor' s blood must be compatible with both infant' s and mother' s serum.

The following steps should be followed when preparing for exchange transfusion:

1. Explain the procedure to the parents and get their signed consent.
2. Get the exchange transfusion tray.
3. Prepare the equipment required for exchange transfusion, including fresh blood.
4. Ensure there is an overhead heat source to maintain room temperature at 28 - 32 degrees Celsius.
5. Starve the baby for four hours before the procedure in order to avoid over distension of the abdomen.
6. The baby should be bandaged to an across-splint. A stethoscope for frequent checking of heart rate during the procedure is strapped to the left chest wall of the infant.
7. You should have a thermometer for temperature monitoring.

Exchange Blood Transfusion Technique

Try to describe the role of the midwife during a blood exchange transfusion.

Did you note the following:

- The midwife assists in preparing the equipment, the baby and stays with the baby throughout the procedure.
- The doctor should pass a special polyethylene catheter through the umbilical vein into the inferior vena cava.
- 10mls of blood is withdrawn for assessment of bilirubin, glucose level and haemoglobin before transfusion. If blood glucose is low, it will not be replaced to avoid overloading the circulation.
- The doctor then starts by removing 10 - 20mls of blood.
- This is discarded then replaced with the same amount of compatible Rhesus negative blood through the same catheter.
- The procedure is repeated until the calculated volume has been replaced. About 300mls is exchanged at a time and the entire procedure takes about two hours.

- The amount of blood to be given is calculated according to body weight, that is, 170ml/kg.
- A continuous slow infusion of calcium gluconate may be given concurrently in order to counteract any hypocalcaemia due to the citrate in the stored blood.
- The baby' s condition, that is the heart rate, respiration and umbilical vein pressure (normal 4 - 8cm H_2O), is monitored every 5 - 15 minutes.
- Temperature is also monitored in order to avoid the development of hypothermia or hyperthermia.
- Keep a record of blood injected and withdrawn and any drug administered.
- Report any cyanosis, pallor, tachycardia, rib recession or grunting, twitching, jittery or any abnormal movements by the baby.
- If the baby is restless, calm them by giving a stuffed teat soaked in 5 - 10% dextrose/glucose for baby to suck.
  The whole procedure takes about two hours and at the end, the last syringe of blood removed is preserved for post transfusion test.

Care of the Infant after Transfusion

The infant is placed in a warm cot or incubator and observed closely quarter to half hourly for six to eight hours. Records of respiration and heart rate should be kept. The umbilical cord dressing should be checked frequently for bleeding every half hour for the first few hours, then four hourly.

Blood serum bilirubin levels are estimated four hourly. Capillary blood glucose should also be estimated at four hour intervals.
The infant should be put under phototherapy as soon as the procedure is over because the serum bilirubin level will rebound as antibodies in the tissues return to the circulation and haemolyse further red blood cells.

Remember:
If the baby under phototherapy is passing loose stools, the baby can be removed and treatment given outside the phototherapy room.

If the bilirubin levels rise again instead of falling, two to eight hours after the initial exchange, a second exchange will have to be done. Meanwhile, you should reassure the parents. The rest of the care will be as for newborn infants.

Remember:
The exchange transfusion should be done early, before the serum bilirubin levels have exceeded 16mg/100mls. Once the signs of kernicterus have set in, it is too late to expect perfect results even if the exchange is given.

However, you should note that there are several adverse effects of the blood exchange procedure, which include the following:

Cardiac failure (especially when the exchange is done too fast)

Cardiac arrest (hypoglycaemia due to decreased blood sugar levels)

Air embolism

Perforation of the intestines

Hypocalcaemia due to decreased level of potassium

Prevention of Rhesus Isoimmunisation

Mothers at risk of developing Rhesus isoimmunisation are given an injection of anti D within 72 hours of delivery, especially during the first delivery. Appropriate antenatal care is essential to detect some of these risk factors. The mother should be advised to deliver in a hospital environment.

If kernicterus sets in as a complication, the infant will present with the signs and symptoms that have already been listed earlier.

ABO Incompatibility

Group factor incompatibility is much more common than Rhesus incompatibility but the disease is milder. There is no sensitisation and this occurs if the baby happens to be blood type A or B and the mother is O, which has antibodies for A and B.

Incompatibility happens if the maternal blood enters the foetus' blood and the antibody attacks. It is dependant on the blood type, which has entered the foetal circulation. Treatment is the same as for Rhesus incompatibility.

Mother' s Blood Group	Infant' s Blood Group	Frequency of Incompatibility
O	A or B	Common
A	B or AB	Rare
B	A or AB	Rare

Prevention of Kernicterus in a Jaundiced Baby

The complication of kernicterus in jaundice can be prevented by performing a blood exchange to keep the serum bilirubin level below 20mg/100ml. Phototherapy to the jaundiced infant will prevent a further rise in serum bilirubin, so that kernicterus causing levels are not reached. In some hospitals, albumin is given with exchange blood transfusion in an effort to bind bilirubin with the aim of lessening brain damage. Finally, you should avoid the use of sulphonamides and salicylates in infants.

You have come to the end of this sub section and will now move on to infections affecting neonates.

Neonatal Infections

You will now focus on infections that are passed on from mother to child and those that are derived from the surrounding environment.

Sepsis or septicaemia is the presence of micro-organisms in the blood. Infection is an ever present problem in the newborn and sepsis has always been one of the prime causes of neonatal mortality. Neonates are susceptible to infection for many reasons, for example:

Their polymorphonuclear leukocytes are less efficient in phagocytosis.

The infant receives passive transplacental immuno-globulins from the mother, which protect against common viral infections and some bacterial infections for the first three to six months of life. However, passive immunisation from the mother does not include 1gA, 1gE or 1gM immunoglobins. The level of 1gG is much lower in premature infants.

The inflammatory response is less rapid and extensive than later in life.

The baby is bacteriologically sterile, which results in little competition from existing bacterial flora when they are exposed to pathogens.

The likelihood of infection is increased in the male infant for unexplained reasons.

The preterm and small for gestational age infants are particularly predisposed to infection.

You will now look at the various origins of infections.

Intrauterine (Congenital) Infections

Transplacental infections in the first trimester include toxoplasmosis, rubella and herpes simplex type II. In the second trimester, possible infections include Treponema pallidum and in the third trimester and labour, infections will include herpes zoster, hepatitis B, B-haemolytic streptococcus, Haemophilus influenzae and pneumococcus.

Ascending Infections
These occur after early rupture of the membranes and represent the most common form of intrauterine infection. They are often a result of repeated vaginal

examinations. Causative organisms include the most frequent pathogens like escherichia coli, Klebsiella Pseudomonas, Proteus aureas and Streptococcus feacalis.

All of these are bowel organisms, which may have been introduced when performing vaginal examinations. Other causative organisms include group B haemolytic Streptococcus and group A Streptococcus, and occasionally Staphylococcus aureas.

Intrapartum Infections
These organisms colonise the infant as it passes through the birth canal.

Prolonged rupture of membranes also predisposes the neonate to intrapartum infection. Pathogens include herpes simplex II, Neisseria gonorrhoea, hepatitis B, Chlamydia Trachomatis,
Candida albicans.

Nosocomial Infections (1 of 4)

These are infections acquired in the hospital. They include bacterial infections, like staphylococcus, sallmonella, shigella and anaerobic bacteria as well as viral infections like rotavirus, adenovirus, echovirus, coxsackie. They may also be fungal infections, for example, candida albicans.

Try to list five indicators you would consider in detecting an infection problem in the infant.

First and foremost, you should be vigilant in your observations to help in the early diagnosis and treatment of infection. Highly susceptible infants, who should be observed closely, include:

- Premature neonates
- Babies born following prolonged rupture of membranes
- Babies born following prolonged and difficult labour
- Babies who have undergone prolonged resuscitation
- Babies who have undergone operations for surgical correction of congenital anomalies
- Infants born by mothers with diabetes, toxaemia of pregnancy and chronic anaemia
- Babies whose mothers have active PTB
- Babies delivered in unhygienic surroundings, especially those born before arrival (BBA’ s)
- Bottle fed babies

The presence of one or more of the following signs is very suggestive of infection:

- Refusal to suck
- Vomiting
- Diarrhoea with or without blood or mucus in stools
- Abdominal distension
- Irritability
- Weak or high pitched cry
- Listlessness or lethargy and loss of interest in the surroundings
- Twitching of limbs or generalised convulsions
- Diminution or absence of reflexes especially Moro or startle reflex
- Full fontanelles
- Alteration in rate and rhythm of respiration, especially laboured or grunting
- Nasal discharge
- Small red patches on the skin
- Ecchymoses, that is, large bleeding areas on the skin, frank bleeding from the rectum and mouth
- Presence of rash, especially pustules
- Jaundice
- Cyanotic attacks

Remember:
The temperature may be raised, but a LOW temperature in the presence of an infection is not uncommon in the neonates.

To confirm your diagnosis the following investigations may help:

- Hb estimation
- WBC count
- Urinalysis
- Blood culture
- Lumbar puncture
- Malarial parasites on blood slide

Prevention of Infection

Your role as a midwife is to be observant and create a safe environment that decreases chances of the infant acquiring infections after birth.

- Encouraging and assisting mothers with breast feeding, hence increasing the infant's immune protection.
- Ensuring careful and frequent hand washing by all caretakers. This simple procedure remains the single most important method of preventing the spread of infection in infants.
- Adequate spacing of cots when neonates are in the nursery with other infants.
- Always using individual equipment for each infant.

- Avoiding any irritation or trauma to the infant's skin and mucous membranes, as intact skin provides a barrier
against infection

6. Discouraging visitors who have infections or who have been exposed to communicable disease, from visiting the hospital or home.
7. Isolating infected babies when absolutely essential.
8. Observing for and appropriately treating, any infection in the mother prior to the infant's birth.
9. Giving prophylaxis treatment to an infant born of mothers with infections.
10. Effective health education to the mother on importance of infection control and prevention.

Infants with Perinatal HIV/AIDS Infection (1 of 4)

In this time of high HIV/AIDS prevalence, it is important to cover this issue. Although HIV/AIDS will be discussed in more detail in unit six, it is important to look at it here because infants are often at a high risk of infection.

Although HIV is transmitted in utero, neonates rarely present with AIDS. However, there may be signs of congenital infection, for example, low birth weight, small for gestational age, anaemia, jaundice, thrombocytopenia or hepatomegaly.

Infants may present with the severe infantile form of HIV infection with opportunistic infections, involvement of CNS, as well as evidence of cellular and human immune deficiency within six to nine months. The clinical course may vary, but with time, there is progressive immune dysfunction accompanied by
clinical deterioration.

Non Specific Signs and Symptoms of the HIV Disease

The World Health Organisation's (WHO) clinical case definition for paediatric HIV disease is classified according to major and
minor criteria.

The major criteria include:

- Weight loss or failure to thrive
- Diarrhoea for more than one month
- Fever for more than one month

The major criteria include:

- Weight loss or failure to thrive
- Diarrhoea for more than one month

- Fever for more than one month

Remember:
HIV infection should be suspected in a child with two major and two minor clinical features from the lists above

Management of a Neonate Born to a Mother with HIV

This could include prevention of mother to child transmission (PMTCT) by the use of anti retroviral drugs (nevirapine), which are administered to the mother during labour and to the infant within 72 hours of birth.

However, here you are mainly going to cover nursing care, as medical treatment will be dealt with in unit five of this module.

1. Avoid breaking/bruising the baby' s skin.
2. Wipe the baby dry with particular attention to the face.
3. Feed the baby within half an hour to one hour.
4. Sleep and rest should be adequate. Ensure that medical/surgical procedures are coordinated, so that they do not interfere with the rest and sleep requirements of the infant. All procedures should be done at once to allow the infant to rest.
5. Skin integrity should be maintained. The skin should remain intact, as it is prone to fungal, viral and bacterial infection. Infectious skin conditions will require barrier nursing precautions.
6. Observe the body temperature frequently as this may be elevated where there is an infected skin condition and may be an indicator to the possible development of other infections.
7. Observe both baby and environmental hygiene at all times.

Nutritional Status

The Kenya PMCT Project guidelines on feeding an HIV infected baby state that:

1. Babies should be exclusively breast fed for the first six months of life. There is early evidence that mixed feeding will increase the risk of transmission through breast milk. This is because, with mixed feeding, the delicate gastro intestinal tract is traumatised, creating avenues for the entry of the virus into the breast milk.
2. The infant should preferably be fed on milk only for the first six months. After this, balanced complimentary foods are added to the diet.

3. Respect the mother's choice of infant feeding and encourage the parents to participate in decision making. Decisions made by the parents will be better upheld than the ones imposed on them.
4. The infant may have problems of wasting syndrome, failure to thrive, low birth weight and/or gastroenteritis. The child should have adequate diet in order to maintain body function and growth. If feeds are tolerated, provide the appropriate diet and maintain a record of dietary intake and faecal/vomit output. Measure the infant's weight regularly.

5. The child's fluid and electrolyte balance should be good in order to counteract dehydration due to diarrhoea.
6. Safety is of paramount importance as the immune dysfunction increases the infant's susceptibility to infection. Monitor vital signs to detect early infection. Ensure basic infection control procedures are applied while nursing the infant.
7. Maintain the body temperature because the problem of pyrexia and febrile convulsions is common. Obtain and record temperature four hourly. Use tepid sponge when necessary to reduce fever.
8. The neonate may experience breathing problems due to respiratory infections. Monitor respiration patterns and administer medication or oxygen when necessary. Position the infant for appropriate respiratory efforts.
9. Implement routine immunisation as per the Ministry of Health (MOH) guidelines.
10. Vitamin A supplements should also be given to the infant according to MOH guidelines. However, if the infant is on commercial infant formula, there is no need for additional supplements.
11. The child should be observed for up to five years. Monitor growth closely, that is, monthly in the first year, then every three months in the second year.
12. Continuous care is needed due to the potential for reinfection.
13. Health workers are encouraged to use the integrated management of childhood infection (IMCI) guidelines. These have been shown to improve diagnosis and reduce mortality from common infections in children.

Congenital Syphilis (1 of 2)

Symptoms of Congenital Syphilis

Another mother to child infection transmission is congenital syphilis. This is seen in neonates if maternal infection occurs after the fourth month of gestation. The causative organism is Treponema pallidum, which crosses the placenta barrier.

Classically, the infant at birth is found to have snuffles, skin eruptions and wide spread metaphyseal bony lesions. Interstitial keratitis is a common feature of congenital infection. Other symptoms include:

- Enlarged liver and spleen
- Jaundice
- Deformities of nails
- Alopecia, that is, loss of hair on the head
- Pseudoparalysis

Late congenital syphilis can also involve the central nervous system, bones, teeth and skin.

Management of Congenital Syphilis

Treatment of maternal syphilis in pregnancy prevents infection in the infant.

If the mother is VDRL positive at birth, intravenous or intramuscular antibiotic treatment is commenced immediately on diagnosis and the infant should be isolated for the first 24 hours (see syndromic management in unit six).

Hepatitis B Positive Mother

The Hepatitis B virus (HBV) is a common cause of hepatitis worldwide. It is transmitted by direct contact with blood or body fluids from infected persons.

The main sources of infection for infants are maternal blood during birth and any body secretions including breast milk. Ninety percent of the infected infants will become carriers of the virus who are at risk of developing hepatocellular carcinoma in the future.

Babies Born Before Arrival (BBA) (1 of 2)

You have covered some of the conditions, especially infections in the mother, that put the infant at high risk. There is another category of infants that are at risk. These include infants born before arrival to the health facility and abandoned babies.

You have probably come across infants delivered on the way to the hospital or at home, who have developed some problems. Infants in this category are predisposed to several risks.

Try to list what problems face infants who are delivered on the way to the hospital or at home.

Some of the problems that the infant might be prone to are:

- Infections like pneumonia or tetanus depending on what was used to cut the cord
- Hypothermia if born on the way, without proper baby clothes
- Asphyxia due to inadequate resuscitation

- Injuries due to inexperienced hands conducting the delivery

Management of Babies Born Before Arrival

On admission, take the proper history (both obstetric and mode of delivery). Keep the infant warm. Provide nutrition for the infant.
They should be started on antibiotics for both prophylacsis and for treatment. Check the cord, which may not have been handled properly by the person conducting the delivery. Measure the weight and conduct a first examination to exclude any abnormalities.

Abandoned Infants (1 of 2)

You may also come across infants who are abandoned, either in or outside the hospital.

There are many reasons for individuals to abandon their newborns. These include:

- Economic pressures
- Unwanted pregnancy
- Babies born of incest
- Congenital malformations on the baby
- Sick mother, for example, psychiatric disorders
- Orphans (especially when the mother dies during delivery)
- Other social cultural and religious factors

These infants may not be sick but they may pick up an infection. Basic/preliminary investigations like blood tests for HIV, HBV and/or a full haemogram should be carried out to rule out any infections.

These infants should be cared for like any normal infant, while attempts are made to trace their relatives through a social worker. Arrangements for adoption, fostering or placement in children' s homes should be made as soon as possible.

You have come to the end of the sub section on high-risk neonates. You looked at the various categories of high risk neonates, more particularly low birth weight infants, jaundiced babies and infants affected by different infections. You also looked at the issue of infants born before arrival and those abandoned

Neonatal Emergencies

Neonatal emergencies are conditions or situations that require prompt and accurate action by the midwife. The speed of these actions will often help determine the outcome for the baby. It is usually a matter of life and death and midwife's knowledge, skill and correct attitude go a long way in successful management of the situation.

You will now look at conditions that qualify as emergency situations, for example, asphyxia neonatorum, respiratory distress syndrome (RDS) and haemorrhagic diseases of the newborn among others. For all these conditions active resuscitation is necessary.

This subsection starts by looking at the resuscitation procedure.

Resuscitation of a Newborn (1 of 5)

Resuscitation is an emergency measure taken to sustain life or to revive when life has just ceased. The aim is to establish the heart and lung function following cardio-pulmonary arrest. There are different levels of resuscitation.

First level resuscitation includes wiping of the face and body and flicking the soles of the feet to stimulate the baby.

Second level resuscitation involves:

- Clearing the airways
- Oxygen administration
- Mouth to mouth/bag and mask
- Intubation, that is, intermittent positive pressure ventilation (IPPV)
- Cardiac massage
- Drug administration

The principles of resuscitation of a newborn differ from the general principles of resuscitation. It is easier and better to prepare for resuscitation in the delivery room. Do remember that it is frustrating to start resuscitation and discover that the vital equipment is missing. The following are the essential requirements both in the labour ward and in the newborn unit:

- A source of heat, for example, a radiant warmer or resuscitaire with bed located close to oxygen and suction outlets, but located away from draughts. Air conditioning outlets should also be present.
- At least two resuscitation trays, that is, one drug tray and one for catheters of various uses. The resuscitation and drug tray should include an airway, ambu bag, laryngoscope with blade, endo tracheal tube, suction catheters, needle, syringes, strapping tapes, gloves and cord clamps.
- Warm dry linen, stethoscope, and a wall clock are essential for the procedure.

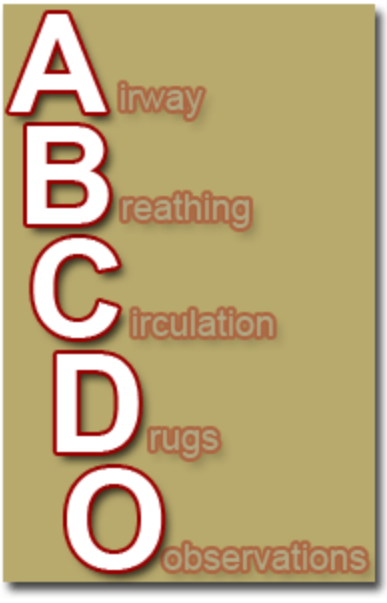
Remember:
All equipment should be in the neonatal sizes.

As previously mentioned, a drug tray is necessary. The drug tray should contain the following items:

- Sodium bicarbonate 8.4% or 7.5% for correction of metabolic acidosis.
- Fifty percent dextrose for correction of hypoglacaemia (survival of the newborn infant correlates with glycogen stores).
- Adrenaline if the heart rate is falling after several minutes of vigorous resuscitative efforts; it may be given directly by cardiac puncture and then external cardiac massage started. This drug is also a vaso-dilator.
- Vitamin K helps in the prevention of bleeding and it is given in cases of prolonged bleeding time in the newborn, for example, haemorrhagic disorders, intracranial injury at birth, to any baby born through difficult labour and is generally recommended for all newborn infants.
- Aminophylline in small doses is given to aid in respiration if distress is present (3mg kg/body weight intravenously). This drug is a vaso-dilator and also stimulates the respiratory centre.
- Lorfan 0.25mg as an antidote to pethidine.
- Calcium gluconate can be administered intravenously and slowly to a baby who displays tetany due to calcium deficiency. It is also a cardiac muscle stabliliser.
- Source of oxygen to be administered after clearing the airway.
- Clean towels/wrappers to keep infant warm during resuscitation.

Principles of Resuscitation

You should be familiar with the ABCDO of resuscitation.



Airway should be cleared either by suction or positioning the infant.

Breathing, that is, establish respiration if not breathing.
Circulation should be noted through pulse, colour of mucus membrane and heart beat. Start cardiac massage if there is no heart beat or pulse.
Drugs (see the section on drugs used).
Observations to make a diagnosis.

Keep the infant comfortable and avoid exposure. At least two skilled persons are required to carry out the resuscitation.

1. In a normal case of vertex presentation, a well accepted practice is to clear the mouth and pharynx with a catheter. Immediately after delivery, the infant should be placed under a radiant warmer or wrapped in warm blankets.
2. The next step will depend on the condition of the neonate. All infants should be dried well to prevent hypothermia.
3. Clear the airway by removing the remaining upper airway secretions.

   Remember:
   Use short sharp sucks to prevent inhalation of mucus during the first gasp to allow the infant to obtain air. Mechanical suction should be gently done.

4. Administer oxygen by using a baby funnel or mask (not closely applied to the face) at two litres per minute. A stream of oxygen directed on the baby' s face will stimulate respiration and provide high oxygen for the baby' s first breaths. This should be applied for a short period.
5. Bagging with oxygen, if properly done, may be the only required form of resuscitation. The infant should lie flat on their back with shoulders slightly elevated and neck slightly extended. Insert the airway above the tongue and place mask around the mouth and nose, making certain that the mask fits tightly and that the neck remains extended during bagging. Rate of bagging should be 40 - 60 per minute. The operator or his assistant should listen to the lungs for heart and breath sounds.
6. In a severely depressed infant, proceed immediately with endo-tracheal intubation and/or umbilical vessel catheterisation.
7. External cardiac massage should be commenced if the heartbeat has not returned after three or four insufflations. This should be performed by an assistant leaving the primary operator free to manage ventilation. The index and middle fingers are placed on the mid thorax at the level of the sternum and the area is pressed downward and released. Total downward displacement of the chest wall should not exceed one inch. This is because excessive vigour may cause ulceration of the liver with severe blood loss.
9. Alternate the two manoeuvres. The heart should be compressed two or three times (approximately 120 times per minute) after which a breath of

oxygen is given. The two procedures must not be performed together (simultaneously).

The 'do nots' of neonatal resuscitation:

1. Hold the baby upside down
2. Perform routine aspiration of the airway
3. Perform gastric suction
4. Use sodium bicarbonate routinely

Asphyxia Neonatorum (1 of 4)

Asphyxia is a very common word. But what does it really mean?

Try to write down your definition of Asphyxia.

There are various definitions that have been suggested. As you read them, see which one is closest to the one you wrote down.

Some of the definitions of asphyxia are:

- Failure to establish respiration at birth
- Depressed APGAR scores of less than 7 at 5 minutes
- A direct result of respiratory dysfunction, whether alteration from utero-placental function or from alterations in the neonate' s ability to breathe independently

Foetal asphyxia can occur any time during gestation but is more common during labour and delivery.

Depression of the central nervous system of the foetus is the most common basic cause for failure to breathe at birth. However there are also maternal and foetal factors.

Try to think of at least three maternal factors, and three foetal factors, that would put an infant at risk of asphyxia.

Maternal factors include:

- Diabetes mellitus
- Isoimmunization
- Infection

- Third trimester bleeding
- Pregnancy induced hypertension or chronic hypertension
- Drug abuse
- Abruptio placenta
- Placenta previa
- Oligohydramnios
- Polyhydramnios
- Preterm labour
- Prolonged second stage of labour

Foetal factors include:

- Multiple gestation
- Congenital anomalies
- Intra uterine growth retardation
- Cord prolapse/cord round the neck
- Prematurity or post-maturity
- Malpresentation
- Prolonged rupture of membranes
- Operative delivery
- Foetal distress
- Meconium stained amniotic fluid

Remember:
The Apgar score gives some indication of the severity of asphyxia but resuscitation should never be delayed. Decision to initiate resuscitation should be based on the evaluation of the infant' s respiration.

The signs of asphyxia will follow what is elicited on the Apgar scoring.
Management of Asphyxia

Immediate care is based on the ABC principles of resuscitation (airway, breathing, circulation) to initiate neonatal physiological adjustment. After active resuscitation continue with the
following care:

- Keep the baby warm, noting colour, muscle tone and respiratory attempts.
- Auscultate the apex beat in order to determine whether the infant is improving or deteriorating.
- Handle the baby as little as possible but observe closely, every two to four hours for vital signs.
- Observe for signs of irritability, twitching, convulsions. If there are any, report without delay.
- Oxygen should be administered if cyanosis is present.
- The airway should be kept clear of mucus by frequent suction if there are any secretions.

- Withhold oral feeds until six to eight hours after resuscitation for baby to recover.
- Give antibiotics for prophylaxis.
- Advise the mother to attend the clinic for regular check up of the infant, because severe asphyxia may result in permanent damage to brain cells and cause mental retardation.

Prevention of Prenatal Asphyxia

Think about what you could do to prevent prenatal asphyxia

- Recognise high risk pregnancies early and take the appropriate action
- Accurately assess gestation when in labour in order to take the relevant precautions
- Assess pulmonary maturity before inducing labour if mother is to be induced
- Intrapartum foetal heart rate monitoring
- Active treatment of foetal distress in utero
- Ensure that a paediatrician, anaesthetist or other trained person is available to resuscitate the infant if necessary
- Assess foetal placental function, for example, ultrasound, foetal movement before delivery
- Discourage maternal use of alcohol and drug abuse
- Avoid use of respiratory depressive drugs during late first stage of labour e.g. pethidine

Respiratory Distress Syndrome (RDS) (1 of 7)
Respiratory Distress Syndrome (RDS) or
Hyaline Membrane Disease

This is a disease of prematurity caused by lack of pulmonary surfactant. The production of surfactant increases with gestational age. Lack of surfactant causes collapse of alveoli with each expiration. Thus, unlike in the normal lung, no residual capacity is established. For an infant with RDS, each breath is like the first, requiring high pressures to reopen collapsed alveoli.

Damage to the alveoli and pulmonary capillary epithelium, secondary to surfactant deficiency, causes the formation of a hyaline membrane consisting of fibrin and sloughed cells.
This further compromises gas exchange. Improvement will be evident in three to five days. Morbidity and mortality vary depending on gestational age.

Predisposing Factors

Try to list four disposing factors to Respiratory Distress Syndrome (RDS).

Did you include some of the following:

- Prematurity
- Infant of a diabetic mother. The neonate could be big, but preterm
- Antepartum haemorrhage
- Second twin, which, if delayed in delivery, may breathe while in utero
- Hypoxia, acidosis, shock
- Male infants are more prone to RDS than female infants for reasons not known
- Possibly Caesarean section neonates (many factors involved)

Clinical signs may occur immediately after birth or after several hours. The infant will present with:

- Grunting first, then cyanosis in room air, tachypnea, pallor, chest retractions and nasal flaring
- Decreased breath sounds and scattered rales
- Vital signs may be altered
- Tachycardia or bradycardia may be observed
- Hypertension and hypothermia
- Infant may become progressively hypotonic and oedema and oliguria also commonly develop within the first 48 hours

An x-ray usually shows the fine reticular pattern often referred to as ‘ ground glass’ . Bronchograms are seen in the lung fields. The severity of the chest x-ray may not correlate well with the clinical severity of the RDS.

Management

If a premature birth is anticipated, administration of steroids (dexamethasone) to the mother 24 hours before delivery may be useful.

Full treatment will include:

- Immediate resuscitation.
- Oxygen therapy, which aims at maintaining the PO_2 within the normal range. This is usually done in mild cases by increasing the inspired oxygen concentration.

- Chest physiotherapy after the second day of life in moderate and severe cases.
- Antibiotics if infection is a possibility.
- Appropriate fluid balance. Intravenous fluids should be given initially.
- Blood pressure monitoring.
- Minimal handling and nursing in the neutral environmental temperature. Infection prevention principles should be practised.
- Surfactant replacement therapy. The two commercially prepared surfactant products that have been approved for use by the Food and Drug Administration (FDA) are Survanta, a modified natural product, and Exosurf, a synthetic product.

Remember:
Dosages and methods of administration vary for the different products but both can be administered through endo-tracheal tube as per manufacturer' s literature. Surfactant replacement reduces mortality by 5 - 12% in treated infants.

Improvement often occurs dramatically in infants with better prognoses. Other infants, usually those of smaller birth weight and lesser gestational age, require longer periods of respiratory assistance through intubation and may fail to improve as expected.

Apnoea

Apnoea is the cessation of respiration for 15 - 20 seconds when cyanosis, bradycardia, hypotonia or metabolic acidosis occur.
It differs from periodic breathing, during which respiration ceases for 5 - 10 seconds without pathophysiological changes.

Periodic breathing is a normal respiration pattern in the preterm infant but should have resolved as full term age is achieved.

Apnoea may occur because of immaturity of the respiratory and neural systems. Any infant who becomes apnoeic should be examined for an underlying cause. It is more likely to develop in premature infants and leads to the ' sudden infant death syndrome' (SIDS).

Management

Infants weighing less than 1750gm or at 34 weeks of gestation are at high risk for apnoeic episodes. They should have their cardiac and respiratory rates, and oxygen saturations monitored continuously for

their first two weeks of life or until five to ten days have passed without any apnoea. Apnoeic infants should also be quickly evaluated for bradycardia and cyanosis.

Immediate gentle tactile stimulation such as rubbing the back or flicking the soles of the feet stimulates respiration in most infants.

A bag and a mask connected to an oxygen source and equipment for suctioning and intubation should be at the bedside and ready for use in mechanical ventilation. A respiratory centre stimulant, for example, theophylline may be used with a loading dose of 5mg/kg/day in divided dose. Caffeine citrate may be used in place of theophylline to treat apnoea in premature neonates.

Anaemia, which is a common cause of apnoea in preterm infants, should be corrected.

Haemorrhagic Disease of the Newborn (HDN) (1 of 4)

This is a bleeding disorder commonly due to a temporary deficiency of the specific clotting factors, factor II (prothrombin), factor VII (proconvertin), factor XI (plasma thromboplastin component) and factor X (thrombokinase).

These factors are proteins, which need vitamin K to convert them into active clotting factors. Vitamin K is poorly transferred across the placenta, which means the foetus has low stores. Any stores are quickly depleted after birth. To enable normal clotting to occur, the baby should receive dietary vitamin K1, absorption of which will require fat and bile salts.

Vitamin K2 is synthesised by the bowel' s normal flora and may also assist in the conversion of the proteins to active clotting factors. Since the neonate' s bowel is sterile, Vitamin K2 production is restricted until colonisation has occurred. Because of deficiency of these active clotting factors babies are susceptible to haemorrhage. The condition may manifest in the following ways:

- Haematemesis
- Melaena stool
- Haematuria
- Umbilical cord bleeding

Bleeding usually occurs within the first four days of life and may be mistaken for the ' swallowed blood syndrome' . Bleeding occurs often in the mucous membranes of the intestinal tract and in the skin, where it is evident as bruises and on puncture sites. With severe bleeding, death can occur if appropriate measures are not undertaken.

Management

Babies who have HDN require careful investigation and monitoring to assess their need for treatment. The diagnosis is confirmed by a prolonged prothrombin time.

Remember:
Presence of streaks of blood in the vomitus or stool of a neonate should put the midwife on the alert.

The following measures should be taken:

- Seek medical care immediately.
- With massive bleeding, act sensibly and quickly. Take blood for investigations as well as grouping and cross matching as you wait for specialised care.
- Disturb the infant as little as possible and keep them warm.
- Treat for shock.
- If there is no doctor immediately available, administer vitamin K 1mg intramuscularly or intravenously to the baby after obtaining blood for investigations.
- Keep all soiled articles for assessment.
- Take blood for grouping and cross matching and prepare for transfusion (whole blood) if in hypovolaemic shock.
- In absence of haematemesis, feed the baby but if haematemesis is present, it is advisable to withhold the feed and give intravenous fluids.
- Maintain close observation for colour, pulse rate and bleeding sites. Note abnormal constituents of stools and vomitus.

Remember:
Prophylactically, Vitamin K 0.5 - 1mg by injection is recommended for all newborn infants.

Birth Trauma and Congenital Abnormalities

In this sub section you are going to look at some of the injuries sustained by the infant during labour or at delivery.

Some of these injuries may occur despite skilled obstetric care. However, in recent years serious birth injuries have become relatively uncommon, a reflection of improvements in perinatal care.

You will need to revise the diagrams on foetal skull as well as the landmarks. You are also going to look at a few of the abnormalities covered in paediatric care.

Birth injuries can be split into the following groups:

- Injuries to the head
- Intracranial injuries
- Peripheral nerve injuries
- Fractures of the long bones
- Organ injuries

The abnormalities include Down’ s syndrome and abnormalities due to substance abuse by the mother during pregnancy.

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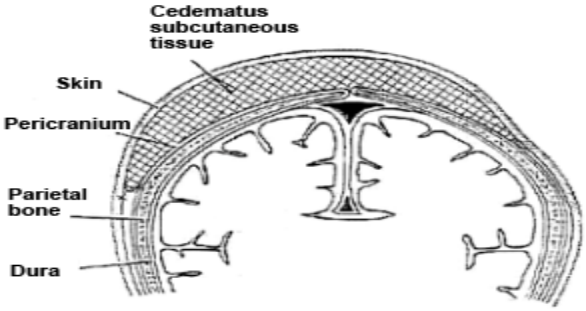
Injuries to the Head

Injuries to the head may vary from minor skin abrasions to severe internal haemorrhage.



Caput Succedaneum

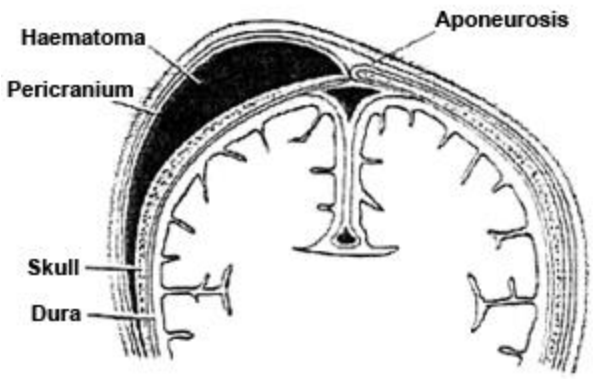
This is characterised by oedema of the subcutaneous layers of the scalp. The oedema lies over the presenting part of the head as it passes through the birth canal. The swelling is maximal at birth and resolves within a few days. A localised caput or chignon may be produced if delivery was aided by vacuum extraction.

Remember:

The swelling is formed by oedema ***of the structures lying superficial to the pericranium. It is not limited to one bone.***

Cephalhematoma

This is sub periosteal haematoma, which most commonly lies over one of the parietal bones Spontaneous absorption occurs, but this may take several weeks. No treatment is necessary.



Skull Fracture
This is rarely seen nowadays. Skull fractures used to occur in a parietal or frontal bone as a result of difficult forceps delivery. However, forceps delivery is now very rarely used. If it does happen, it is best to seek neuro surgical advice about the management.

Intracranial Injuries (1 of 6)

Although traumatic intracranial injuries have become rare, they may occur following difficult instrumental deliveries of infants with malposition or breach deliveries. Preterm infants are particularly vulnerable, due to fragile bones.

Try to think of two causes for intracranial injuries.

Direct causes include the tearing of the intracranial membranes containing blood vessels. The membranes are the falx cerebri, that is, a fold of duramater which dips down between the cerebrum
and cerebellum.

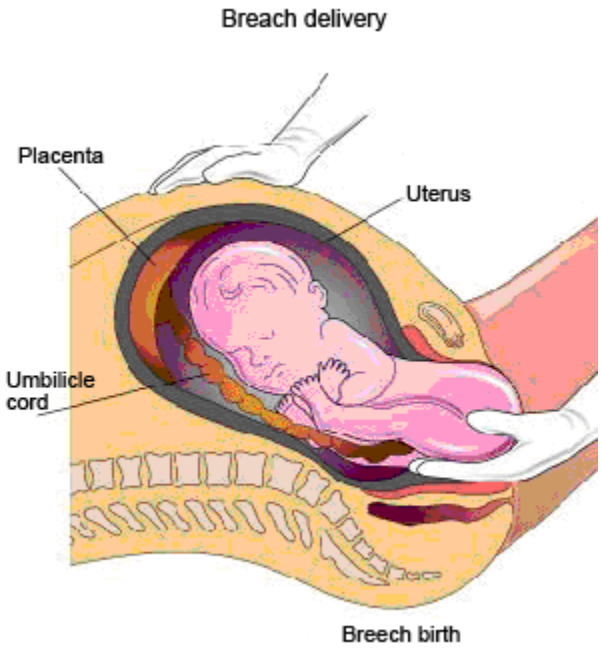
Indirect causes include anoxia leading to venous engorgement on the skull and rapid or an abnormal type of moulding caused by prolonged or obstructed labour or by instrumental delivery.

Infants associated with the following conditions are also prone to intracranial injuries:

- Premature labour
- Face to pubes presentation
- Breech delivery

- Asphyxia neonatorum

Signs of intracranial injury that will be manifested
depend on the severity of the condition. On the other hand, the infant may not show all the signs.



At birth some babies may cry and seem normal, then later show signs of cerebral haemorrhage.

A few infants are born in a state of white asphyxia. They are shocked and lie limply in the cot after responding to resuscitation. The signs include:

- Colour is pale
- Respirations show abnormal variations and the condition of the infant deteriorates with increasing depression of respiratory and other vital functions due to increasing cerebral haemorrhage
- The infant has a high-pitched cry
- In many instances, the condition
  gradually improves

Later signs of cerebral irritation may appear twelve hours after birth and are rarely seen later than the second or third day after delivery. They include:

- An infant who was limp and quiet after birth becomes restless. The child may be heard to utter a high-pitched, shrill or even piercing cry.
- The facial expression is that of an unnaturally wide
  awake baby.

- The brow is wrinkled, showing a deep frown, which increases with disturbance or movement.
- The infant is irritable and cannot tolerate handling, bright lights and sudden noise.
- The degree of muscular twitching or rigidity of the limbs varies. Stiffness of the neck or actual head retraction may be present.
- Sucking and swallowing reflexes are poor, with refusal to feed, or regurgitation during or after feeds.
- Temperature may be subnormal or high.
- Anterior fontanel may be bulging or feel tense on palpation.
- Vomiting, convulsions and sudden phases of intense cyanosis may occur in serious cases.

Periventricular Haemorrhage
This is predominantly a problem of preterm infants. The bleeding is around the ventricle. It is rarely seen in term infants but may accompany trauma and pre-natal hypoxia.

Subdural Haemorrhage
This condition may occur following trauma during the delivery of the preterm infant when there is increased compliance of the skull and a prolonged or precipitous delivery, especially with abnormal presentations. It results from damage to the superficial veins where the great vein of Galen and the inferior sagittal sinus combine to form the straight sinus. It may also result from laceration of the tentorium and falx, particularly at their junction. It is rarely seen in term infants.

Subarachnoid Haemorrhage
This haemorrhage is of venous origin. There is bleeding from the veins within the subarachnoid space, which may follow mild trauma or asphyxia at birth. The condition may be asymptomatic but can present with irritability or seizures during the first few days. Later hydrocephalus may develop.

To diagnose, CSF is uniformly blood stained. A CT scan is also required for diagnosis. Most infants require no treatment and their long term prognosis is good. It is only in rare instances of massive haemorrhage that the prognosis is poor.
Management

Infants born in a state of white asphyxia should be resuscitated and wrapped in warm clothing for transfer to hospital if in a health centre. In long term care, the baby is placed in a room selected for its quietness, warmth and protection from direct light and draughts. Clear the airway of excess mucus and keep the head slightly raised to avoid obstruction of the airway. The baby should be handled gently and quietness maintained where possible.

The type and method of feeding should be made according to the condition and ability of the individual baby. The infant' s temperature should be taken and recorded four hourly and tepid sponging should be done if the baby has pyrexia. The infant' s linen should be changed, and toilet needs met in the cot every three to four hours. Oxygen therapy, may be necessary so keep oxygen at hand.

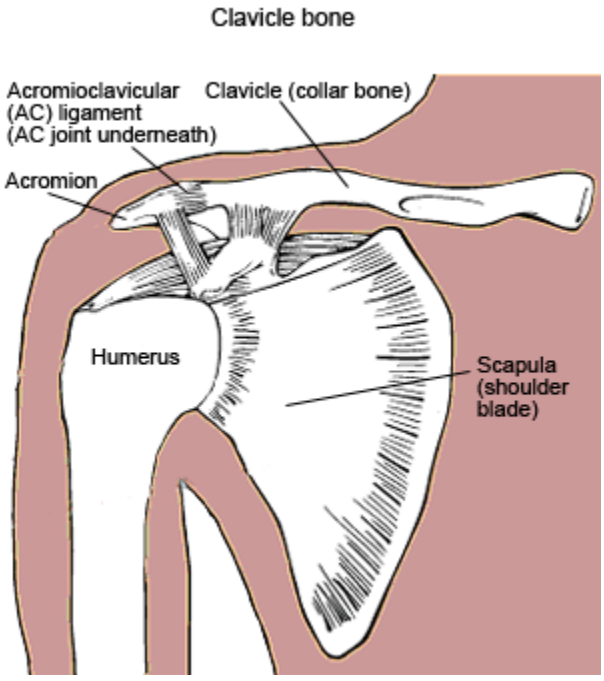
Many of these infants make good progress in the neonatal period, but not until much later is it possible to asses the degree of mental damage which has resulted from the trauma at birth. Therefore, they should be referred to the paediatric clinic for follow up.

Fractures of the Long Bones

These are uncommon nowadays. The clavicle is the bone most frequently broken. Injuries are usually noticed when the infant fails to move one arm as freely as the other because of the pain. Sometimes a lump can be felt over the bone from callus formation.

Other fractures, which can happen although uncommon, are fractures of the femur, usually humorous, during intrauterine manipulations.

Orthopaedic advice should be obtained for their management. Healing is usually rapid and complete.



Peripheral Nerve Injuries

Nerve injuries in the newborn infant may be due to stretching, compression, twisting, hyperextension or separation of the nervous tissue. All these are as a result of complicated labour and delivery.

Facial Nerve

This is damage to the facial nerve by pressure from the tip of the forceps. Palsy can also follow an apparent normal delivery. You will find that, on the affected side, the infant is unable to shut the eye completely. The corner of the mouth drops and the nasal-labia fold is less marked than on the unaffected side. When the infant cries, the mouth is drawn to the normal side. In most cases recovery occurs spontaneously within a few days.

Brachial Nerve Palsy 1

Injury to the brachial plexus may be due to excessive lateral flexion, rotation or traction upon the neck. This usually occurs during a difficult delivery, either from shoulder dystocia or a breech presentation. The clinical picture depends on the nerve roots involved.

If the roots of C5 and C6 are damaged, then Erb' s palsy results (upper brachial plexus injury). The arm lies on the side of the trunk with internal rotation at the shoulder. The elbow is extended, there is pronation of the forearm and flexion at the wrists. Klumpke' s palsy (lower brachial plexus palsy) occurs when the wrist and the finger flexors are affected resulting in a claw hand deformity with wrist drop and limb fingers the upper arm is unaffected. The spinal root C8 and T1 are affected.

However, these injuries are increasingly uncommon, given improvements in reproductive health care. There is no treatment for brachial plexus injuries. However, passive movements of the joints will prevent contractures. Mild injuries recover within a few days, while more severe lesions can be expected to recover spontaneously in two to four months. Occasionally, there is incomplete recovery.

Radial Nerve Injury

This type of injury is rare but may result from fracture of the humerus, especially with difficult delivery of the arm during breech extraction.
The use of the ' deltoid region' as a site for intra-muscular injection (now usually avoided) results in a radial nerve injury, because the deltoid muscle of the newborn infant is so small that correct localisation of the needlepoint is difficult.

Organ Injuries

The following injuries to the internal organs may occur, especially with difficult deliveries like breech extraction:

- Liver and spleen may rupture, especially when there is hepatosplenomegaly (rhesus haemolytic disease,
  diabetic infants)
- Adrenal haemorrhages may occur, but are usually a post mortem finding, being unsuspected in live infants
- Kidneys may rupture during delivery in breech
  preterm infants
- Testicles may be bruised and haemorrhages commonly seen in breech presentation

You might have realised by now that difficult deliveries will lead to complications. That is why there is a need for diligent observation and for early intervention in order to avoid or prevent injury to the newborn infant. You may have realised that there is very little in the form of treatment. Thus, prevention is better than cure.

Congenital Abnormalities (1 of 11)

Congenital abnormalities are structural deformations present
at birth.

Approximately 1.5% of babies are born with congenital abnormalities, especially congenital heart disease, which becomes evident when the baby is older.

A number of malformations are now recognised prenatally from routine ultrasound scanning or prenatal testing of the foetus.

When a baby is born with a defect, the parents are shocked and upset and ask for reasons. Thus, it is important to have an overview of the events that can change the normal pattern of foetal growth and development so that you can counsel the parents.

Most of these defects have unknown causes but are believed to be due to:

- Genetics
- Adverse effects of drugs on the foetus
- Radiation, metabolic disturbances in the mother
- Lack of space for the foetus to grow, for example, oligohydramnios
- Infections affecting the mother

In this section you will only cover chromosome disorders. The other disorders, such as gastrointestinal tract and central nervous system malformation, have been covered in module one. You will also look at the effects of substance abuse in the development of the foetus.

Chromosome Disorders

Every cell in the body contains 46 chromosomes (diploid number) in its nucleus. Forty-four are autosomes (xx or xy). Half (the haploid number) are derived from each parent at the time of fertilisation. During meiosis, the chromosomes separate and align themselves around the centre of the cell and half migrate into each daughter cell. Occasionally, one of the chromosomes does not separate in time (non-disjunction) and stays with its partner in one daughter cell, leaving the other daughter cell with no chromosomes of this type. Sometimes a process known as translocation occurs where part of one chromosome is added to another during the crossover process of meiosis.

Specific chromosomal abnormalities, which have been identified, include:
For the purposes of your study, you will only cover the first one.

Trisomy 21	Down’ s syndrome
Trisomy 14	Patau syndrome
Trisomy 18	Edward’ s syndrome
xo syndrome	Turner syndrome, ovarian dysgenesis
xxy syndrome	Klinefelter syndrome

Down’ s Syndrome (Trisomy 21)

Down’ s syndrome is the commonest chromosomal disorder occurring in 1.4 per 1000 live births. It results from the presence of 47 chromosomes since the infants have three number 21 chromosomes. The majority (95%) are the result of non dysjunction during mitosis. The risk increases with maternal age from 1:350 at 35 years to 1:100 at 40 years and 1:30 at 45 years. Another 3 - 4 percent are due to translocation and are not related to maternal age.

If translocation affects the mother, there is a 20% risk of an affected child. If it affects the father the risk is about 6%. One or two percent are mosaic, that is, with a normal cell line as well as a cell line with an extra 21 chromosome. Chromosome analysis can be done on samples obtained by chorionic villus sampling, or amniocentesis in women at increased risk because of maternal age, or where either parent has a chromosomal translocation.

The characteristics of Down’ s syndrome are numerous and include:

- Eyes which slant upwards and outwards with epicanthic folds slit eyes
- A round face, small mouth with protruding tongue and a shorter upper lip

- Low set ears, flat occiput
- Palpable third fontanelle
- Hands which are short with incurving of the little finger and single transverse palmar crease (simian crease)
- The cleft between the great toe and the others is great.
- Profound hypotonic
- Increased incidence of duodenal atresia and congenital heart disease
- Many affected individuals tend to have a low intelligence quotient (IQ)

The survival of a baby with this disorder depends on associated malformation but survival rates are usually good. In management, a multi professional approach will be needed because these children have many needs to be addressed.

Drug or Substance-Addicted Infants

If a mother abuses drugs during her pregnancy, the infant may be born with withdrawal symptoms, known as Neonatal Abstinence Syndrome (NAS). These drugs include narcotics, alcohol, barbiturates, codeine, benzodiazepines, cocaine and tricyclics antidepressant. The abuse of such drugs is associated with foetal and neonatal deaths, prematurity and intrauterine growth retardation. There is also an increased risk of sudden infant death syndrome (SIDS).

According to Ellwood and others (1987), the risk of SIDS is increased five fold by maternal narcotic addiction. Pregnant drug abusers often have chaotic lifestyles with accompanying social and economic problems. Hence they are at more risk of STIs/HIV and Hepatitis B virus. Therefore, this puts the mother and baby in the risk group.

Neonatal Abstinence Syndrome (NAS)

As mentioned earlier, infants born to drug abusers are born with withdrawal symptoms. You should, therefore, look out for the following signs of withdrawal:

- Tremor, high pitched cry, irritability
- Hyperactivity, hyper tonicity
- Sweating, pyrexia, convulsions
- Sneezing, vomiting, disorganised sucking
- Diarrhoea
- Respiratory distress

In opiate misuse, the symptoms of NAS will generally appear within the first 24 – 48 hours of life, but they have been reported to take up to six days to appear. Methadone and barbiturates abstinence signs may not appear for two weeks and may go up to a period of several weeks or months.

Nursing Care

Infants should be nursed in a quiet environment with reduced light and noise stimulus. Cuddle the baby so that it feels secure and give small frequent feeds for comfort and adequate nutrition. Control convulsions by giving phenobarbitone syrup. Give intravenous fluids
if feeds are not tolerated.

Medical Treatment

This varies in different countries depending on the drug misused and severity of presenting signs. However, the following may be used:

- Narcotics, giving 0.05mg/kg of morphine every 3 - 4 hours, increasing dosage if necessary until the observable signs are controlled (Roberton, 1993).
- In the UK the sedative chlorpromazine is also used starting at 3mg/kg/24 hours in divided doses increasing dose until presenting signs are controlled.

The midwife' s role includes:

- Build up a good working relationship with the mother
- Communication should be clear and
  non judgmental
- Explain the baby' s presenting signs and emphasise that the behaviour is not a rejection of their parents
- Encourage parents to take active part in the care of their baby
- Emphasise the possible effects of breast feeding, which would be harmful especially with cocaine and heroine. Parents should seek advice from pharmacist
  or paediatrician
- On discharge, you should coordinate the follow up and refer to appropriate professionals for rehabilitation

Foetal Alcohol Syndrome (FAS)

It is clear that heavy alcohol use results in the foetal alcohol syndrome. Alcohol also affects brain cells size, resulting into a smaller mass of tissue. FAS is characterised by:

- Intra uterine growth retardation
- Failure to thrive
- Developmental delay and dysmorphic facial features
- It is thought that ethanol (a component of alcohol) disrupts cell differentiation and growth in the foetus and also impairs normal placental function

The infant, therefore, will present with the following:

- Small eyes with exaggerated epicanthic folds
- Shallow or absent philtrum with a poorly formed nasal bridge
- Ears that appear large
- The infant may be fretful and difficult to feed
- Other associated abnormalities of the heart and musculoskeletal system, gut atresia, skin lesions and cleft palate
- Delay in mental and motor development and hence learning and behavioural problems

The midwife's role is to identify women at risk and give effective antenatal education on effects of structural defects that occur during period of organogenesis. It is important for the pregnant woman to know that these defects are irreversible. You should also monitor signs of alcohol withdrawal and prepare for follow up in the community after discharge.

Remember:
Improved nutrition, decreasing cigarette use and abstinence from alcohol greatly improve the foetal brain's chances of growing.

Remember that other drugs/substances such as tobacco, caffeine and cortisones that are abused during pregnancy can also lead to a foetal problem. You should now be able to identify a newborn with Down's syndrome and problems that result from substance abuse and take the appropriate action.