



Federal Democratic Republic of Ethiopia
Ministry of Health

Antenatal Care, Part 1

Blended Learning Module for the
Health Extension Programme



HEAT

Health Education and Training
HEAT in Africa



Federal Democratic Republic of Ethiopia Ministry of Health

The Ethiopian Federal Ministry of Health (FMOH) and the Regional Health Bureaus (RHBs) have developed this innovative Blended Learning Programme in partnership with the HEAT Team from The Open University UK and a range of medical experts and health science specialists within Ethiopia. Together, we are producing 13 Modules to upgrade the theoretical knowledge of the country's 33,000 rural Health Extension Workers to that of Health Extension Practitioners, and to train new entrants to the service. Every student learning from these Modules is supported by a Tutor and a series of Practical Training Mentors who deliver the parallel Practical Skills Training Programme. This blended approach to workplace learning ensures that students achieve all the required theoretical and practical competencies while they continue to provide health services for their communities.

These Blended Learning Modules cover the full range of health promotion, disease prevention, basic management and essential treatment protocols to improve and protect the health of rural communities in Ethiopia. A strong focus is on enabling Ethiopia to meet the Millennium Development Goals to reduce maternal mortality by three-quarters and under-5 child mortality by two-thirds by the year 2015. The Modules cover antenatal care, labour and delivery, postnatal care, the integrated management of newborn and childhood illness, communicable diseases (including HIV/AIDS, malaria, TB, leprosy and other common infectious diseases), family planning, adolescent and youth reproductive health, nutrition and food safety, hygiene and environmental health, non-communicable diseases, health education and community mobilisation, and health planning and professional ethics.

In time, all the Modules will be accessible from the Ethiopian Federal Ministry of Health website at www.moh.gov.et; online versions will also be available to download from the HEAT (Health Education and Training) website at www.open.ac.uk/africa/heat as open educational resources, free to other countries across Africa and anywhere in the world to download and adapt for their own training programmes.

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Introduction to the *Antenatal Care* Module

According to WHO estimates, more than 1,500 women die from pregnancy or childbirth-related complications every day. Annually, about half a million maternal deaths occur worldwide, and most of these deaths are in developing countries. Globally, there is not much improvement in the maternal mortality ratio (MMR, the proportion of women dying due to complications of pregnancy or childbirth), primarily because of the high maternal deaths in less developed countries. The maternal mortality ratio is less than 10 per 100,000 live births in Western countries and above 1,000 per 100,000 live births in very poor countries. As the Ethiopian Demographic and Health Survey reports showed, the maternal mortality ratio was 871 per 100,000 live births in 2000 and 673 per 100,000 live births in 2005 (European calendar). In short, a woman's lifetime risk of maternal death is 1 in 7,300 in developed countries, versus 1 in 75 in less developed countries.

The most common causes (about 80%) of maternal mortality in developing countries (unsafe abortion, haemorrhage, eclampsia, infection and obstructed labour – described in detail either in this Module, or in the next one) are either avoidable or treatable. With that understanding, improving maternal health is one of the eight Millennium Development Goals (MDGs) adopted by the international community at the United Nations Millennium Summit in 2000. The Ethiopian government has expressed its commitment to deliver the MDGs, including improving maternal health and reducing maternal mortality by three-quarters (MDG5), and reducing mortality of children aged under 5 years by two-thirds (MDG4).

To make a difference to maternal and newborn health in developing countries, or anywhere else, health promotion, disease prevention and effective healthcare have to begin even before the occurrence of pregnancy. This helps to evaluate the physiological maturity and psychological readiness of the mother, and also her medical fitness to conceive and carry the pregnancy. As a continuum of preconception care, effective antenatal care is a very crucial aspect of the health service. It can detect established medical problems and reduce the occurrence of some pregnancy-related complications; it gives the opportunity for pregnant women and their families to become familiar with the health facility environment and accept home visits by health professionals, such as the Health Extension Practitioners of Ethiopia; it alerts pregnant women to possible danger signs, so that they are aware of pregnancy and delivery-related problems that may arise later, and thus can make practical and financial preparations for possible emergencies ahead of time.

The goal of antenatal care is to have a healthy mother and healthy baby by monitoring the well-being of both the woman and the fetus during pregnancy, and helping them make a smooth transition to labour and delivery. To achieve this goal, your role of providing optimal antenatal care at the Health Post or in the home is immense. Therefore, understanding the concepts and competencies of antenatal care as recommended in this Module, and taught in your practical skills training programme, is crucial for the better health and survival of the pregnant women and newborns in your catchment area, and for the general wellbeing of Ethiopian mothers and their children.

This Module is formulated to equip you with the basic principles and practice of antenatal care at Health Post and home level. It has 22 Study Sessions divided into two parts. In Part 1, you will learn about antenatal care planning and promotion, the anatomy and physiology of the female reproductive system, physiologic changes during pregnancy, routine assessment of the pregnant woman and fetus, and methods of evaluating and identifying the progress of a normal pregnancy and some common maternal and fetal problems. In Part 2, you will learn what focused antenatal care is, and about counselling pregnant women on staying healthy, eating well at low cost, the danger signs to watch for, pregnancy from the perspective of HIV and prevention of mother-to-child transmission, premature labour, hypertensive disorders of pregnancy, abortion, and late pregnancy bleeding, and other common medical problems in pregnancy. Part 2 ends with the theory of two major practical procedures: setting up pre-referral intravenous therapy for women in shock, and inserting a catheter to drain the bladder of a pregnant woman.

Study Session I Planning Antenatal Care

Introduction

In this study session you will learn about the status of maternal and newborn mortality worldwide, in Africa as a whole, and in Ethiopia specifically, so you can understand the extent of the problems that need to be addressed through improved maternal and newborn health services. **Antenatal care**, the professional healthcare a woman receives throughout her pregnancy, is important in helping to ensure that women and newborn babies survive pregnancy and childbirth. We show you how to plan the antenatal care services that your community needs in order to improve and protect the health of mothers and newborns during pregnancy, childbirth and the postnatal period. You will learn what is meant by the antenatal profile of your community, and how to calculate the number of mothers who are pregnant every year in your catchment area. They will need antenatal care throughout pregnancy, and your expert support during labour, delivery and the postnatal period. You will also be collecting and reporting data on how many antenatal visits each woman receives, and what proportion of births were attended by a health professional.



Learning Outcomes for Study Session I

When you have studied this session, you should be able to:

- 1.1 Define and use correctly all of the key words printed in **bold**. (SAQs 1.1, 1.2 and 1.4)
- 1.2 Compare the extent of maternal and newborn deaths and complications in Ethiopia with the situation globally and in Africa as a whole. (SAQ 1.1)
- 1.3 Know how to estimate the number of pregnant women who will need antenatal care in your community in one year. (SAQ 1.2)
- 1.4 Know how to develop a focused antenatal care plan of four visits to each pregnant woman during a specific period of time in your catchment area. (SAQ 1.3)
- 1.5 Know how to calculate the antenatal care coverage rate, and the proportion of births attended by a health professional, in your catchment area. (SAQ 1.2)
- 1.6 Know how to calculate the maternal mortality ratio (MMR) and the neonatal mortality rate in your catchment area. (SAQ 1.4)

1.1 Maternal and newborn mortality

We begin this study session by describing how many mothers and newborns die as a result of complications of pregnancy or childbirth around the world. The World Health Organization (WHO) set Millennium Development Goals (MDGs) in the year 2000 (1992 in the Ethiopian calendar) to reduce maternal mortality in every country by three-quarters, and the mortality of children under 5 years by two-thirds by the year 2015 (2007 in the Ethiopian calendar). Ethiopia is one of the few countries in the world that is expected to achieve the MDGs for reducing maternal and child deaths. Your role as a health professional is vital in attaining these goals.

All dates in the rest of this Module use the European/US calendar.

1.1.1 Maternal deaths and complications

A **maternal death** (also known as a **maternal mortality**) is defined as the death of a woman while pregnant or within 42 days of termination of pregnancy, irrespective of the duration (length) and the site of pregnancy, from any cause related to, or aggravated by, the pregnancy or its management, but not from accidental or incidental causes (i.e. causes of death not related to the pregnancy). The five major causes of maternal mortality are:

- unsafe abortion
- eclampsia (caused by dangerously high blood pressure during the pregnancy)
- obstructed labour
- postpartum haemorrhage (bleeding after childbirth)
- puerperal sepsis (bloodstream infection after childbirth).

You will learn about each of these causes in detail in later study sessions in this Module. Here we are focusing on how data on maternal deaths are collected and reported, so you can estimate the maternal mortality in your catchment area.

Every year the WHO estimates that worldwide around 536,000 women die from complications of pregnancy and childbirth, and that 99% of them are in developing countries. At least 7 million women who survive childbirth suffer serious long-term health problems, and a further 50 million women suffer some adverse health consequences after childbirth. The overwhelming majority of these complications occur in developing countries (*WHO Report on Progress Towards Achieving the Millennium Development Goals*, published 2009).

Each year in Africa, 30 million women become pregnant, and 18 million give birth at home without skilled care from a trained health professional. As a consequence, every year over 250,000 African women die because of complications related to pregnancy and childbirth, and four million African women have non-fatal complications of pregnancy (Save the Children, USAID, UNFPA, UNICEF, WHO, *Opportunities for Africa's Newborns: Practical Data, Policy and Programmatic Support for Newborn Care in Africa*, 2006).

- What proportion of the worldwide number of maternal deaths occurs in Africa?
- African women account for almost half of the 536,000 women who die every year as a consequence of complications of pregnancy or childbirth.

Maternal mortality ratios (MMRs)

The best way of comparing the extent of maternal deaths in different parts of the world is to calculate the **maternal mortality ratio (MMR)**, which tells you the number of maternal deaths that occur in every 100,000 live births. The MMR is internationally recognised as one of the most important indicators of maternal health and the quality of antenatal, delivery and postnatal care in a country. Later in this study session, we will show you how to calculate the maternal mortality ratio in your catchment area.

The Ethiopian Demographic and Health Surveys (EDHS) of 2000 and 2005 have produced estimates of the maternal mortality ratio for the country as a whole. In 2000, for every 100,000 live births in Ethiopia, 871 mothers died



because of complications of pregnancy or childbirth. By 2005, this number had fallen to 673 per 100,000 live births — well below the average of 900 per 100,000 live births for Africa as a whole, but still one of the highest in the world. In 2008, the global average MMR was 400 maternal deaths per 100,000 live births, and the European average was only 27 per 100,000 live births.

In Ethiopia in 2005, an estimated 3,119,000 million women gave birth. Figure 1.1 shows that 94% of these births occurred at home — mostly in rural communities like yours (EDHS, 2005).

- Calculate the number of maternal mortalities in Ethiopia in 2005, based on the MMR for that year.
- The MMR in 2005 = 673 per 100,000 live births and there were 3,119,000 total births that year. $3,119,000 \div 100,000 = 31.19$. So, in the country as a whole, $31.19 \times 673 = 20,991$ women died as a consequence of complications of pregnancy or childbirth.

Although MMRs give public health policy makers a measurement of the magnitude of the problem of maternal deaths, they cannot inform us about what interventions are needed to save women's lives. Studying this Blended Learning Module and the next two, which are on *Labour and Delivery Care* and *Postnatal Care*, together with the associated practical training for these Modules, will enable you to reduce maternal mortalities in your community.



Figure 1.1 Proportion of home and institutional births in Ethiopia in 2005.

1.1.2 Newborn deaths and complications

A **neonatal death** (also known as a **newborn death**) is defined as a death in the first four weeks of life of a baby who was born alive. Globally, about 3 million newborn deaths occur in the first four weeks of life and there are also 3 million stillbirths. A **stillbirth** is defined as the delivery of a dead baby after the 24th week of pregnancy. Before 24 weeks the loss of the fetus is usually referred to as a **miscarriage**.

Africa accounts for 11% of the world's population, but more than 25% of the world's newborn deaths. Of the 20 countries in the world with the highest risk of neonatal death, 15 of them (75% of the total) are in Africa. Approximately one million African babies are stillborn, of whom at least 300,000 die during labour. A further 1.16 million African babies die in their first four weeks of life, with up to half of these on the first day — and another 3.3 million will die before they reach their fifth birthday. Four million low birth weight babies, and others with neonatal complications survive, but may not reach their full potential (Save the Children, USAID, UNFPA, UNICEF, WHO. *Opportunities for Africa's Newborns: Practical Data, Policy and Programmatic Support for Newborn Care in Africa*, 2006).

Neonatal mortality rates

The **neonatal mortality rate** is the number of deaths in the first four weeks (28 days) of life for every 1,000 babies born alive. This rate is usually referred to as 'neonatal deaths per 1,000 live births'. Neonatal mortality rates have also been calculated by the EDHS. In 2005, the rate was 39 deaths per 1,000 live births. Ethiopia is one of five countries that contribute to half of Africa's newborn deaths. The primary causes of these deaths are infection, asphyxia and preterm birth. Later in this study session, we will show you how to calculate the neonatal mortality rate in your catchment area.

1.1.3 How can maternal and neonatal mortalities be reduced?



The reduction of maternal and neonatal mortality has been globally recognised as one of the World Health Organization's Millennium Development Goals (MDGs), set in the year 2000. By improving maternal health and nutrition during pregnancy through effective antenatal care, ensuring safe and clean delivery, and providing immediate postnatal care, it is estimated we could prevent about 75% of neonatal deaths, more than 50% of deaths in the first year of life, and 99% of maternal deaths. These improvements can be achieved by effective community level interventions, which include effective communication and health education about antenatal care (covered in Study Session 2), the early detection and management of health problems during pregnancy (covered in later study sessions in this Module), and about care during labour, delivery and the postnatal period, and the management of newborn and childhood illness (in the next three Modules).

1.2 Planning for maternal and newborn healthcare in your community

Pregnant women may face many different health problems during pregnancy. Some of these are bleeding, high blood pressure, convulsions, high fever, blurred vision, abdominal pain, breathing difficulties, severe headache, anaemia, diabetes and infections. You will learn about the diagnosis and management of all these health problems in later study sessions in this Module.

To ensure a full understanding of the problems that pregnant women may face during the antenatal period, and the possible solutions, a well planned antenatal care programme is necessary. The content of the programme and the method of approach should be based on the presentation of clear educational messages (as you will see in Study Session 2).

To plan effective maternal and newborn health services, you need to make an assessment of your community and identify the health needs of the population.

- How could you do this?
 - You can carry out this assessment through asking questions or through discussion with community representatives and elderly people who know the persistent patterns of habits, customs, attitudes and values in the community, which are transmitted from generation to generation.

Then you need to identify the problems in relation to maternal and newborn health conditions, and assess the uptake of services. In promotion of maternal and child health services, you should clearly identify any attitudes and conditions which have an influence on the outcomes. For example, in small villages, when a woman has a problem in labour it is very difficult for her to go to a health centre or hospital. Few or no villagers have cars, and even in urban areas most taxi drivers refuse to take a woman in labour to hospital. It is therefore very important for you to have an emergency care plan set up, and to make arrangements for transporting women who need urgent care to treat complications associated with pregnancy or childbirth. You will learn about emergency care planning in Study Session 13.

Finding out what the concerns are in your community is an important first step in identifying and studying the problems in your catchment area, and your next step is to rank them in priority order.

1.2.1 Ranking and prioritising problems to tackle

You should rank the identified problems based on the following criteria:

- Magnitude or extent of the problem (how big is this problem?)
- Severity of the problem (how serious is it in terms of adverse outcomes?)
- Feasibility or practicability (how easy or difficult would it be to tackle this problem?)
- Community concern (is this problem an important concern for the community?)
- Government concern (is it an important concern for the government?).

For example, if there is low antenatal care (ANC) coverage and low latrine coverage in your catchment area, you might set the priority of these two problems, as shown in Table 1.1. The scoring system is from 1 to 5, where 1 is the lowest ranking and 5 is the highest. You decide on the score in each box in the table, based on your knowledge of your community and its needs.

Table 1.1 Example of a priority setting analysis of two identified problems

Identified problem	Magnitude	Severity	Feasibility	Community concern	Government concern	Total (out of 25)
Low ANC coverage	5	5	5	5	5	25
Low latrine coverage	5	4	4	4	4	21

As you can see in Table 1.1, the total score is 25 for low ANC coverage and 21 for low latrine coverage. So, in this example, you would set low ANC coverage as a higher priority problem. When you have identified a high priority problem to tackle in your community, your next steps are listed in Box 1.1.

Box 1.1 Steps in tackling a problem

- Set the objectives (e.g. increase the number of women receiving antenatal care visits)
- Identify the strategies you will use to achieve this (e.g. by organising a health education campaign to promote the benefits of antenatal care — as described in Study Session 2)
- Locate the resources needed for implementation of your plan
- Set the time span for reaching your target
- Continuously monitor and evaluate your progress towards achieving your goals.

1.2.2 Calculating the number of women who need antenatal care services

The first step in assessing the need for antenatal care in your community is to calculate the number of women who are likely to be pregnant in a normal year. These women are sometimes referred to as the **antenatal eligibles** (because they are 'eligible' to receive antenatal care).

A **community profile** describes the size and characteristics of a community, and the main health factors that affect its population. Population statistics, including facts and figures about maternal health and pregnancy in the community and information about how the community functions, are important information for planning and promoting effective antenatal care. But remember that every community is different, so the examples we give in this section may not be the same as you will find in your community.

According to the population statistics for Ethiopia, the number of pregnant women is calculated as 4% of the general population. This percentage will vary to some extent between communities, depending on the number of women of childbearing age in the population. The number of women who are eligible for antenatal care in one year in Ethiopia can be estimated with reasonable accuracy using the 4% figure.

Activity 1.1 Calculating the antenatal eligibles in a community

Imagine that the total number of people in one community is exactly 5,000. Calculate how many pregnant women are likely to be eligible for antenatal care services in this community in one year.

Answer

The total number of pregnant women is calculated as 4% of the 5,000 population. To calculate 4% of 5,000, you multiply 5,000 by 4 and divide the result by 100. A good way to write this down is as follows:

$$\begin{aligned}\text{Number of pregnant women} &= \text{Total number of population} \times \frac{4}{100} \\ &= 5,000 \times \frac{4}{100} \\ &= 200 \text{ pregnant women}\end{aligned}$$

Therefore, this community is expected to have 200 pregnant women in one year, who are eligible for antenatal care, delivery and postnatal care. If you know the number of people in your own community, use the 4% figure to calculate the number of pregnant women who will need your services in one year. Write your calculation in your Study Diary and show it to your Tutor at the next Study Support Meeting.

1.2.3 Calculating the number of focused antenatal care check-ups

Women who have good antenatal care during pregnancy are more likely to have safer births and healthier babies. A more efficient and effective approach to providing antenatal care has been developed in recent years. This new approach is called focused antenatal care (FANC). It is a four visit schedule which is recommended for a pregnant woman without major health problems. The schedule of the four focused antenatal visits is as follows:

First visit	Beyond 16 weeks of pregnancy
Second visit	Between 24–28 weeks
Third visit	Between 30–32 weeks
Fourth visit	Between 36–40 weeks.

You will learn what to do at each of these focused antenatal check-ups in detail in Study Session 13.

- Look back at the answer to Activity 1.1. In that community, how many antenatal visits would you make in one year if you achieved focused antenatal care for every pregnant woman?
- You would make 800 antenatal visits (4 visits to each of the 200 pregnant women).

This calculation illustrates how carefully you will need to plan your antenatal care service, if you are going to visit each pregnant woman four times! If you cannot achieve this total, you should visit every pregnant woman at least once, and record the visit as described in the next section.

1.2.4 Calculating the uptake of antenatal care services

Antenatal care coverage is defined as the proportion of pregnant women attended *at least once* during the current pregnancy by a health professional such as a Health Extension Practitioner, for reasons related to the pregnancy. Calculating the antenatal care ‘first visit’ coverage provides information on the percentage of women who use antenatal care services.

The antenatal care coverage rate (or ANC coverage rate) is calculated as the total number of pregnant women attended at least once during their pregnancy by a health professional for reasons relating to the pregnancy, divided by the total number of expected pregnancies during a given time period (usually one year) in the catchment area. The result is expressed as a percentage by multiplying by 100.

$$\text{Antenatal care coverage rate} = \frac{\text{Number of first antenatal visits}}{\text{Total number of expected pregnancies}} \times 100$$

For example, if the total number of first antenatal visits = 100, and the total number of pregnancies = 200, then the antenatal care coverage in your community will be 50%, calculated as written below:

$$\text{Antenatal care coverage rate} = \frac{100}{200} \times 100 = 50\%$$



- Why do you think the calculation of the antenatal care coverage rate in your community is important?
- It enables you and your supervisor to see whether your efforts to promote the uptake of antenatal care services are successful. For example, if the antenatal care coverage rate was 50% of pregnant women before you began a health promotion campaign to increase uptake of antenatal care services, you could claim your campaign was successful if the uptake rose to 60% or more.

1.2.5 Calculating the proportion of births attended by health professionals

Similarly, successful planning of labour and delivery care services can be evaluated by calculating the percentage of deliveries attended by a health professional, divided by the total number of expected deliveries occurring during a given time period (usually one year) in the catchment area ($\times 100$).

According to the Ethiopian Demographic and Health Survey 2005, only 6% of births in Ethiopia were attended by a **skilled birth attendant** — a person who has been trained in midwifery skills to the level of proficiency necessary to manage normal deliveries and diagnose, manage or refer obstetric complications. She or he must be able to recognise the onset of complications, perform certain essential interventions, start treatment, and supervise the referral of mother and baby for interventions that are beyond their competence, or not possible in their particular setting. Ethiopia has the lowest skilled delivery coverage rate in the world. The percentage of deliveries attended by a skilled birth attendant is calculated as follows:

$$\text{Skilled delivery coverage rate} = \frac{\text{Number of deliveries by a skilled birth attendant}}{\text{Total number of expected deliveries}} \times 100$$

- Calculate the skilled delivery coverage rate if you attended 150 out of 200 births in your catchment area.
- It would be $150/200 \times 100 = 75\%$

Achieving a high delivery coverage rate will help you to reduce maternal and neonatal deaths and complications in your community. In the next two sections, we show you how to calculate these death rates.

1.2.6 Calculating the maternal mortality ratio

The **maternal mortality ratio (MMR)** is defined as the number of maternal deaths in a given year, in a particular area (which can be a whole country, or a region, or a community such as your community), divided by the number of live births in the same year and area. The result is multiplied by 100,000 live births, so that comparisons can be made with other years and other areas.

$$\text{Maternal mortality ratio (MMR)} = \frac{\text{Number of maternal deaths in a given year and area}}{\text{Number of live births in the same year and area}} \times 100,000 \text{ live births}$$

- In Region X in 2002, there were 10 maternal deaths and 10,000 live births. What was the maternal mortality ratio in Region X per 100,000 live births in that year?
 - $$\frac{\text{Number of maternal deaths in Region X in 2002}}{\text{Number of live births in Region X in 2002}} \times 100,000 \text{ live births}$$
- The MMR in Region X in the year 2002 = $\frac{10}{10,000} \times 100,000$
- =100 maternal deaths per 100,000 live births
- How does this MMR compare with the MMR for Ethiopia in 2005?
 - It is very low by comparison with the Ethiopian MMR of 673 maternal deaths per 100,000 live births in that year. If this MMR was achieved across Ethiopia, the Millennium Development Goal of reducing maternal mortality by three-quarters by 2015 would be more than successfully met.

1.2.7 Calculating the neonatal mortality rate

By now, you should be able to work out how to calculate the neonatal mortality rate in your catchment area. Remember that this rate is expressed per 1,000 live births.

Neonatal mortality rate =

$$\frac{\text{Number of neonatal deaths}}{\text{Number of live births in the same year and area}} \times 1,000 \text{ births}$$

In conclusion, this study session has shown you how to plan the number of visits in your antenatal care service, and how to estimate your success every year by calculating how much you have *increased* the antenatal care coverage and delivery coverage rates, and *reduced* the maternal mortality ratio and the neonatal mortality rate in your catchment area. In Study Session 2, we show you some effective methods of promoting good antenatal care in your community through health education, advocacy and social mobilisation.

Summary of Study Session 1

In Study Session 1, you have learned that:

- 1 Every year worldwide, around half a million women die from complications of pregnancy and childbirth, at least 7 million suffer serious long-term health problems, and a further 50 million suffer some adverse consequences. The overwhelming majority of these deaths and complications occur in developing countries, particularly in Africa.
- 2 Globally, about 3 million newborn babies die in the first four weeks of life and there are also 3 million stillbirths. Africa accounts for 11% of the world's population, but 25% of all newborn deaths.
- 3 The maternal mortality ratio (MMR) in Ethiopia in 2005 was 673 per 100,000 live births. The neonatal mortality rate in that year was 39 deaths per 1,000 live births.
- 4 The World Health Organization's Millennium Development Goals (MDGs), set in the year 2000, have set targets to reduce child mortality by two-thirds, and maternal mortality by three-quarters, by 2015.
- 5 Large reductions can be achieved through effective community level communication and health education, and well-planned antenatal, labour,

delivery and postnatal care services, and the integrated management of newborn and childhood illness.

- 6 Assessment of your community, and identification of the health needs of the population, can be carried out through asking questions or through discussion with community representatives and elderly people.
- 7 You can estimate the number of women who are eligible for antenatal care in one year in your catchment area with reasonable accuracy by calculating 4% of the general population of the area.
- 8 You can calculate your antenatal care coverage rate from the total number of pregnant women you attended at least once for reasons relating to their pregnancy, divided by the total number of expected pregnancies in your catchment area in one year ($\times 100\%$).
- 9 You can estimate your delivery coverage rate by calculating the proportion of deliveries you attended, divided by the total number of expected deliveries in your catchment area in one year ($\times 100\%$).
- 10 One way to estimate the effectiveness of your antenatal and delivery care services is to calculate the maternal mortality ratio (MMR) per 100,000 live births, and the neonatal mortality rate per 1,000 live births in your area, to see if they are reducing every year.

Self-Assessment Questions (SAQs) for Study Session 1

Now that you have completed this study session, you can assess how well you have achieved its Learning Outcomes by answering these questions. Write your answers in your Study Diary and discuss them with your Tutor at the next Study Support Meeting. You can check your answers with the Notes on the Self-Assessment Questions at the end of this Module.

SAQ 1.1 (tests Learning Outcome 1.2)

How does the MMR for Ethiopia in 2005 compare with the MMR for Africa, and the world figure? Justify your choice from the list below.

- A It is above the average figure for Africa, and above the average figure for the world.
- B It is below the average figure for Africa, and below the average figure for the world.
- C It is above the average figure for Africa, and below the average figure for the world.
- D It is below the average figure for Africa, and above the average figure for the world.

SAQ 1.2 (tests Learning Outcomes 1.1, 1.3 and 1.5)

Imagine that the total number of people in a catchment area is 10,000, and the total number of first antenatal visits the Health Extension Practitioners (HEPs) made last year was 150.

- (a) Calculate the number of pregnant women who were eligible for antenatal care services in this catchment area last year.
- (b) What was the antenatal care coverage rate achieved by the HEPs last year?

SAQ 1.3 (tests Learning Outcome 1.4)

Assume that the total population of a community is 8,000. How many antenatal visits would the HEPs make in one year if they achieved focused antenatal care for every pregnant woman?

SAQ 1.4 (tests Learning Outcomes 1.1 and 1.6)

Assume that there were 480 maternal deaths, 960 neonatal deaths and 60,000 live births in Region Y in the year 2005.

- (a) Calculate the MMR and the neonatal mortality rate in this region in that year.
- (b) Was Region Y doing better or worse than the national average for maternal and neonatal mortalities in Ethiopia in 2005? Justify your conclusions.

Study Session 2

Promoting Antenatal Care

Introduction

In this study session you will learn the difference between health promotion, health education, health screening and disease prevention, and learn about different methods of communicating health education messages respectfully and compassionately.

You will also learn how to educate and engage individuals, groups, opinion leaders and community members in the promotion and better utilisation of antenatal care services. Exactly the same principles apply to promoting the uptake of health services for labour and delivery, and postnatal care — as you will see in the next two Modules. Finally, we show you the steps in planning health education activities aimed at reducing maternal and newborn mortality by increasing the antenatal care coverage rate. You can apply these same steps to health promotion activities with other aims, for example increasing the uptake of family planning services.



Learning Outcomes for Study Session 2

When you have studied this session, you should be able to:

- 2.1 Define and use correctly all of the key words printed in **bold**. (SAQ 2.1)
- 2.2 Discuss the benefits of promoting the antenatal care service in your community. (SAQ 2.2)
- 2.3 Describe different methods of promoting antenatal care, including through advocacy and social mobilisation, health campaigns, community events, group and individual discussions. (SAQ 2.3)
- 2.4 Describe the steps in organising a health education event to promote the utilisation of antenatal care services in your catchment area. (SAQ 2.3)

2.1 Health promotion

Health promotion refers to any activities that result in better health in a community or a country. It includes the process of enabling people to increase control over, and to improve, their own health, but it moves beyond a focus on individual behaviour towards a wide range of social and environmental interventions that increase health and wellbeing. Health promotion includes any actions of individuals, community organisations, district and regional health bureaus, and governments, aimed at improving the health of their population. For example, building more hospitals and health centres, and training more health workers, is a ‘health promoting’ activity at the national level. So too is ensuring that everyone in the population has access to enough food, shelter and clean water.

Health promotion at the community level includes three types of activities (Figure 2.1). We will begin by looking at examples of each of these in turn.

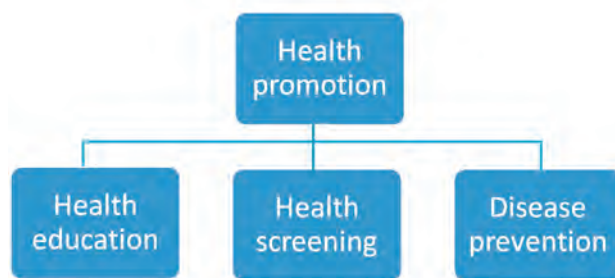


Figure 2.1 Health promotion at the community level includes health education, health screening and disease prevention activities.

Health education is the effective transmission of accurate, useful, health-related information to community members; it enables individuals and groups to develop their knowledge of health issues, and increase their self-reliance and competence to solve their own health problems through their own initiatives. A major determinant of good or ill health is the knowledge people have about health issues, their beliefs, attitudes and behaviour, and their desire to bring about positive behaviour change in their lives.

A key role for you as a health worker is to provide effective health education to the people in your community, so they can discuss their health problems with you and with each other, and make the right decisions to improve their health, and that of their family members, through their own efforts. Hence, health education is a vital tool for moving people to action. If health education is delivered in a well-planned and coordinated programme, with full community support and participation, there is no better way to encourage positive health behaviours and resolve or prevent many common health problems.

- What is behaviour and from where does it originate?
- Behaviour is what people do or practise in their daily lives. It originates from our daily living, and from our surroundings and the experiences we have accumulated, informed by our beliefs, culture, tradition and habits.

Positive health behaviour is any action of an individual that results in improvement in his or her health, or in the health of others in the community.

- Can you suggest some examples of positive health behaviour?
- You may have thought of examples such as eating a balanced diet, taking enough exercise, getting enough sleep at night, and avoiding health-damaging behaviours such as smoking tobacco, drinking a lot of alcohol, or having unsafe sex without using a condom.



The second box in Figure 2.1 refers to **health screening** — the routine testing of individuals to see if they are at risk of developing a health problem. Health screening is an important health promotion activity that you will conduct as part of your antenatal care service. For example, you will take the temperature, blood pressure and pulse of every pregnant woman at every antenatal visit (we show you how to do this in Study Session 9) to see if she may be developing a health problem that could harm her or her baby.

The last box in Figure 2.1 refers to **disease prevention**, which means any action taken to prevent a disease from developing. For example, giving pregnant women iron supplements as a routine part of antenatal care is an action to prevent the development of **anaemia** — a condition in which the body makes too few red blood cells because the woman's diet does not contain enough iron. (You will learn about the detection and treatment of anaemia in Study Sessions 9 and 18 of this Module.)

You can see from the above discussion that health promotion includes a wide-ranging set of activities. In later study sessions in this Module, you will learn a lot about the specific health education, health screening and disease prevention activities that contribute to the antenatal care of pregnant women in your community. In this study session, we will focus on the general principles of health education as a key aspect of health promotion in antenatal care.

2.2 Educating your community about antenatal care

Health education enables people to understand and analyse their health problems, and it motivates and leads them in the right direction to effect the desired change. In the context of antenatal care, it helps to educate, motivate and encourage pregnant women to use the service by providing information that helps them to make informed decisions. Moreover, it advocates greater acceptance and uptake of antenatal care by educating the whole community. The result is that everyone understands that the overall benefits of antenatal care are the promotion of maternal and newborn health, and the prevention of common diseases and complications during pregnancy, labour, delivery and the postnatal period. Effective antenatal care helps to detect complications early, and it leads to swift management, including referral to a higher health facility when necessary. It encourages people to make preparations for possible emergencies during pregnancy and childbirth, and it brings about a sustained reduction in maternal and newborn deaths and complications.

Your role is to ensure community awareness of the antenatal care services you provide for pregnant women, and to inform women, their families and community members about the danger signs, and where to seek emergency care. (You will learn about the danger signs in later study sessions.) You need to ensure that everyone in the community is aware of the need to plan in advance for emergency transportation, should the need arise.

You will certainly save lives, even though the overall health of those around you is not in your hands alone. This is because people decide for themselves how to use your advice, and what choices to make about their own health and that of other family members. By teaching and sharing information, you can help people to make their own choices more wisely. Your first task is to educate your community and promote positive health behaviour.

An antenatal care visit is a good opportunity to promote dialogue with your clients, and reinforce positive health messages. Therefore, you need to encourage women to come for the first antenatal visit early in pregnancy. In the next part of this study session, you will learn about the best methods for achieving this aim.

2.3 Methods of communicating health messages

2.3.1 Two-way communication



To promote improved utilisation of antenatal care services, good communication plays a key role. **Communication methods** are all the ways in which people exchange ideas, feelings and information, including through conversation, print media such as books and leaflets, posters, radio, television, and increasingly through the internet, where facilities allow. Effective health education involves a two-way dialogue.

- What do you understand by **two-way communication**?
- It occurs when information is exchanged between at least two people through participation and discussion.

Two-way communication is the best method to promote health education messages to individuals or groups. There should be a free flow of communication between all participants. Remember, your ears are two of your most important tools! This is particularly important in health education because it enables you to get useful feedback from everyone, and to understand their concerns and resolve them through discussion.

- Where and when can the health education of pregnant women happen?
- It can happen anywhere and anytime. For example, during an antenatal check-up, while you are asking questions and listening to the woman's answers, you can discuss the issues that are important to her. At the market, at a community gathering (Figure 2.2), or anytime you meet with pregnant women, or their husbands, you have the chance to discuss the benefits of antenatal care.



Figure 2.2 Community gatherings are good times to get positive health messages across; involve men as well as women in discussing the benefits of antenatal care.

2.3.2 Choose communication methods to suit your audience

Health promotion is not a one-time affair. It is a continuing process, based on planned and organised activities. It addresses different community members and uses different communication methods as appropriate; it is not limited to a specific audience and one method only. Health promotion involves active and full participation of the whole community, and is based on the reality of the area's culture, traditions, language and local resources. People learn differently, and everyone learns better when they learn the same thing in different ways. After you talk with individuals or groups about the benefits of

antenatal care, they will share their experience with others in the community, so they also become agents of positive change.

2.3.3 Advocacy and community mobilisation

Advocacy is speaking up for, or acting on behalf of, yourself or another person. **Community mobilisation** refers to a broad scale movement to engage people's participation in achieving a specific goal through self-reliant efforts. Advocacy and community mobilisation will help you to gain and sustain the involvement of a broad range of influential individuals, groups and sectors at different levels in the community, who will support the antenatal care programme.

These strategies are covered in detail in the [Module on Health Education, Advocacy and Community Mobilisation](#).

If you are successful in educating advocates to speak up for antenatal care, and in mobilising broad scale support for the service, the outcomes can include:

- Improving access to antenatal services for pregnant women, and its acceptance in the community
- Providing forums for discussion and coordination of the antenatal care service
- Mobilisation of community resources, such as transportation, outreach and emergency funding for pregnant and labouring women with complications that require urgent medical attention.

Opinion leaders as advocates of antenatal care

Engaging the support of advocates who are 'opinion leaders' or 'key persons' in your locality is an important task. Well-known and respected elders, traditional or religious leaders, and 'wise persons' whose advice and words are accepted in the community, can convince others of the benefits of the antenatal care service by exerting social pressure. The tendency of community members to agree with them is important in conveying your health messages and getting acceptance from others.

You can use these community-honoured leaders to communicate positive messages about antenatal care if you give them the right information, and you are ready to use them as advocates. Advocacy by respected leaders can make sure people maintain the positive behaviour changes you have brought about through health education.

Try to get the maximum number of people involved in the promotion of antenatal care, so that the community will really strengthen its support for pregnant women's health (Figure 2.3).



Figure 2.3 Community mobilisation to support antenatal care involves the whole community, since a pregnant woman's health can be protected or hurt by everyone.

Men as advocates of antenatal care

- Do men have a role in antenatal care?
 - Yes! Their involvement is very important, because men can influence whether pregnant women in their family attend antenatal care check-ups regularly, and follow your health advice.



As much as possible, encourage men to be partners in improving women's health. Husbands, fathers, sons, community leaders, spiritual leaders, bosses and other men all play a role in how healthy women will be in relation to pregnancy, labour and delivery. If the men of the community feel responsible for the health of women, the whole community will benefit. So help men to be involved in the promotion of antenatal care.

Build on the roles and skills that men already have. For example, in many communities men are seen as protectors. Help men learn how to protect the health of women. Encourage men to share the responsibilities of pregnancy and parenting. Men can care for children in the same ways that women do — comforting, bathing, feeding, teaching, and playing with them. Invite women and men to community meetings, and encourage women to speak up. Sometimes women feel reluctant to speak about pregnancy and birth issues in front of men.

Work with men who are sympathetic to women's needs. They can talk to other men who may listen more closely to a man than to a woman. When you discuss antenatal care with them, try to give practical suggestions. Men who care very much about the health of women in their lives may not know where to start. For example:

- Explain to a man that his pregnant wife needs help with her daily work (see Figure 2.4).
- Encourage the couple to make a birth plan together, and to be aware of the danger signs during pregnancy, childbirth, and after birth. Advise them to save some money in case of an emergency, and make arrangements for transport if she has to go to a health centre or hospital.
- Make sure the man knows he must send for you when his wife goes into labour (if her pregnancy has been normal and she has no danger signs), so you can be there for the delivery.
- Make sure he knows where to take his wife for emergency care at a health facility if complications occur.
- Show him how a husband supports his wife during labour, for example how and where to rub her back to relieve her pain.
- Tell men how they can get tested and treated for sexually transmitted infections. If only a woman is treated, she will quickly be infected again by her partner.



Figure 2.4 Women need extra help with their work during pregnancy.

2.3.4 Organising a health campaign

Health campaigns promote health knowledge, skills, attitudes and values on a particular health issue. They may also be used to accomplish a particular community improvement project. The actual community activities of a campaign often take place during only one week or one month. For this reason, campaigns are often called 'Health Weeks'.

A health campaign to promote the uptake of antenatal care could be organised around one issue or problem that has been identified by community members

themselves. For example, publicising the benefits of antenatal care services for pregnant women would be a priority campaign in a community where the antenatal care coverage rate was low. If there is a health committee in the community, it should be active in identifying issues for health campaigns, and planning the action to be taken.

Health campaigns can also be conducted at a national level. For example, Ethiopia conducted a campaign called ‘Safe Motherhood Month’ in January 2010. The focus of the campaign was ‘No mother should die while giving birth’ (Figure 2.5).

The problem identified was high maternal deaths and complications related to pregnancy and childbirth. At the same time, there was low uptake of maternal health services, such as antenatal care, skilled birth attendance and family planning. Throughout the whole month, advocacy and social mobilisation campaigns were conducted using different communication media, including posters, television broadcasts and radio. There were panel discussions with stakeholders, religious leaders, parliamentarians, and so on, about the magnitude of the maternal health problem and sharing best practice on service provision. Campaigns on family planning and HIV counselling and testing also took place during the month.



Figure 2.5 The campaign logo of Ethiopia’s ‘Safe Motherhood Month’ in January 2010.

2.3.5 Special community events

Every community has festivals, celebrations and ceremonies, e.g. to mark special seasons of the year, such as planting time, the harvest and the New Year; there are many religious festivals and days in remembrance of national occasions and heroes. Some events are a time for enjoyment and relaxation, such as the coffee ceremony. Others call for serious thinking and quiet devotion. People celebrate in different ways, according to the culture and norm of the community. Whatever the purpose of the ceremony or festival may be, the whole community usually participates. All these events can be useful occasions to disseminate information on antenatal care and conduct activities that promote maternal and newborn health.

2.3.6 Group discussions

Group discussion is the most commonly employed method of health education. It involves the free flow of communication between a facilitator and two or more participants (Figure 2.6).



Figure 2.6 Group discussions create a forum for exchanging experiences.

The advantages of group discussion as a method of health promotion are that it:

- Encourages equal participation from all members
- Increases motivation to act on the health education message
- Helps participants to synthesise knowledge, new ideas and skills
- Creates a supportive forum for learning and exchanging experiences
- Promotes collective thinking to identify and solve problems by pooling ideas and expertise.

Group discussions are extremely useful as a method of health education if they have a shared goal, and collective planning and implementation of subsequent actions. Box 2.1 gives some steps for facilitating an effective discussion group.

Box 2.1 Steps for effective group discussions

- 1 Better results are achieved if it is a small group. If the group is too large, the level of participation of each person will be low. Organise the group to enable full participation of all members.
- 2 Begin your presentation with a clear starting point, an introduction, the general and specific objectives, and some useful discussion points to get the conversation going.
- 3 Ensure that the discussion is purposeful, i.e. the discussion points are relevant and clear, people don't interrupt each other, and they keep to the agreed topic.
- 4 The effectiveness of group discussions may be enriched or weakened by differences in the participants' backgrounds, e.g. in their cultures, geographical area, social and economic status, sex and age group. These differences can have a positive or negative influence on the outcome of the discussion, and you should be aware of this.
- 5 Your role as facilitator is to motivate and encourage the participants to exchange ideas freely and reach a common decision.
- 6 Conclude the discussion by summarising the outcomes, agreeing on next steps, and thanking everyone for their participation.

2.3.7 Individual health education

Individual health education occurs when you exchange ideas and information with one other person. It is more forceful than any other communication method. It will help you to create mutual understanding with the other person and get to know each other more closely. It promotes frankness between participants and enables them to exchange ideas and give and receive feedback immediately. It also creates the opportunity to discuss problems which are sensitive and need special handling, as is often the case in pregnancy. In individual communication, it is essential to start by building a good relationship. Box 2.2 gives some steps to help you do this.

Box 2.2 Steps for effective individual communication

- 1 Greet the other person warmly, in a friendly way.
- 2 Then create a good learning environment by making the person feel comfortable and relaxed.
- 3 Your message has to be clear, simple and understandable to avoid any confusion.
- 4 Use appropriate visual aids if this is helpful.
- 5 Encourage participation of the individual by asking him or her to express views on the topic, raise issues and ask questions.
- 6 Summarise the message at the end of the session, and invite the other person to say if he or she has any further comments or questions.

2.4 Planning a health education event

2.4.1 Preparation is essential

If you are planning a health education event to promote the uptake of antenatal care, or any other health education topic, thorough preparation is essential. Begin by preparing well in advance everything you need to know about the topic, researching the main points and assembling all the necessary information (Figure 2.7).

Think carefully about the audience and pinpoint what they need. For example, if your audience is community leaders, you need to prepare your messages in relation to their knowledge and role. An event for elders will need different messages than an event for new parents, or single mothers, and so on. Consider the needs, feelings and wishes of the specific audience, and identify what points they are likely to want you to focus on.

Choose a place and time that is convenient for as many people as possible to be present. For example, if most people prefer to attend the event on Saturday at the *kebele* compound at 9:00am, try as much as possible to agree to their choice.

2.4.2 Getting started

When you conduct a health education event or meeting, ensure that everybody is seated comfortably and is ready for active participation in the discussion. Smile, and try to make eye contact with everybody as you welcome them and introduce yourself. Ask everyone present to introduce themselves.

Start the presentation with what people know already about the antenatal care service, and build on, or add, what people do not know. You may need to tell them about its advantages, how often and at what time a pregnant woman should have antenatal check-ups, and so on.

Choose your presentation method according to the audience's condition, number, age, sex, etc. For example, a group of pregnant women may like it if you show them pictures of the uterus with a baby growing inside, or demonstrate how a baby moves down the birth canal, using a doll. Community leaders may benefit from seeing data on maternal and newborn mortality rates (as in Study Session 1 of this Module), to convince them of the need for antenatal care.



Figure 2.7 Books and study help you to prepare for a health education event.

2.4.3 Keeping everyone involved

Concentrate on what can be done and achieved in the time available for the event. Don't try to give out too much new information all at once, or people may feel overloaded and stop listening.

Remember, two-way communication is the best method! Participants should be encouraged to share their knowledge and experiences, and express their ideas and suggestions freely.

Support the active participation of women in particular, since they are the ones who should be encouraged to use antenatal care services. Some people are used to speaking up in groups, and others may be shy or afraid. Therefore, you should encourage those women who usually keep quiet to share their thoughts.

Make sure that everyone gets an equal chance to participate. For example, if a group of women wants to learn about what to eat during pregnancy and after birth, you can first ask each person to share what she knows. Many women will already know about a healthy diet from books or classes, from talking to other women, or from their own experience. But some women may be misinformed, for example about foods they think should be avoided in pregnancy, which are in fact good for pregnant women to eat, if they can afford to buy them (Figure 2.8).

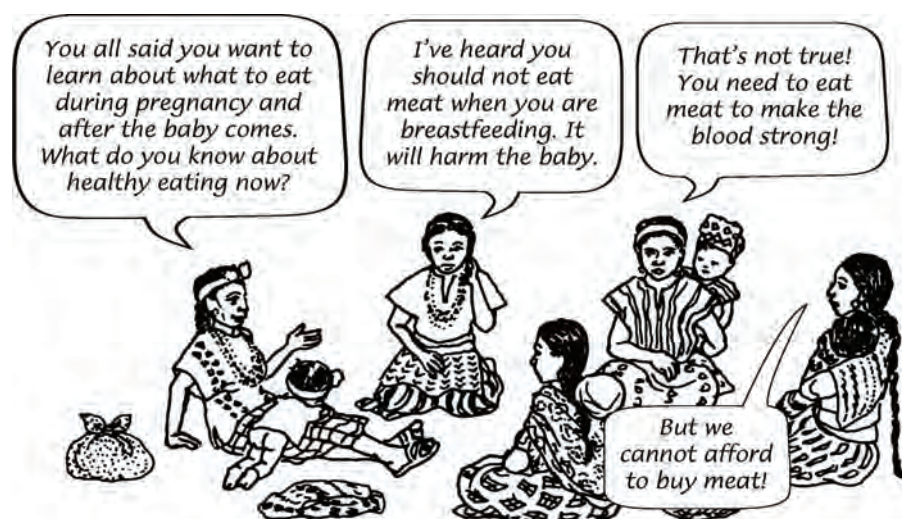


Figure 2.8 Health education events can reveal many different views, for example about a healthy diet during pregnancy.

2.4.4 Concluding the event positively

When the time approaches to bring the event to a conclusion, find out what questions, comments or issues anyone still has, and give particular attention to answering questions as much as possible before the meeting ends.

Then summarise the points that have been discussed, and any agreements reached, and bring the meeting to a close.

Thank everyone for their participation and encourage them to tell others what they have learned. They can become good advocates for antenatal care.

In the next study session, we turn our attention to the anatomy and physiology you will need to learn about in order to give good antenatal care.

Summary of Study Session 2

In Study Session 2, you have learned that:

- 1 The main purpose of promoting the utilisation of antenatal care is to reduce the number of maternal and newborn deaths and complications.
- 2 Antenatal care is an opportunity to promote dialogue with clients, to reinforce maternal health messages about danger signs during the antenatal, delivery and postnatal periods, and to ensure everyone knows where to seek appropriate care.
- 3 Health promotion covers any activities that result in better health in a community or a country; it can involve the actions of individuals, groups, organisations, institutions and governments. Health education, health screening and disease prevention all contribute to health promotion activities.
- 4 Health education enables people to increase control over, and improve, the health of themselves, their families and their communities by their own actions and efforts. It is a continuing process, based on planned and organised activities that take account of the audience's culture, tradition, language and local resources.
- 5 Advocacy and community mobilisation help to gain and maintain the involvement of a broad range of individuals, groups and sectors at different levels in the community, in achieving the desired goal.
- 6 Educating influential opinion leaders, religious leaders, husbands and fathers to be advocates and partners in improving women's health during pregnancy, labour and delivery, is very important.
- 7 Health promotion campaigns, education events, discussion groups and communication with individuals should be carefully prepared, and use different communication and presentation media as appropriate.
- 8 Group discussion is the most commonly used health education method. It involves two-way communication, in which participants are given an equal chance to express their views freely, and exchange their experiences and ideas.
- 9 Individual health education is based on creating trust and mutual understanding, enabling frankness between participants, the free exchange of ideas, and immediate feedback.
- 10 A good place to start is by listening to your audience. When you find out what people already know, you can help them build on that knowledge, and when you listen, you will learn from those you are educating.
- 11 Provide opportunities to make the antenatal care service the community's own programme, by promoting the identification of problems and solutions, the planning and implementation of positive actions, and the evaluation of outcomes.

Self-Assessment Questions (SAQs) for Study Session 2

Now that you have completed this study session, you can assess how well you have achieved its Learning Outcomes by answering these questions. Write your answers in your Study Diary and discuss them with your Tutor at the next Study Support Meeting. You can check your answers with the Notes on the Self-Assessment Questions at the end of this Module.

SAQ 2.1 (tests Learning Outcome 2.1)

Give one example of each of the following:

- (a) A routine health screening activity that contributes to antenatal care.
- (b) A routine disease prevention activity that contributes to antenatal care.

SAQ 2.2 (tests Learning Outcome 2.2)

State the main benefits of promoting the utilisation of antenatal care services in your community.

SAQ 2.3 (tests Learning Outcomes 2.3 and 2.4)

Suppose you have a group of pregnant women in your catchment area who want to know about where to go for delivery. What method of health promotion is likely to be the best in this example, and what steps should you take in organising a health education programme for these women?

Study Session 3 Anatomy and Physiology of the Female Reproductive System

Introduction

Applied anatomy and physiology for basic obstetric care is an entry to your studies in this Module and the next four Modules, and is essential preparation for your practical skills training. **Obstetric care** refers to healthcare for women during pregnancy, labour and delivery, and their immediate postnatal care. It requires a good understanding of the anatomy and physiology of the female reproductive system. **Anatomy** is the study of the *structures* of the human body, i.e. the features of how the organs, tissues and body systems are constructed. **Physiology**, on the other hand, is the study of the coordinated *functions* of the organs, tissues and systems in the body.

In this study session, you will learn about the structures that make the external female genitalia and the internal reproductive organs. In Session 4, we teach you about the hormonal regulation of the internal female reproductive organs and the female monthly menstrual cycle (bleeding from the vagina). In Study Session 5, we describe ovulation, fertilisation and implantation of the embryo in the mother's uterus (womb), and the development of the fetus, the placenta and fetal nutrition. In Study Session 6, you will learn the anatomy of the female bony pelvis, and also of the fetal skull, which has to pass through the mother's pelvis during delivery.

Learning Outcomes for Study Session 3

When you have studied this session, you should be able to:

- 3.1 Define and use correctly all of the key words printed in **bold**. (SAQs 3.1 and 3.2)
- 3.2 Identify and describe the basic anatomical features of the external female genitalia and the internal reproductive organs. (SAQs 3.2, 3.3 and 3.4)
- 3.3 Describe the functions of the main anatomical structures in the female reproductive system and their importance for obstetric care. (SAQs 3.3 and 3.4)

3.1 Some common terms in anatomy and physiology

In learning anatomy and physiology for the first time, you will be exposed to a large number of new terminologies. Some of these may be familiar to you from your previous biology course at high school. In this study session, we have tried to use simple terms as much as possible to help you understand the study material. Defining most of the terms used in anatomy and physiology is beyond this study session, but defining the most important terms used in obstetric care will help you achieve the learning outcomes of this study session and Study Sessions 4 to 6.

The terminologies used in human anatomy often include a **directional term**, i.e. a term that indicates the position of one anatomical structure in relation to another one, or in relation to the body as a whole (see Box 3.1). You will encounter directional terms many times in this Module.

Box 3.1 Some common directional terms used in anatomy

Superior: above

Inferior: below

Medial: towards the midline of the body

Lateral: away from the midline (sides, edges)

Anterior: in front of

Posterior: behind, at the back of

3.2 Anatomy and physiology of the female reproductive organs

The reproductive role of females is far more complex than that of males:

- Women produce **ova** (eggs), which can be fertilised by the male.
- After fertilisation, women also carry and protect the developing fetus in the uterus.
- After childbirth, the breasts (mammary glands) produce milk to nourish the baby.

By nature, every one of us is eager to know how we develop in our mother's uterus, how a fetus (the growing baby inside the uterus) develops during the nine months of pregnancy, how it is nourished, and how the female menstrual cycle is controlled. To understand these and other related questions about female reproductive functions, you have to learn about the anatomy (structure) of the female reproductive organs, and understand the physiology (function) of each organ.

We begin with the anatomical positions of the female reproductive organs in relation to the urinary system (the kidneys and bladder), the gastrointestinal system (the 'gut' where digestion of food occurs), and other nearby structures in the pelvic cavity, (see Box 3.2 below and Figure 3.1 on the next page).

Box 3.2 Cavities in the human body

A **cavity** is a space in the human body which contains different organs, fluids and other structures. For example, the *cranial cavity* contains the brain; the *chest cavity* contains the lungs and the heart; the *abdominal cavity* contains the stomach, intestines, liver, kidneys and some other organs; and the **pelvic cavity** contains the reproductive organs and bladder. Note that the pelvic cavity is actually the lower part of the abdominal cavity, and that there is no barrier between them.

Ova (plural) is pronounced 'oh-vah'. Ovum (singular) is pronounced 'oh-vumm'.

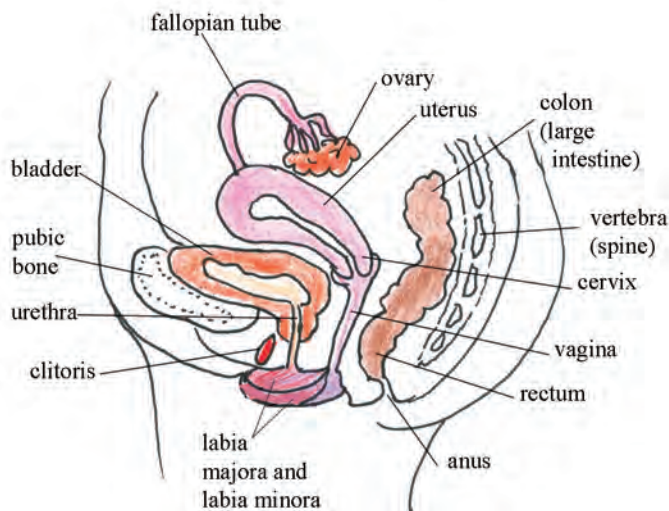


Figure 3.1 Half section of the pelvic cavity showing the female reproductive organs, with the body facing to the left. You will learn more about the anatomical terms labelled in this diagram as this study session proceeds.

- Look carefully at Figure 3.1 for about two minutes, taking note of the position of the labelled structures. Choose the correct directional terms from Box 3.1 to describe the position of the uterus in relation to the bladder.
- The bladder is in front of (*anterior* to) the uterus, or you could say instead that the uterus is behind (*posterior* to) the bladder. The top part of the uterus is bending over the bladder and is above (*superior* to) it, or you could say that the bladder is below (*inferior* to) the top of the uterus.

Behind (posterior to) the uterus, cervix and vagina in Figure 3.1, you can see part of the large intestine (colon) and the rectum, where solid waste is directed out of the body through the anus. Knowing about the anatomical position of all these structures is very important during pregnancy, labour and delivery. For example, in the pregnant woman, the enlarging uterus containing the growing fetus will push down on the bladder and large intestine. This can often result in decreased urine-carrying capacity of the bladder, so the woman has to urinate (pee) more frequently, and she may also experience constipation (drying and difficulty of passing stools).

When you are studying the female reproductive system, you have to bear in mind that structurally it is divided into two broad categories. Structures external to the vagina are said to be the *external female genitalia*, whereas structures above the vagina (including the vaginal canal), and lying internally, are called the *internal female reproductive organs*. You have already seen some structures in both categories from the side view in Figure 3.1. Now we will look at each of them in more detail.

3.3 External female genitalia

Look at Figure 3.2 carefully. All the structures which are visible externally, surrounding the urethral and vaginal openings, including the mons pubis, labia majora, labia minora, vestibule and perineum, make the **external female genitalia**. Sometimes these structures are collectively named the **vulva**.

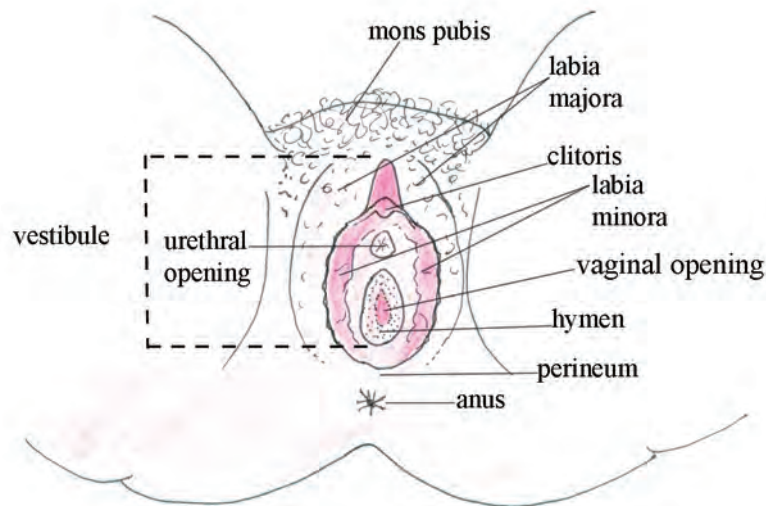


Figure 3.2 The external female genitalia (or vulva).

Structures in the external female genitalia have a nerve supply, which can respond to different sensory stimuli (touch, pain, pressure and temperature). This makes these structures sensitive and active to sexual arousal during touch, especially by the male partner. Following this, the sexual act between the male and female facilitates the ejaculation of male sex cells into the female internal reproductive organs, initiating the process of fertilisation, pregnancy, labour and delivery.

- Notice in Figure 3.2 that the urethral opening, the vaginal opening and the anus are all close together in the vulva. What do you think is the clinical importance of this close relationship for the pregnant woman?
- As you know, the area around the anus is contaminated with bacteria from waste matter emerging from the gastrointestinal tract. So, direct bacterial contamination of the urethral and vaginal openings easily occurs.

Advising the pregnant woman to keep this area clean through good personal hygiene is very important. Infections of the bladder and vagina are common in pregnancy, and if bacteria get into her uterus, she could lose the baby.

Now we will look at each of the structures in Figure 3.2, beginning with those on the outer edges of the diagram, and ending with those in the centre.

3.3.1 Mons pubis

The **mons pubis** is a thick, hair-covered, fatty and semi-rounded area overlying the *symphysis pubis*. **Symphysis** is a type of strong and immovable joint between bones. As you will see in Study Session 6 (Figure 6.1), the two halves of the pubic bone are joined in the middle by the pubic symphysis. The function of the fatty tissue in the mons pubis is to protect the woman's pubic area from bruising during the sex act.

Symphysis is pronounced 'simm-feh-siss'.

3.3.2 Labia majora and labia minora

The **labia majora** are two elongated, hair-covered, fatty skin folds that enclose and protect the other organs of the external female genitalia.

The **labia minora** are two smaller tissue folds enclosed by the labia majora. They protect the opening of the vagina and the **urethra** (the tube that carries urine from the bladder to the urethral opening in the vulva). The labia minora normally have an elastic nature, which enables them to distend and contract during sexual activity, and labour and delivery.

- How is this elasticity helpful during delivery?
- The labia minora can stretch to let the baby's head out.

In some countries, including parts of Ethiopia, the labia minora and the clitoris (described below) may be removed by **female genital mutilation** (FGM), one of the harmful traditional practices.

Female genital mutilation is discussed in the Module on Adolescent and Youth Reproductive Health.

3.3.3 Vestibule

The **vestibule** is the area between the labia minora, and consists of the clitoris, urethral opening and the vaginal opening.

The **clitoris** is a short erectile organ at the top of the vestibule, which has a very rich nerve supply and blood vessels. Its function is sexual excitation and it is very sensitive to touch. Its anatomical position is similar to the position of the male penis.

If the clitoris and labia minora are removed by female genital cutting, the vaginal opening will not expand easily during childbirth due to the scarring where tissue has been removed. This can result in difficulty in labour and delivery, including severe bleeding and rupture of the scarred tissue, sometimes even causing a **fistula** — a hole torn in the wall of the vagina.

- Female genital mutilation that involves the labia minora and clitoris is usually performed without an anaesthetic. What will be the consequence of this for the female?
- There will be severe pain due to the nerve supply to this area, which can lead to fainting (becoming unconscious).

Also, the labia minora and clitoris have a rich blood supply, so cutting them leads to severe bleeding, which may cause fainting and shock.

The **urethral opening** is the mouth or opening of the urethra, which is a small tubular structure that drains urine from the bladder. In Study Session 22, at the end of this Module, and in your practical training classes, you will learn how to insert a small tube (called a catheter) into this opening to drain urine from the bladder. This may be necessary during emergency care for a pregnant woman, or during labour and delivery, if she cannot pass urine for herself because the tissues of the vestibule have swollen and squashed the urethra flat.

The **vaginal opening** is the entrance to the vagina. It is where you will begin to see the 'presenting part' of the baby as it stretches wider open near the end of labour.

3.3.4 Perineum and hymen

The skin-covered muscular area between the vaginal opening and the anus is called the **perineum**. It has strong muscles and its own nerve supply, and it

helps to support the contents of the pelvic cavity. The hymen is a fold of thin vaginal tissue which partially covers the vaginal entrance in girls. It can be torn during strenuous exercise, as well as by the first sexual penetration.

3.4 Internal female reproductive organs

In learning about pregnancy and delivery, understanding the anatomical structures involved in production of eggs (ova), fertilisation and fetal development is fundamental. In this section, you will learn how to identify and describe the internal female reproductive organs involved in these processes. Knowledge of the position and function of these organs is also essential for the accurate examination of pregnant women, and a safe labour and delivery.

3.4.1 Fallopian tubes and ovaries

Begin by looking carefully at Figure 3.3. As you can see from the diagram, there are two **fallopian tubes** — one on each side of the uterus — and the finger-like ends of each tube (called the **fimbriae**) are close to the ovary on the same side, and open to the pelvic cavity. This means that if there is an infection in the pelvic cavity, it can get into the uterus through the fallopian tubes. Similarly, if there is an infection in the uterus, it can spread along the fallopian tubes and out into the pelvic cavity, and from there all around the woman's abdomen, affecting her other organs. This can be very dangerous if it is not treated early.

Fallopian is pronounced 'fah-loh-pee-ann'. Fimbriae is pronounced 'fimm-bree-aye'.

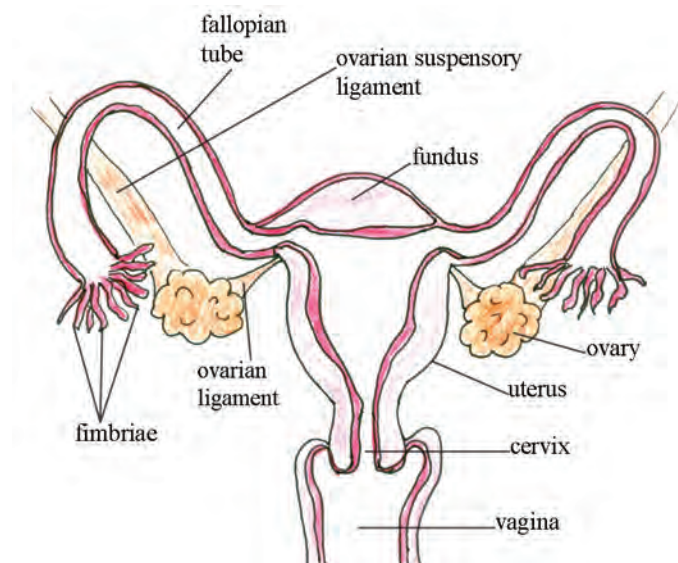


Figure 3.3 Structures of the internal female reproductive organs.

The **ovaries** are paired female reproductive organs that produce the eggs (ova). They lie in the pelvic cavity on either side of the uterus, just below the opening of the fallopian tubes (see Figure 3.3). They are kept in position through attachment to two ligaments. **Ligaments** are the fibrous, slightly stretchy, connective tissues that hold various internal organs in place; they also bind one bone to another in joints.

Women are born with a fixed number of immature eggs (ova), around 60,000 in number. The eggs are held in small 'pits' in the ovaries, named **ovarian follicles**. Each ovum has the potential to mature and become ready for fertilisation, but in actuality only about 400 ripen during the woman's lifetime. Every month, several ovarian follicles begin to enlarge and the ovum inside it

begins to mature, but usually only one will ‘win the race’ and be released from the ovary. The moment when the ovum is released is called **ovulation**. The other enlarging follicles degenerate.

- What could happen if two ova are released at the same time?
- The woman could become pregnant with twins.

The enlarging ovarian follicles also produce the female reproductive hormones, **oestrogen** and **progesterone**, which are important in regulating the monthly menstrual cycle, and throughout pregnancy. You will learn a lot more about these hormones in Study Sessions 4 and 5. **Hormones** are signalling chemicals that are produced in the body and circulate in the blood; different hormones control or regulate the activity of different cells or organs.

Oestrogen is pronounced ‘ee-stroh-jenn’. Progesterone is pronounced ‘proh-jest-err-own’.

After ovulation, the lining of the empty follicle grows and forms a yellow body in the ovary called the **corpus luteum**, which temporarily functions as a hormone-producing organ. It secretes oestrogen and progesterone for about the next 14 days. Oestrogen thickens the fatty tissues in the wall of the uterus in case pregnancy occurs. Progesterone stops further ovulation from occurring during the pregnancy.

Corpus luteum is pronounced ‘korr-puss-loot-ee-umm’.

- Why is it beneficial to prevent further ovulation once a woman is pregnant?
- It means she cannot get pregnant again during this pregnancy, so all her resources can go towards nourishing and protecting the first fetus developing in her uterus.

But if pregnancy does not occur within 14 days after ovulation, the corpus luteum degenerates and stops producing progesterone. As a result, the blood supply to this additional fatty tissue in the wall of the uterus is cut off, and it also degenerates and is shed through the vagina as the menstrual flow. The levels of oestrogen can then begin to rise, and the woman can ovulate again in the following month.

When an ovary releases a mature ovum (ovulation), the fimbriae of the fallopian tube catch the ovum and convey it towards the uterus. The male sperm swim along the fallopian tubes, and if they find the ovum, they fertilise it (as you will see in Study Sessions 4 and 5). The lining of the fallopian tubes and its secretions sustain both the ovum and the sperm, encourage fertilisation, and nourish the fertilised ovum until it reaches the uterus.

3.4.2 The uterus

The **uterus** is a hollow, muscular organ in which a fertilised ovum becomes embedded and develops into a fetus. Its major function is protecting and nourishing the fetus until birth.

During pregnancy, the muscular walls of the uterus become thicker and stretch in response to increasing fetal size during the pregnancy. The uterus must also accommodate increasing amounts of **amniotic fluid** (the waters surrounding the fetus, contained in a bag of fetal membranes), and the **placenta** (the structure that delivers nutrients from the mother to the fetus). You will learn a lot more about this in Study Session 5.

- Why do you think the muscular walls of the uterus become thicker during pregnancy?
- A thicker layer of muscle has the strength to support the growing fetus and the other contents of the uterus, which get much heavier as pregnancy proceeds.

The uterus has four major anatomical divisions, shown in Figure 3.4:

- **Body:** the major portion, which is the upper two-thirds of the uterus.
- **Fundus:** the domed area at the top of the uterus, between the junctions with the two fallopian tubes.
- **Endometrial cavity:** the triangular space between the walls of the uterus.
- **Cervix:** the narrow neck at the upper end of the vagina.

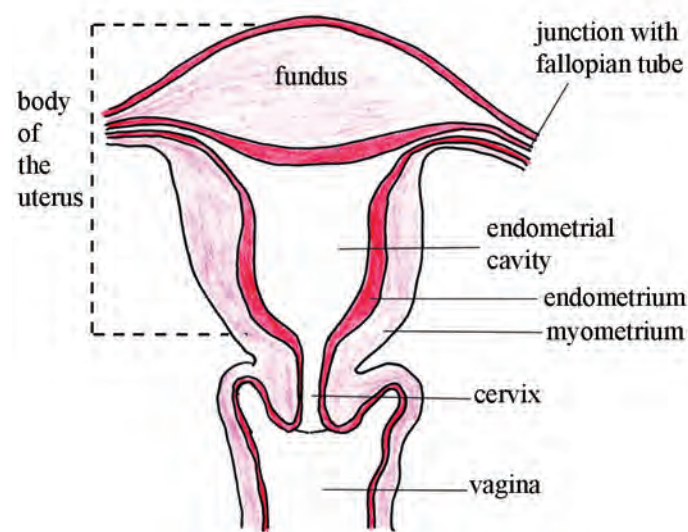


Figure 3.4 Structure of the empty uterus, showing the four main regions.

The wall of the uterus has three layers of tissue, two of which are shown in Figure 3.4:

- The **perimetrium**: the outermost thin membrane layer covering the uterus. (It is not important for you to know this term for obstetric care.)
 - The **myometrium**: the thick, muscular, middle layer in Figure 3.4.
 - The **endometrium**: the thin, innermost layer of the uterus, which thickens during the menstrual cycle. This is the tissue that builds up each month in a woman of reproductive age, under the influence of the female reproductive hormones.
- What happens to the endometrium if the hormones stop circulating after ovulation?
 - The blood supply to the endometrium is cut off, and it sheds from the body through the vagina as the monthly menstrual flow.

3.4.3 The cervix and the vagina

The **cervix** is the lower, narrow neck of the uterus, forming a tubular canal, which leads into the top of the vagina (see Figure 3.4). It is usually about 3–4 cm (centimetres) long.

The **vagina** is a muscular passage, 8–10 cm in length, between the cervix and the external genitalia. The secretions that lubricate the vagina come from glands in the cervix.

- The vagina has three functions. Can you suggest what they are?
- It is a receptacle for the penis, where sperm are deposited during sexual intercourse. It is the outlet for the menstrual flow every month in the non-pregnant woman. And it is the passageway down which the baby passes at birth.

Pregnant women should be encouraged to strengthen the muscles of the vagina by contracting (squeezing) them as hard as they can at least 10 times, and repeating this exercise at least four times a day. A woman can learn to do this exercise while she is urinating. As the urine comes out, she should contract the muscles in her vagina until the urine stops, then relax the muscles so the urine flows again. Once she learns how to squeeze these muscles, she should only do it when she is not urinating. Doing the squeezing exercises can help to:

- Prevent leaking of urine
- Prevent the vagina and perineum from tearing when they are stretched during childbirth
- Speed healing after birth
- Increase sexual pleasure.

In this study session you have studied the structures and functions of the organs in the female reproductive system and their importance in obstetric care. In the next study session you will look at the hormonal regulation of the reproductive cycle in women.



Summary of Study Session 3

In Study Session 3, you have learned that:

- 1 Anatomy is the study of the *structures* of the human body, and physiology is the study of the coordinated *functions* of the organs, tissues and body systems.
- 2 The female reproductive system is divided into the external genitalia (below and exterior to the vaginal opening), and the internal reproductive organs (above the vaginal opening in the pelvic cavity).
- 3 The internal reproductive organs are close to the bladder, the large intestine and the rectum; the external opening of the vagina is close to the urethral opening and the anus. These close relationships increase the opportunities for infection to spread in the genital area.
- 4 In some traditional societies, the clitoris and labia minora are often removed by female genital mutilation; this can have serious (even fatal) consequences for the woman, especially during labour and delivery.
- 5 The ovaries are female sex organs which usually produce one ovum every month during the reproductive years. One of the fallopian tubes carries the ovum from the ovary towards the uterus. If fertilisation occurs, it normally happens in the fallopian tube.
- 6 The uterus is a muscular organ, which gives mechanical protection and nutritional support to the developing fetus during pregnancy.

- 7 The female reproductive hormones, oestrogen and progesterone, direct the maturation of ova in the ovaries, the release of an ovum (ovulation), and the thickening of the endometrium (the fatty lining of the uterus). If fertilisation of the ovum and pregnancy does not result, the endometrium is shed as the menstrual flow.
- 8 The vagina functions as a passageway for elimination of the menstrual flow; it receives the penis during sexual intercourse; and it forms the lower portion of the birth canal.

Self-Assessment Questions (SAQs) for Study Session 3

Now that you have completed this study session, you can assess how well you have achieved its Learning Outcomes by answering these questions. Write your answers in your Study Diary and discuss them with your Tutor at the next Study Support Meeting. You can check your answers with the Notes on the Self-Assessment Questions at the end of this Module.

SAQ 3.1 (tests Learning Outcomes 3.1 and 3.2)

Look at Figure 3.5. Label the anatomical features marked from 'a' to 'i'.

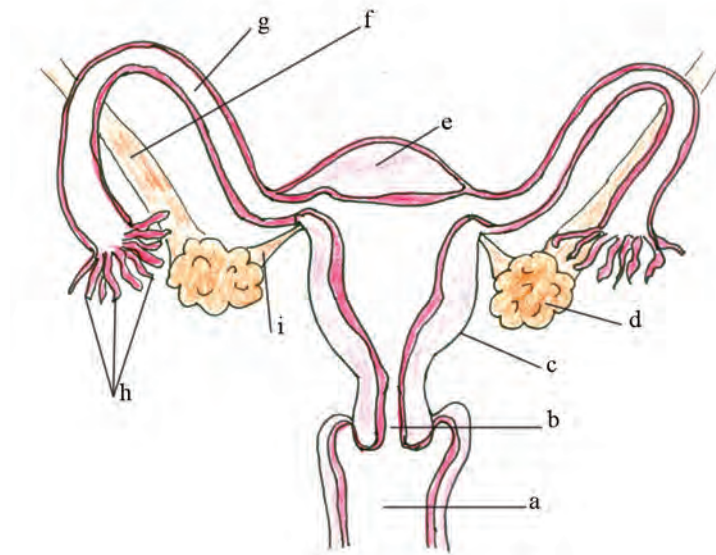


Figure 3.5 Label the internal female reproductive organs to complete SAQ 3.1.

SAQ 3.2 (tests Learning Outcome 3.1)

Choose the correct directional terms from Box 3.1 to describe the relative positions of the uterus and the rectum in Figure 3.1.

SAQ 3.3 (tests Learning Outcomes 3.2 and 3.3)

Which structures are removed in female genital mutilation, and what harm can come to a woman during labour and delivery as a result?

SAQ 3.4 (tests Learning Outcomes 3.2 and 3.3)

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

- A Infection in the uterus can get into the pelvic cavity through the vagina.
- B The perineum is a muscular area between the vaginal opening and the anus.
- C The maturation of an ovum is controlled by the female reproductive hormones.
- D Glands in the cervix produce secretions which lubricate the vagina.
- E The fundus is the narrow 'neck' at the bottom of the uterus.

Study Session 4 Hormonal Regulation of the Female Reproductive System

Introduction

In the previous study session you learned about the anatomy and physiology of the female reproductive system. The hormones oestrogen and progesterone were briefly introduced. In this study session you will learn much more about the role of these and other important hormones involved in the regulation of the human menstrual cycle, the monthly production of mature ova (eggs) by females of reproductive age, and the preparation of the uterus as a welcoming environment for the start of a pregnancy.

Learning Outcomes for Study Session 4

When you have studied this session, you should be able to:

- 4.1 Define and use correctly all of the key words printed in **bold**. (SAQ 4.1)
- 4.2 Describe the physiological processes and changes during the menstrual cycle. (SAQs 4.1 and 4.2)
- 4.3 Describe the hormonal regulation of the female reproductive system. (SAQs 4.3 and 4.4)

4.1 The female reproductive hormones

As you will probably remember from your previous high school biology course, the various functions of the body are regulated by the nervous system and the hormonal system. Both these systems are involved in controlling the activity of the female reproductive system in a regular monthly series of events known as the **menstrual cycle**, as we will now describe.

You should remember from Study Session 3 that a **hormone** is a signalling chemical produced in the body, which circulates in the blood; different hormones control or regulate the activity of different cells or organs. The functions of the five main hormones that regulate the female reproductive system are described in Box 4.1, and their interactions are illustrated in Figure 4.1 on the next page.

Box 4.1 Hormones regulating the female reproductive system

Gonadotropin-releasing hormone (GnRH) is produced by a part of the brain called the *hypothalamus*. When it circulates in the blood, it causes the release of two important hormones (see below, and Figure 4.1) from the *pituitary gland* in another specialised part of the brain.

Follicle-stimulating hormone (FSH) is produced by the pituitary gland during the first half of the menstrual cycle. It stimulates development of the maturing ovarian follicle and controls ovum production in the female, and sperm production in the male.

Leutenizing hormone (LH) is also produced by the pituitary gland in the brain. It stimulates the ovaries to produce oestrogen and

Gonadotropin is pronounced 'gonn-add-oh-troh-pinn'. Hypothalamus is pronounced 'hy-poh-thah-lah-mooss'. Pituitary is pronounced 'pitt-yoo-itt-ary'.

progesterone. It triggers **ovulation** (the release of a mature ovum from the ovary), and it promotes the development of the corpus luteum.

- What is the **corpus luteum**? (Think back to Study Session 3.)
- The name means ‘yellow body’, and after ovulation it develops in the ovary from the enlarged ovarian follicle that released the ovum.

Oestrogen is a female reproductive hormone, produced primarily by the ovaries in the non-pregnant woman. It promotes the maturation and release of an ovum in every menstrual cycle. It is also produced by the placenta during pregnancy.

Progesterone is produced by the corpus luteum in the ovary; its function is to prepare the **endometrium** (lining of the uterus) for the reception and development of the fertilised ovum. It also suppresses the production of oestrogen after ovulation has occurred.

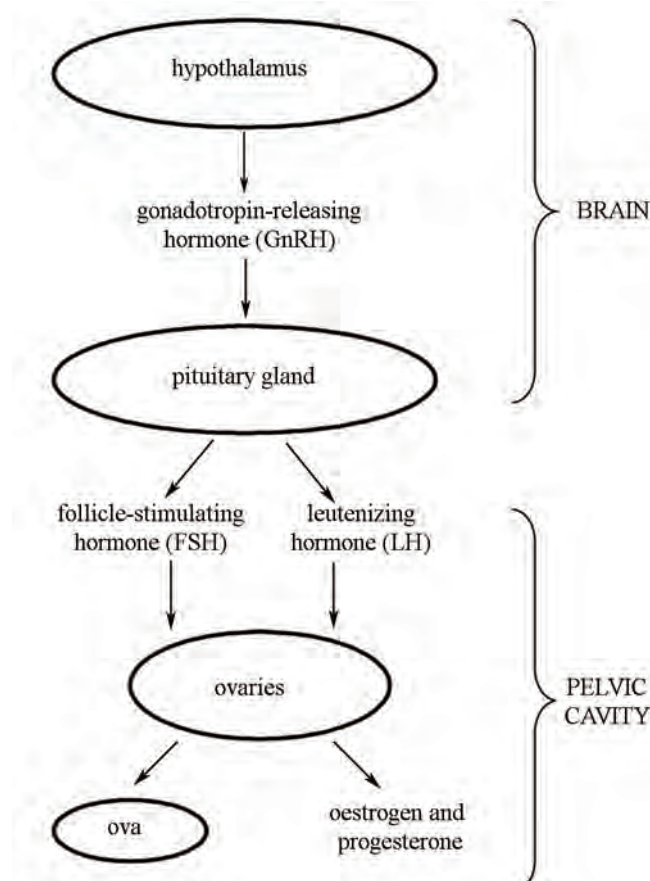


Figure 4.1 Hormonal regulation of the female reproductive system.

The length of the menstrual cycle is typically 28 days, but it can be highly variable. In some women it may be as short as 21 days or as long as 39 days. The menstrual cycle is best understood if we focus first on events occurring in the ovaries, and then on events occurring in the uterus. We are going to describe each of them in turn.

4.2 The ovarian cycle

The **ovarian cycle** refers to the monthly series of events in the ovaries, associated with the maturation and release of an ovum, and the ‘just in case’ preparation for its fertilisation and implantation in the uterus. You may be wondering why the regulation of the female reproductive system is so complicated, as shown in Figure 4.1. The reason is that the ovarian cycle has to be initiated (switched on) and then suppressed (switched off) in a precisely regulated sequence every month. In this section, we will explain how this is achieved.

The ovarian cycle consists of two consecutive phases, each of about 14 days’ duration. Events are measured from ‘day 1’, which is the first day of the **last normal menstrual period (LNMP)**.

4.2.1 The follicular phase: days 1–14

The sequence shown in Figure 4.1 begins with the secretion of GnRH from the hypothalamus, which stimulates the pituitary gland to produce FSH and LH, which in turn act on the ovaries, telling the ovarian follicles to complete the maturation of an ovum. During this period, a few ovarian follicles containing immature ova develop and mature under the stimulation of FSH and LH. Usually by day 14, only one follicle has become fully mature, and the ovum it contains is ready to be released. All other follicles that had begun maturing during this phase of the ovarian cycle degenerate as soon as ovulation has occurred.

Note that only one time interval is fairly constant in all females — the time from ovulation to the beginning of menstruation, which is almost always 14–15 days. However, the time of ovulation is variable and difficult to predict accurately.

4.2.2 The luteal phase: days 15–28

This phase is the period of corpus luteum activity, during which the uterus is prepared ‘just in case’ of pregnancy. After ovulation has occurred, the corpus luteum begins to secrete progesterone, as well as a small amount of oestrogen. Progesterone maintains the uterus in a state ready to receive and nourish an embryo. The lining of the uterus (the endometrium) becomes thicker, more richly nourished by blood vessels, and more receptive to the fertilised ovum. Progesterone also inhibits any further release of FSH or LH from the pituitary gland.

Thus, ovulation is quickly followed by a rise in the level of progesterone in the circulation, as the corpus luteum takes over the production of this hormone. As the progesterone level rises, it circulates around the body in the blood. When a high concentration of progesterone reaches the hypothalamus in the brain, the effect is to stop the hypothalamus from producing GnRH.

- What will happen when the hypothalamus stops producing GnRH? (Look back at Figure 4.1.)
- The pituitary gland will stop producing FSH and LH.

- What effect will this have on the ovaries?
- The maturation of more ova will stop at that point.

This type of control system, where the rise in one body chemical (in this case, progesterone) stops the production of another body chemical (in this case, GnRH), is called a **negative feedback mechanism**. But the corpus luteum has a limited lifespan, and after it stops producing progesterone, the negative feedback on the hypothalamus stops, and this allows it to begin producing GnRH again. So the ovarian cycle begins all over again.

4.3 The uterine cycle

Next, we turn our attention to the events occurring in the uterus during the same (typically) 28-day period as the events just described in the ovaries. The **uterine cycle** indicates the cyclical changes that occur in the uterus in response to the female sex hormones, progesterone and oestrogen.

4.3.1 The menstrual phase: days 1–5

If fertilisation does not occur after ovulation, the corpus luteum will degenerate and production of progesterone will decrease, so the stimulus for maintaining the thick endometrium will disappear. The reduction in progesterone causes the shedding of the thick endometrial lining. The muscular wall of the uterus (the myometrium) contracts to help cut off the blood supply to the endometrium, causing it to break away from the uterus. The endometrium was richly supplied with blood vessels to nourish the fetus if a pregnancy occurred, so when it disintegrates and passes down the vagina, some blood is mixed in with it. The mixture of tissue and blood passes out through the vagina as the **menstrual fluid** (or menstrual flow), usually for a period of about three to five days. Other common names for menstruation are ‘monthly bleeding’ or ‘menstrual period’.

Menstruation usually occurs at monthly intervals throughout the reproductive years, except during pregnancy when it is completely suppressed and the woman cannot get pregnant again until after the baby is born. Breastfeeding a baby also suppresses menstruation, but there is a risk that ovulation and pregnancy may still occur.

4.3.2 The proliferative phase: days 6–14

The concentration of oestrogen in the blood is rising during this period, following the end of menstruation, as the ovaries prepare for the next ovulation at around day 14. It is called the proliferative phase (‘proliferate’ means to ‘multiply or increase’), because in this period the endometrium grows thicker and becomes more richly fed by blood vessels in preparation for the possibility of fertilisation and pregnancy.

4.3.3 The secretory phase: days 15–28

During this phase, the blood concentration of progesterone increases, which causes even more blood vessels to grow into the endometrium. This makes the endometrium receptive to the fertilised ovum. If the ovum is fertilised and the embryo implants in the endometrium and a placenta develops, it produces a hormone called *human chorionic gonadotropin* (HCG) throughout pregnancy. The detection of HCG in a woman’s urine is the basis of most pregnancy tests.

Chorionic is pronounced ‘korr-ee-onn-ik’. Gonadotropin is pronounced ‘gonn-add-oh-troh-pinn’.

HCG signals the corpus luteum to continue to supply progesterone to maintain the thick, nourishing endometrium throughout the pregnancy. Continuous levels of progesterone act as a negative feedback mechanism on the hypothalamus and pituitary gland, preventing the release of FSH and LH, and hence further ovulation ceases.

- What happens if fertilisation of the ovum does not occur?
- The corpus luteum degenerates and the level of progesterone declines; the endometrium disintegrates and the woman menstruates — a signal that she did not become pregnant during that menstrual cycle.

4.4 The menarche, puberty and the menopause

You probably know that **menarche** (the first menstruation) starts on average between the ages of 12–15 years in Ethiopia. But in some cases it can start as late as 17–20 years, or as early as 8–9 years. Some of the factors that affect the age of menarche are biological, and some are cultural.

Menarche is pronounced 'menn-ark'.

Menarche begins when the hypothalamus in the brain is sensitised to begin producing GnRH at around the age of 12–15 years. But evidence suggests that GnRH may begin at an earlier age in girls who are well nourished and exposed to sexual motivating factors, such as watching sexual films and talking about sex. In malnourished girls, who have little exposure to sexual motivating factors, menarche may be delayed until the age of 17–20 years. Disease conditions that affect the hypothalamus and pituitary gland, or the ovaries and uterus, can also affect the age of first menarche.

Around the age of the menarche, the female sex hormones, oestrogen and progesterone, are responsible for the development of **secondary sexual characteristics** in the female. These include:

- the development of the breasts
- the broadening of the pelvis
- increased activity of sweat glands and sebaceous glands (oil glands in the skin)
- the growth of pubic and armpit hair.

Together with the menarche, the appearance of the secondary sexual characteristics marks the period known as **puberty** — the period of life (typically between the ages of 10–15 years) during which the reproductive organs grow to adult size and become functional. The secondary sexual characteristics are termed 'secondary' because they develop after the **primary sexual characteristics**, which distinguish females from males.

- Name some of the primary sexual characteristics of females.
- You already learned about them in Study Session 3 — they are the anatomical structures of the external female genitalia (e.g. the labia minora and clitoris), and the internal female reproductive organs (e.g. the ovaries, uterus and vagina).

Menstruation continues every month, except during pregnancy, until the woman reaches the **menopause** at around the age of 48–50 years, when menstruation ceases. You may recall from Study Session 3 that at birth a female baby's ovaries already contain about 60,000 immature eggs, and she cannot produce any more in her lifetime. By the time she reaches the menopause, her ability to bring ova to maturity has come to an end.

In Study Session 5, we describe what happens when an ovum is fertilised and it implants in the uterus and develops into a fetus.

Summary of Study Session 4

In Study Session 4, you have learned that:

- 1 The hormones controlling the female reproductive system include gonadotropin-releasing hormone (GnRH), follicle-stimulating hormone (FSH) and leutenizing hormone (LH), all of which are produced in the brain; oestrogen and progesterone produced by the ovaries and the corpus luteum; and human chorionic gonadotropin (HCG), produced by the placenta during pregnancy.
- 2 The menstrual cycle typically lasts 28 days, but it can be highly variable. It is characterised by menstruation from days 1–5 and ovulation at around day 14, but the date of ovulation is difficult to predict accurately.
- 3 Menstruation is the monthly shedding from the uterus of the endometrium with some blood, which emerges through the vagina, typically for a period of three to five days. Menstruation continues from menarche to the menopause, except during pregnancy. It may also be suppressed by breastfeeding.
- 4 The ovarian cycle refers to the regular, repeating events occurring in the ovaries during the menstrual cycle, characterised by the development of a few ovarian follicles; the maturation and release (ovulation) of a single ovum; and the formation and subsequent degeneration of the corpus luteum if pregnancy does not occur.
- 5 The uterine cycle refers to the regular, repeating events occurring in the uterus during the menstrual cycle, characterised by the thickening of the endometrium and an increase in its blood supply, followed by its degeneration and shedding as the menstrual flow if pregnancy does not occur.
- 6 The menarche and the development of secondary sexual characteristics signal the period known as puberty, when the internal reproductive organs grow to adult size and a girl becomes fertile and capable of becoming pregnant.

Self-Assessment Questions (SAQs) for Study Session 4

Now that you have completed this study session, you can assess how well you have achieved its Learning Outcomes by answering these questions. Write your answers in your Study Diary and discuss them with your Tutor at the next Study Support Meeting. You can check your answers with the Notes on the Self-Assessment Questions at the end of this Module.

SAQ 4.1 (tests Learning Outcomes 4.1 and 4.2)

The left-hand column of Table 4.1 gives the names of the various phases in the menstrual cycle. Complete the right-hand column by entering the correct period in days measured from the last normal menstrual period (LNMP).

Table 4.1 for SAQ 4.1.

Phase of the menstrual cycle	Days (1 = first day of the LNMP)
Follicular phase of the ovarian cycle	
Luteal phase of the ovarian cycle	
Menstrual phase of the uterine cycle	
Proliferative phase of the uterine cycle	
Secretory phase of the uterine cycle	

SAQ 4.2 (tests Learning Outcome 4.2)

Why do you think that a woman may feel cramping pains in her abdomen when she is menstruating?

SAQ 4.3 (tests Learning Outcome 4.3)

Can you suggest how the relatively high concentration of artificially produced oestrogen and progesterone in contraceptive pills prevents pregnancy in women who take the pills regularly as prescribed?

SAQ 4.4 (tests Learning Outcome 4.3)

Explain why menstruation stops during pregnancy.

Study Session 5 Fertilisation, Implantation and the Fetal and Placental Circulation

Introduction

The exact moment when a fertilised ovum, embryo, fetus or baby is called a ‘human being’ is controversial, and differs between individuals, religious groups, legal systems and nations. We will not address this difficult concept in this study session, but focus instead on the theoretical knowledge of how fertilisation and implantation of the ovum in the uterus occurs, and how the fetus is nourished as it develops during the nine months of gestation. This study session will also help you to recognise factors affecting fetal development that may lead to complications during the antenatal period.

Learning Outcomes for Study Session 5

When you have studied this session, you should be able to:

- 5.1 Define and use correctly all of the key words printed in **bold**. (SAQ 5.1)
- 5.2 Describe the process of fertilisation, implantation of the fertilised ovum in the uterus, and the early development of the embryo and the placenta. (SAQs 5.1 and 5.2)
- 5.3 Explain how the fetal circulation functions and how the fetus gets nutrition from the mother via the placenta. (SAQs 5.1 and 5.3)

5.1 Male and female sex cells

Before we look at the fertilisation process in humans, you need to understand the structure of both male sperm and female ova.

5.1.1 Sperm: the male sex cells

The mature sperm cell (see Figure 5.1) is a little swimming male sex cell. It consists of a head, body and tail. The head is covered by a cap and contains a nucleus of dense genetic material. It is attached to a region containing mitochondria, which supply the energy for the sperm’s activity. The tail is able to contract and relax, producing a characteristic wave-like movement.

- Look at Figure 5.1. Can you explain how sperm move up the vagina, into the uterus and along the fallopian tubes?
- A sperm has a tail that can wave about, propelling the sperm along as the tail ‘whips’ from side to side. As you probably remember from high school biology, the mitochondria are the energy-producing ‘motors’ in a cell, which supply the sperm tail with the energy for its movement.

The sperm make up only about 5% of what a man ejaculates during the sex act. This represents about 100 to 400 million sperm each time, carried in a nutritious fluid (semen) which helps to keep them alive. Sperm are very, very small in size; in fact, a single sperm is the smallest cell in the male body.

From puberty onwards, new sperm develop in the testes (testicles) throughout a man’s adult life. It takes about 72 days for one sperm to develop to maturity. Sperm production requires a temperature which is 3–5°C below body

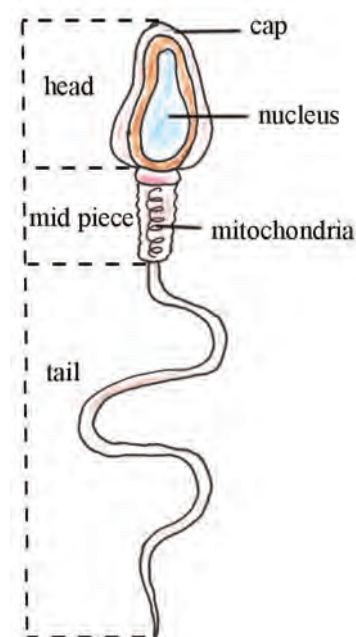


Figure 5.1 The structure of a sperm, the male sex cell.

temperature — which is why the testicles are outside the abdomen, where they can remain a little cooler. Exposure of the testicles to a higher temperature will inhibit sperm production and may lead to infertility.

5.1.2 Ova: the female sex cells

As you learned in Study Session 3, a baby girl is born with all the ova that she will have in her lifetime, but they are in an immature state. Each ovum is a large cell, with an external cell membrane, and is full of liquid which is rich in protein. It has a nucleus which contains the female genetic material.

The ova are stored in ovarian follicles in the ovaries, and a few begin to mature each month after a girl reaches puberty at about 12–15 years of age. This process continues until the menopause at about age 48–50 years, when the menstrual cycles end.

- Which hormones are involved in stimulating the maturation of ova?
- The hypothalamus in the brain produces gonadotropin-releasing hormone (GnRH), which stimulates the pituitary gland (also in the brain) to produce follicle-stimulating hormone (FSH) and leutenizing hormone (LH). These two hormones act on the ovarian follicles and cause a few of the immature ova to begin maturation.
- If the first day of the last menstrual period is called ‘day 1’, after how many days will a mature ovum be released from one of the ovaries?
- Ovulation occurs at around day 14 of the cycle in most women.

5.2 Fertilisation

Fertilisation is defined as the fusion of the sperm nucleus with the ovum nucleus. For fertilisation to occur, sperm must be deposited in the vagina no earlier than three days *before* ovulation or within one day *after* ovulation. This short ‘window of opportunity’ is because the sperm and the ovum have only limited lives, and they both soon die if they do not meet and fuse in this period. Following ovulation, the ovum is picked up by the fimbriae of the fallopian tube on the same side of the body as the ovary that released the ovum. The ovum will remain in the fallopian tube, alive and fully functioning, for only about 12 to 24 hours. Sperm can live longer in the female reproductive system, up to 72 hours, but most die before this time.

Once deposited within the vagina, the sperm swim through the cervix and into the uterus, and then up into the fallopian tubes (look back at Figure 3.3 to remind yourself of the anatomy). Fertilisation of the ovum occurs in the fallopian tube. The movement of sperm on this long journey is helped by muscular contraction of the walls of the uterus and the fallopian tubes. Sperm can swim several millimetres (mm) in a second, so it only takes them about 15 minutes to get into the fallopian tubes, but millions die along the way.

Only one sperm will succeed in fertilising the ovum (Figure 5.2), by penetrating its cell membrane and depositing the male genetic material into the female cell, where the two nuclei fuse. The fertilised ovum (zygote) immediately becomes resistant to penetration by any other sperm arriving later. After fertilisation occurs, the zygote remains in the fallopian tube for about 72 hours, and during this time it develops rapidly, as you will see in the next section.

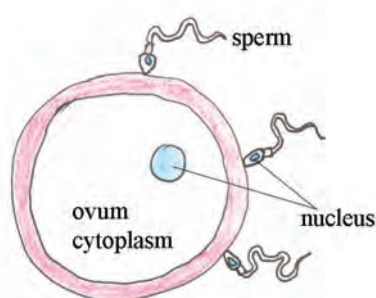


Figure 5.2 Fertilisation of a human ovum.

5.3 Early development of the embryo

From the moment of fertilisation until the eighth week of pregnancy, the developing human is called an **embryo**. First it divides into two cells; then they each divide again to give four cells (see Figure 5.3). The process of cell division is repeated many times until a solid ball of cells called a *morula* is produced after about three days. As the cells in the morula continue to divide, they begin to move towards the outer edges of the ball, until it becomes a hollow ball of cells called the *blastocyst* at about five days after fertilisation. Notice in Figure 5.3 that the blastocyst has a solid mass of cells on one side of the cavity.

Morula is pronounced 'morr-you-lah'. Blastocyst is pronounced 'blass-toh-sist'.

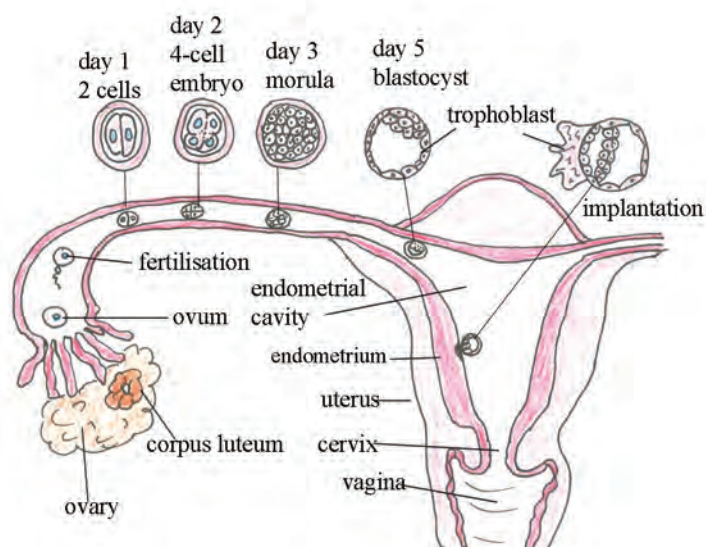


Figure 5.3 The sequence of fertilisation and implantation in the human female reproductive system.

While these changes are taking place in the early embryo, it is moving along the fallopian tube towards the uterus. This takes five to seven days.

5.3.1 Implantation

Between five to seven days after fertilisation, the blastocyst reaches the uterus and embeds itself in the thickened **endometrium** (lining of the uterus). This process is called **implantation**, and if the embryo survives it is the beginning of a pregnancy. However, the embryo may not implant, or it may not survive for more than a few days. In this case, it is shed from the uterus as the endometrium breaks down, and it passes out of the vagina in the menstrual fluid. The loss of a very early pregnancy in this way is very common, and the woman does not even know that she was momentarily pregnant.

Implantation may also occasionally occur in the fallopian tube, which is called an **ectopic pregnancy** and is very dangerous for the woman. The tube may rupture as the embryo grows, and cause severe pain and loss of blood into the abdominal cavity.

If the blastocyst implants successfully in the uterus, the cells go on multiplying by cell division and moving around into new locations to form two distinct structures:

- Three or four blastocyst cells develop into the inner cell mass, which — over the next few weeks — will form into the recognisable structures of a human embryo, with a head, beating heart and tiny limbs. Some of these



If you suspect an ectopic pregnancy, refer the woman immediately.

cells also develop into the **fetal membranes** that form a fluid-filled protective ‘bag’ around the embryo.

- The remaining 100 or so blastocyst cells form a structure called the *trophoblast*, which will provide the baby’s contribution to the placenta. The first stage of development of the placenta is when the trophoblast cells burrow into the endometrium.

Box 5.1 summarises the names and dates of the key stages in the development of a human, from fertilisation until one year after birth.

Box 5.1 Human developmental stages after fertilisation

Fertilisation: fusion of ovum and sperm on day one



Morula: solid ball of cells after three days



Blastocyst: hollow ball of cells after five days



Trophoblast: forms early embryo, fetal membranes and placenta after five to seven days



Embryo: the developing human from fertilisation to the eighth week of pregnancy



Fetus: the developing human from nine weeks of pregnancy to birth at around 40 weeks



Neonate: newborn baby from birth to 28 days old



Infant: baby or young child aged less than one year.

5.4 The placenta

The **placenta** is a temporary organ required for the development of the embryo and fetus. It allows for the exchange of nutrients and oxygen from mother to fetus, and the transfer of fetal waste products back to the mother for disposal by her organs. There is no mixing of maternal and fetal blood in the placenta. In this section, you will learn about the circulation of blood through the fetus and placenta, and how the fetus is nourished and gets rid of its waste. The blood system in the placenta also limits what chemicals and infectious agents in the mother’s body can cross the placenta to endanger the life of the fetus.

As we mentioned in the previous section, the placenta starts to develop from the trophoblast, after the embryo implants in the uterus. It is fully developed

within two months, and it continues growing until labour begins. The placenta weighs about 600 gm on average at delivery.

5.4.1 Fetal and maternal blood vessels

In order to understand how maternal and fetal blood is brought close together in the placenta, but does not mix, you must first learn some basic facts about blood and blood vessels. The **cardiovascular system** consists of the heart, the blood vessels (veins and arteries – see Box 5.2), and the blood that circulates around the body. It is the transport system that supplies oxygen and nutritive substances absorbed from the gastrointestinal system (gut) to all the cells, tissues and organs of the mother's body and that of the growing fetus, enabling them to generate the energy they need to perform their functions. It also returns carbon dioxide, the waste product of respiration, to the lungs where it is breathed out. The chemical processes that go on in the body generate many waste products, which the blood transports to the kidneys and liver, where they are removed. Other functions of the cardiovascular system include the regulation of body temperature, and the circulation and delivery of hormones and other agents that regulate body functions.

Box 5.2 gives some key facts about the interaction of the maternal and fetal cardiovascular systems, and their relationship to the placental circulation.

Box 5.2 Key facts about the fetal, maternal and placental circulation

Oxygenated blood: Blood that carries enough oxygen and nutrients to the body's cells, tissues and organs to enable them to function normally.

Deoxygenated blood: Blood that contains less oxygen and a higher proportion of dissolved wastes and carbon dioxide than is found in oxygenated blood.

Umbilical arteries: Arteries usually carry oxygenated blood, but the two umbilical arteries (see Figure 5.4 on the next page) collect deoxygenated blood from the body of the fetus and carry it to the placenta. The blood in the umbilical arteries is pumped to the placenta by the fetal heart.

Maternal veins: The mother's veins collect deoxygenated blood from the placenta; as the blood passes through her liver and kidneys, dissolved wastes are removed — including those collected from the placenta by her endometrial veins. When the deoxygenated blood reaches the mother's heart, it is pumped to her lungs to pick up more oxygen.

Maternal arteries: The mother's arteries carry oxygenated blood around her body, pumped by her heart. Her endometrial arteries bring blood to her uterus and into the placenta, delivering oxygen from the mother's lungs, and nutrients from her digestive system.

Umbilical vein: Veins usually carry deoxygenated blood, but the single umbilical vein (see Figure 5.4) carries oxygenated and nutrient-rich blood from the placenta and delivers it to the fetal heart, which pumps it around the body of the fetus.

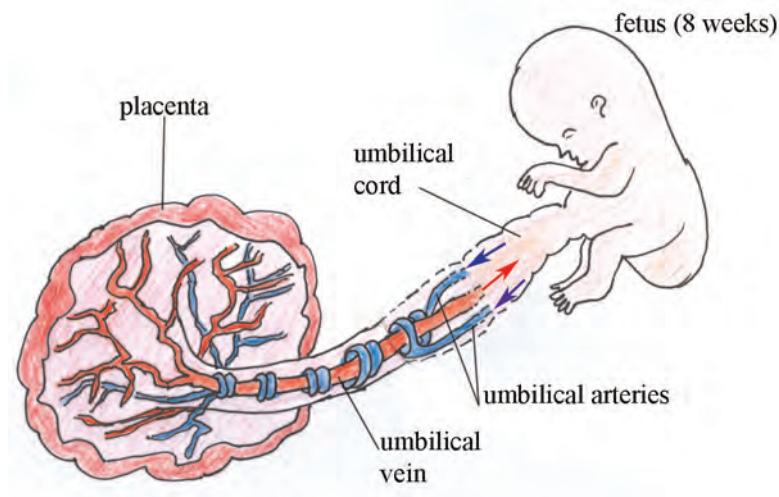


Figure 5.4 The fetal and placental circulation. Note that there are two umbilical arteries and one umbilical vein.

5.4.2 The placental circulation

During fetal development, parts of the placenta project into the maternal endometrium. These small projections are called *villi*. They produce chemicals that digest and break open the walls of the mother's arteries in the endometrium, so spaces in the placenta fill with oxygenated, nutrient-rich blood from the maternal endometrial arteries.

However, the pools of maternal blood in the placenta are not in direct contact with the fetal blood. The walls of the smallest fetal arteries and veins in the placenta — known as capillaries — remain intact (they are not digested). They are bathed on the outside by maternal blood, which is separated from the fetal blood inside the capillaries by the thickness of the vessel walls (Figure 5.5).

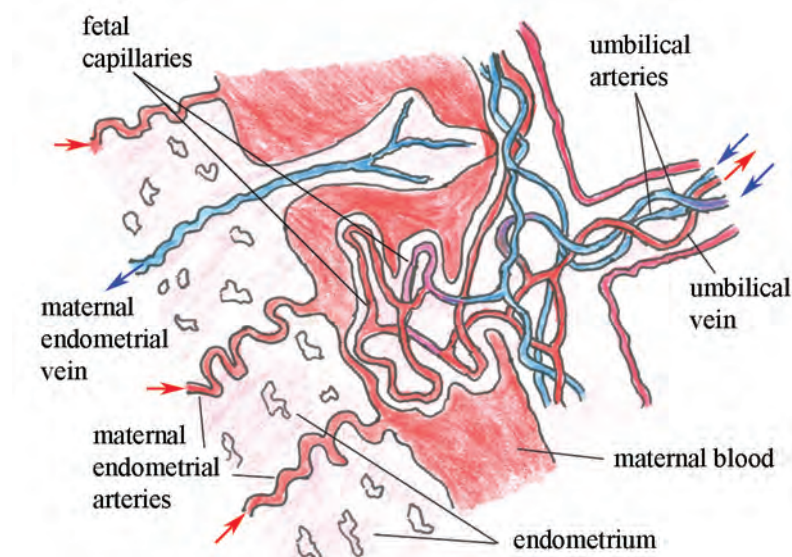


Figure 5.5 Placental circulation, showing the fetal capillaries bathed in blood from the maternal circulation.

The fetal capillaries in the placenta are very close to the pool of maternal blood, which has a higher concentration of oxygen and dissolved nutrients than the fetal blood inside the fetal blood vessels.

Villi (singular = villus) is pronounced 'vill-eye'.

- Think back to your high school biology. What will happen to the oxygen and nutrients in the mother's blood in this situation?
- The oxygen and nutrients will move from the higher concentration in the mother's blood, towards the lower concentration in the fetal blood. They will move through the walls of the fetal capillaries and into the fetal blood, by a process called *diffusion*. In this way, the fetal circulation is supplied with oxygen and nutrients.
- How do you think dissolved waste in the fetal blood is removed as it passes through the placenta?
- The concentration of dissolved waste in the fetal blood coming into the placenta is at a higher concentration than exists in the maternal blood bathing the fetal blood vessels. So the fetal waste diffuses through the walls of the fetal blood vessels and into the maternal blood, which carries the waste away to be removed by the mother's liver and kidneys.

The placenta has a very large surface area, which facilitates the transport of substances in both directions by diffusion, as described above. Notice that the maternal blood never mixes with the fetal blood — they are always kept separated by the walls of the fetal blood vessels.

5.4.3 The placenta as a filter

One of the functions of the placenta is to act as a filter — allowing beneficial substances such as oxygen and nutrients to pass from the maternal circulation into the fetal circulation, but also trying to prevent harmful substances from making this journey. For example, the placenta allows the passage of some proteins and other bigger chemicals in the blood, including maternal **antibodies** — chemicals made by the mother to attack any infectious agents, such as bacteria that get into her body while she is pregnant. Allowing her antibodies to pass across the placenta and into the fetus is important in providing protection for the fetus, and later the newborn baby, against the same infectious agents.

However, the placenta cannot prevent the transfer of alcohol, other drugs and viruses to the fetus. These agents can cause birth defects, like discolouration of teeth, bone deformity and brain damage. Advising a pregnant woman to stop taking harmful drugs, and to reduce her exposure to harmful chemicals as much as possible, is very important. You will learn more about this in Study Session 14 on health promotion issues in antenatal care.

5.4.4 Placental hormone synthesis

The placenta is an important hormone-secreting organ for much of the pregnancy. It secretes human chorionic gonadotropin (HCG), oestrogen and progesterone. The most commonly used pregnancy test detects HCG in the woman's urine. The purpose of these hormones is to maintain the placenta, to keep it growing steadily as the fetus develops and gets bigger, and to prevent further ovulations and menstrual cycles, so the woman cannot become pregnant again until after the baby is born.

In the next study session, we consider a different interaction between the maternal and fetal anatomy — the bony structures of the mother's pelvis and the fetal skull.

Summary of Study Session 5

In Study Session 5, you have learned that:

- 1 Fertilisation involves the fusion of the male and female sex cells, the sperm and ovum, in the fallopian tubes.
- 2 Sperm can survive in the female reproductive system for up to about 72 hours; the ovum lives for only 12 to 24 hours. For fertilisation to occur, sperm must be deposited in the vagina not more than three days before ovulation, or within 24 hours after ovulation.
- 3 After fertilisation, cell division starts to form the developing embryo in stages, including the morula (solid ball of cells) and then the blastocyst (hollow ball of cells).
- 4 Transportation of the embryo along the fallopian tube to the uterus takes about five to seven days.
- 5 Implantation of the embryo takes place in the endometrium (lining) of the uterus. If it occurs in the fallopian tube, it is called an ectopic pregnancy, and this is very dangerous for the woman.
- 6 The trophoblast region of the blastocyst penetrates the endometrium, and projections called villi secrete chemicals that dissolve maternal blood vessels. Maternal blood bathes the fetal blood vessels in the placenta, and nutrients, oxygen and dissolved waste is exchanged between mother and fetus.
- 7 The maternal and fetal blood never mix in the placenta.
- 8 The placenta functions as a transport site, a filter for beneficial and harmful substances, and a hormone-secreting organ.

Self-Assessment Questions (SAQs) for Study Session 5

Now that you have completed this study session, you can assess how well you have achieved its Learning Outcomes by answering these questions. Write your answers in your Study Diary and discuss them with your Tutor at the next Study Support Meeting. You can check your answers with the Notes on the Self-Assessment Questions at the end of this Module.

SAQ 5.1 (tests Learning Outcomes 5.1, 5.2 and 5.3)

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

- A The energy for moving the sperm's tail comes from the genetic material in its head.
- B Contractions in the muscular walls of the uterus and fallopian tubes assist sperm to move rapidly towards the ovum.
- C Implantation occurs when the blastocyst burrows into the endometrium and successfully establishes the early placenta.
- D The umbilical vein transports deoxygenated blood from the fetus to the placenta.
- E The placenta acts as a filter, preventing the transfer of all harmful substances from the mother to the fetal circulation.

SAQ 5.2 (tests Learning Outcome 5.2)

Read Case Study 5.1 and then answer the question that follows it.

Case Study 5.1 Advice for Mrs A after unprotected sex

Mrs A had unprotected sex (without a condom) 17 days after the first day of her last normal menstrual period. She visited your Health Post to ask you if there is a possibility that she could be pregnant.

Explain the possibilities to Mrs A in language that she can understand.

SAQ 5.3 (tests Learning Outcome 5.3)

Read Case Study 5.2 about Mrs P, and then answer the question that follows it.

Case Study 5.2 Mrs P asks why alcohol and khat can affect her fetus

Mrs P is a 38-year old pregnant woman who is addicted to alcohol and khat chewing. She attended an antenatal care health education session at your Health Post and listened to your explanation that 'the maternal blood and fetal blood are not in direct contact'. Following this she asked you 'Why are you telling me to stop taking alcohol and khat if my blood has no direct contact with my baby's blood? If my blood has no direct contact, the alcohol and khat will not get into the baby'.

What is your response? Explain it to her in language that she can understand.

Study Session 6 Anatomy of the Female Pelvis and Fetal Skull

Introduction

In this study session you will learn about the bony structures with the most importance for the pregnant woman and the baby she will give birth to. The bones of the skeleton have the main function of supporting our body weight and acting as attachment points for our muscles. The focus in this study session will be on the female pelvis, which supports the major load of the pregnant uterus, and the fetal skull, which has to pass through the woman's pelvis when she gives birth.

There are certain key landmarks in the anatomy of the female pelvis and the fetal skull that we will show you in this study session. Knowing these landmarks will enable you to estimate the progress of labour, by identifying changes in their relative positions as the baby passes down the birth canal. You will learn how to do this in the next Module in this curriculum, which is on *Labour and Delivery Care*.

Learning Outcomes for Study Session 6

When you have studied this session, you should be able to:

- 6.1 Define and use correctly all of the key words printed in **bold**. (SAQs 6.1, 6.2 and 6.3)
- 6.2 Describe the female pelvis and identify the important features for obstetric care. (SAQs 6.1, 6.2 and 6.3)
- 6.3 Describe the main features of the fetal skull, and their importance for labour and delivery. (SAQs 6.1, 6.2 and 6.3)

6.1 The female bony pelvis

The pelvis is a hard ring of bone (see Figure 6.1), which supports and protects the pelvic organs and the contents of the abdominal cavity. The muscles of the legs, back and abdomen are attached to the pelvis, and their strength and power keep the body upright and enable it to bend and twist at the waist, and to walk and run.

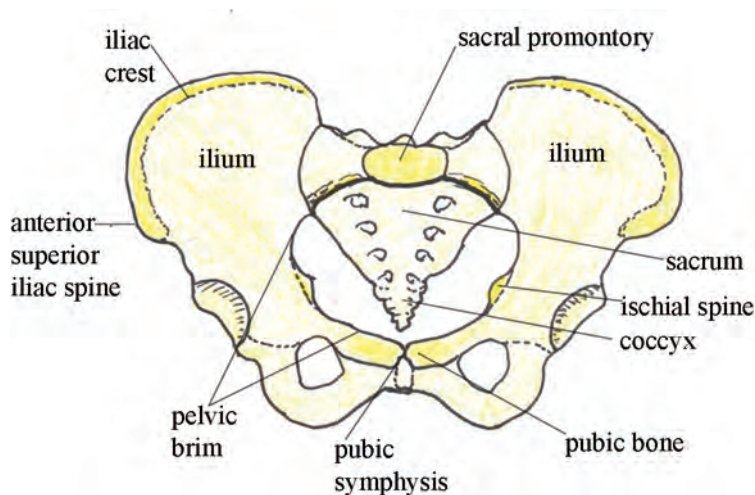


Figure 6.1 The bones of the female pelvis.

The woman's pelvis is adapted for child bearing, and is a wider and flatter shape than the male pelvis. The pelvis is composed of pairs of bones, which are fused together so tightly that the joints are difficult to see. We will describe each of the bones in turn, and their major landmarks. It will help you to visualise the anatomy of the pelvis if you keep referring back to Figure 6.1.

Ilium is pronounced 'ill-ee-umm' and iliac is 'ill-ee-ack'.

6.1.1 Ilium

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

- What do the directional terms 'anterior superior' tell you about the position of the iliac spines? (If you can't remember, look back at Box 3.1 in Study Session 3.)
- Anterior tells you that the iliac spines are at the *front* of the body, and superior tells you that they are *above* the main portion of the ilium on each side.

6.1.2 Ischium

Ischium is pronounced 'iss-kee-umm' and ischial is 'iss-kee-al'.

The **ischium** is the thick lower part of the pelvis, formed from two fused bones — one on either side. When a woman is in labour, the descent of the fetal head as it moves down the birth canal is estimated in relation to the **ischial spines**, which are inward projections of the ischium on each side. The ischial spines are smaller and rounder in shape in the woman's pelvis than in that of the man. In the Module on *Labour and Delivery Care*, you will learn how to feel for the ischial spines to help you estimate how far down the birth canal the baby's head has progressed.

6.1.3 Pubic bones and the symphysis pubis

The **pubic bones** on either side form the front part of the pelvis. The two pubic bones meet in the middle at the **pubic symphysis**. (A *symphysis* is a very strong bony joint.) The pubic symphysis is immediately below the hair-covered pubic mound that protects the woman's external genitalia (as shown in Figure 3.2, if you want to look back at it now).

When you examine the abdomen of a pregnant woman, feeling for the top of the pubic symphysis with your fingers is a very important landmark. In Study Session 10, you will learn how to measure the height of the uterus from the pubic symphysis to the fundus (top of the uterus — see Figure 3.3 if you need to remind yourself of the position of the fundus). This measurement enables you to estimate the **gestational age** of the fetus, i.e. how many weeks of the pregnancy have passed, and whether the fetus is growing at the normal rate.

6.1.4 Sacrum

Sacrum is pronounced 'say-krum'. Coccyx is pronounced 'kok-six'.

The **sacrum** is a tapered, wedge-shaped bone at the back of the pelvis, consisting of five fused vertebrae (the small bones that make up the spinal column or backbone). At the bottom of the sacrum is a tail-like bony projection called the *coccyx*. The upper border of the first vertebra in the

sacrum sticks out, and points towards the front of the body; this protuberance is the **sacral promontory** — an important landmark for labour and delivery.

6.2 The pelvic canal

The roughly circular space enclosed by the pubic bones at the front, and the ischium on either side at the back, is called the **pelvic canal** — the bony passage through which the baby must pass. This canal has a curved shape because of the difference in size between the anterior (front) and posterior (back) borders of the space created by the pelvic bones. You can see it from the side view in Figure 6.2.

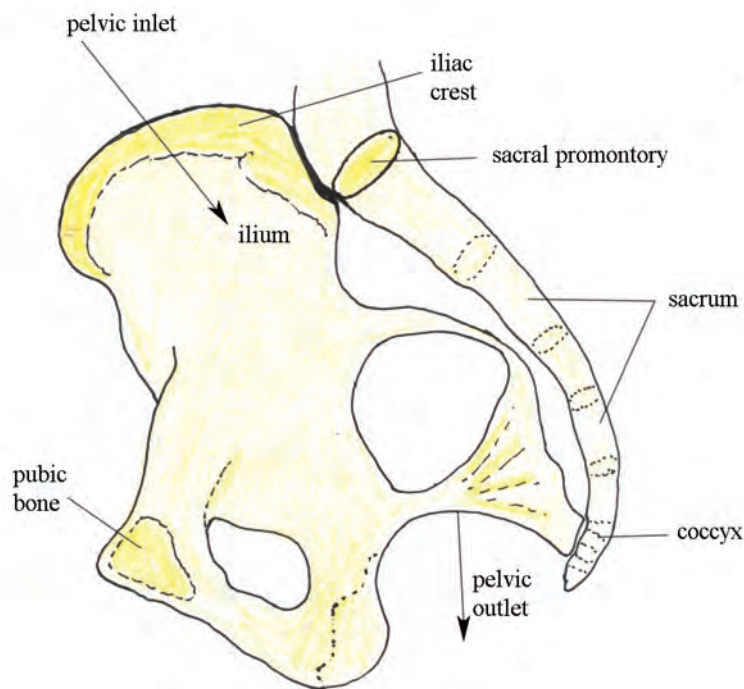


Figure 6.2 The pelvic canal seen from the side, with the body facing to the left.

6.2.1 The size and shape of the pelvis

The size and shape of the pelvis is important for labour and delivery. Well-built healthy women, who had a good diet during their childhood growth period, usually have a broad pelvis that is well adapted for childbirth. It has a round pelvic brim and short, blunt ischial spines. (Doctors and midwives call this shape a ‘gynaecoid’ pelvis.) It gives the least difficulty during childbirth, provided the fetus is a normal size and the birth canal has no abnormal tissue growth causing an obstruction.

There is considerable variation in pelvis shapes, some of which create problems in labour and delivery. A narrow pelvis can make it difficult for the baby to pass through the pelvic canal. A deficiency of important minerals like iodine in the diet during childhood may result in abnormal development of the pelvic bones. Stunting (being much shorter than average for age) due to malnutrition and/or infectious diseases can also result in a narrow pelvis.

Next, we look at the shape of the pelvic canal in more detail, and distinguish between the pelvic *inlet* (the roughly circular space where the baby's head *enters* the pelvis — Figure 6.3), and the pelvic *outlet* (the roughly circular space where the baby's head *emerges* from the pelvis). As you will see in the next section, the inlet and the outlet of the pelvis are not the same size.

6.2.2 The pelvic inlet

The pelvic inlet is formed by the pelvic brim, which you saw in Figure 6.1. The pelvic brim is rounded, except where the sacral promontory and the ischial spines project into it. The dimensions in centimetres (cm) of the pelvic inlet are shown in Figure 6.3 in both directions (top to bottom; and transverse or side to side). When you look at Figure 6.3, imagine that you are a baby in the head-down position, looking down on the pelvis from above, at the space you must squeeze through! It is just 13 cm wide (on average) and 12 cm from top to bottom.

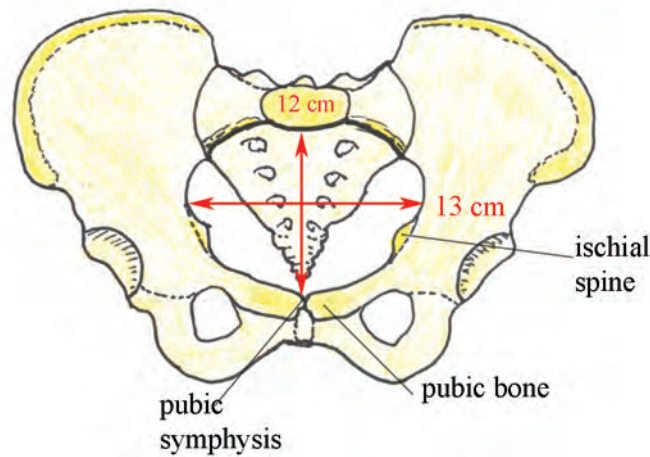


Figure 6.3 Diameters of the pelvic inlet, viewed from above.

6.2.3 The pelvic outlet

The pelvic outlet is formed by the lower border of the pubic bones at the front, and the lower border of the sacrum at the back. The ischial spines point into this space on both sides. Figure 6.4 shows the dimensions of the space that the fetus must pass through as it emerges from the mother's pelvis. As you look at Figure 6.4, imagine that you are the birth attendant who is looking up the birth canal, waiting to see the fetal head emerging.

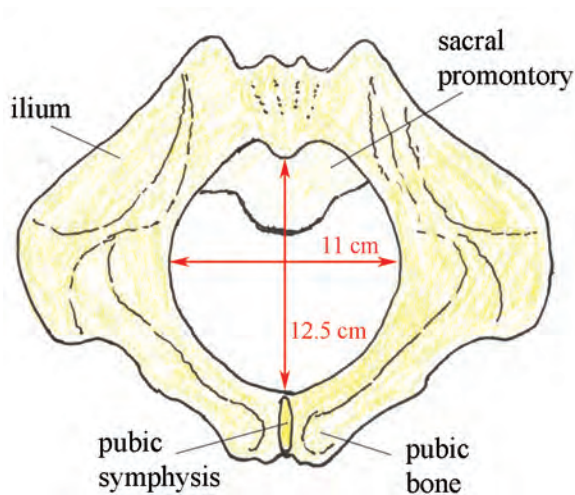


Figure 6.4 Diameters of the pelvic outlet, viewed from below.

- What do you notice when you compare the dimensions of the pelvic inlet (Figure 6.3) and the pelvic outlet (Figure 6.4)? Which is the narrowest?
- The narrowest diameter for the fetus to pass through is the pelvic outlet, which is only 11 cm wide in the average female pelvis.

It is difficult to see from Figures 6.3 and 6.4, but the fetus has to rotate in order to get through the pelvic canal. This is because the pelvic *inlet* is 13 cm wide, whereas the pelvic *outlet* is only 11 cm wide. In order to fit through the pelvic outlet at its widest dimension (12.5 cm from top to bottom), the fetus must rotate so it ‘presents’ its head to the widest dimension of the pelvic cavity at every point as it passes through. The largest part of the fetus is the skull, so the baby’s head rotates first, and the shoulders and the rest of the body follow. You will learn all about this in the *Labour and Delivery Care* Module. First, we have to look more closely at the structure of the fetal skull.

6.3 The fetal skull

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

6.3.1 Fetal skull bones

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

You can locate the main skull bones in Figure 6.5.

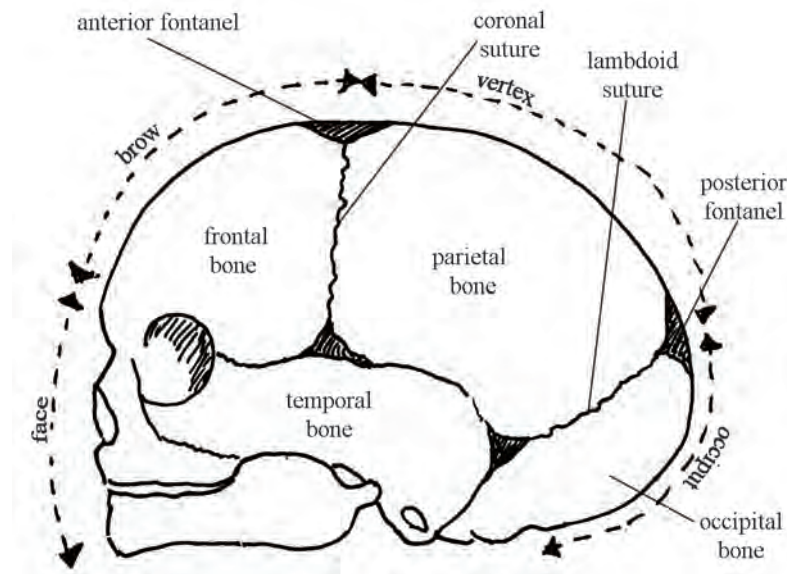


Figure 6.5 Bones of the fetal skull — side view facing left.

The fetal skull bones are as follows:

- The *frontal bone*, which forms the forehead. In the fetus, the frontal bone is in two halves, which fuse (join) into a single bone after the age of eight years.
- The two *parietal bones*, which lie on either side of the skull and occupy most of the skull.
- The *occipital bone*, which forms the back of the skull and part of its base. It joins with the cervical vertebrae (neck bones in the spinal column, or backbone).
- The two *temporal bones*, one on each side of the head, closest to the ear.

Understanding the landmarks and measurements of the fetal skull will help you to recognise normal and abnormal presentations of the fetus during antenatal examinations, labour and delivery.

6.3.2 Sutures

Sutures are joints between the bones of the skull. In the fetus they can ‘give’ a little under the pressure on the baby’s head as it passes down the birth canal. During early childhood, these sutures harden and the skull bones can no longer move relative to one another, as they can to a small extent in the fetus and newborn. It is traditional for their names and locations to be taught in midwifery courses. You may be able to tell the angle of the baby’s head as it ‘presents’ in the birth canal by feeling for the position of the main sutures with your examining fingers. You can see the position of the sutures in the fetal skull in Figure 6.6, and also the diameters at two points.

Parietal is pronounced ‘parr-eye-ett-al’. Occipital is pronounced ‘ox-ipp-itt-al’.

Suture is pronounced ‘soo-tyor’.

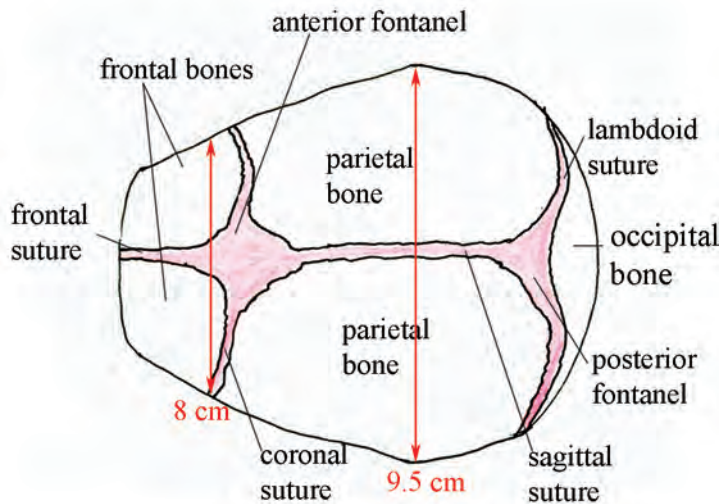


Figure 6.6 Regions and landmarks in the fetal skull facing to the left, as seen from above. Notice the average diameters in red.

- The *lambdoid suture* forms the junction between the occipital and the frontal bone.
 - The *sagittal suture* joins the two parietal bones together.
 - The *coronal suture* joins the frontal bone to the two parietal bones.
 - The *frontal suture* joins the two frontal bones together.
- What do you notice about the diameters given in Figure 6.6, relative to the dimensions of the pelvic canal (Figures 6.3 and 6.4)?
- At its widest part, the fetal skull is (on average) 9.5 cm wide. This is 3.5 cm less than the widest diameter of the pelvic inlet, and 1.5 cm less than the widest diameter of the pelvic outlet.

Lambdoid is pronounced 'lamm-doyd'. Sagittal is 'saj-itt-al' and coronal is 'korr-oh-nal'.

Thus, if the mother's pelvis and the fetal skull are the average size, there is just sufficient room for the baby's head to pass through the pelvic canal if the head rotates to present to the widest dimension of the pelvis.

6.3.3 Fontanels

A **fontanel** is the space created by the joining of two or more sutures. It is covered by thick membranes and the skin on the baby's head, protecting the brain underneath the fontanel from contact with the outside world. Identification of the two large fontanels on the top of the fetal skull helps you to locate the angle at which the baby's head is presenting during labour and delivery. The fontanels are shown in Figures 6.5 and 6.6. They are:

- The **anterior fontanel** (also known as the bregma) is a diamond-shaped space towards the front of the baby's head, at the junction of the sagittal, coronal and frontal sutures. It is very soft and you can feel the fetal heart beat by placing your fingers gently on the fontanel. The skin over the fontanel can be seen 'pulsing' in a newborn or young baby.
- The **posterior fontanel** (or lambda) has a triangular shape, and is found towards the back of the fetal skull. It is formed by the junction of the lambdoid and sagittal sutures.

6.3.4 Regions and landmarks in the fetal skull

Figures 6.5 and 6.6 allow you to identify certain regions and landmarks in the fetal skull, which have particular importance for obstetric care because they may form the so-called **presenting part** of the fetus — that is, the part leading the way down the birth canal.

- The **vertex** is the area midway between the anterior fontanel, the two parietal bones and the posterior fontanel. A **vertex presentation** occurs when this part of the fetal skull is leading the way. This is the normal and the safest presentation for a vaginal delivery.
- The **brow** is the area of skull which extends from the anterior fontanel to the upper border of the eye. A brow presentation is a significant risk for the mother and the baby.
- The **face** extends from the upper ridge of the eye to the nose and chin (lower jaw). A face presentation is also a significant risk for the mother and baby.
- The **occiput** is the area between the base of the skull and the posterior fontanel. It is unusual and very risky for the occiput to be the presenting part.

When you study the next Module on *Labour and Delivery Care*, you will learn about other presentations, including ‘breech’ (the baby is head-up and its feet or bottom is the presenting part), and ‘shoulder’ first.

Now that you know all the major anatomical features of the female reproductive system, the female pelvis and the fetal skull, we move on in Study Session 7 to consider the major physiological changes that take place in a woman’s body during pregnancy.

Summary of Study Session 6

In Study Session 6, you have learned that:

- 1 The bony pelvis is composed of the ilium, ischium, pubic bones and sacrum.
- 2 The size and shape of the bony pelvis can affect the ease or difficulty of labour and delivery; a broad pelvis gives less difficulty than a narrow one, which may obstruct the descent of the baby down the birth canal.
- 3 Certain landmarks in the anatomy of the pelvis are commonly used to estimate the descent of the baby during labour and delivery. The two most important landmarks are the ischial spines and the sacral promontory, which can be felt with the fingers during a vaginal examination.
- 4 The pelvic inlet is the space where the baby’s head enters the pelvis; it is larger than the pelvic outlet, where the baby’s head emerges from the pelvis. In order to get through the widest diameter of the inlet and the outlet, the baby has to rotate as it passes through the pelvic canal.
- 5 The skull is formed by several bones joined tightly together by joints called sutures. In the fetus and newborn, spaces called fontanels exist between some of the skull bones on the top of the baby’s head. The position of the sutures and the fontanels can tell you about the angle at which the baby’s head is presenting during labour and delivery.

- 6 The vertex presentation (where the top of the baby's head is the presenting part) is the most common and the safest presentation for a normal vaginal delivery. Other presentations carry a much higher risk for the mother and baby.

Self-Assessment Questions (SAQs) for Study Session 6

Now that you have completed this study session, you can assess how well you have achieved its Learning Outcomes by answering these questions. Write your answers in your Study Diary and discuss them with your Tutor at the next Study Support Meeting. You can check your answers with the Notes on the Self-Assessment Questions at the end of this Module.

SAQ 6.1 (tests Learning Outcomes 6.1, 6.2 and 6.3)

Match each anatomical name in List A with the correct description in List B by drawing an arrow between them.

A	B
Ilium	Joint between the parietal bones in the fetal skull
Frontal bones	Fused vertebrae at the back of the bony pelvis
Sagittal suture	Hip bone in the pelvis
Sacrum	The top of the fetal skull between the two fontanelles
Vertex	Paired bones forming the front of the skull

SAQ 6.2 (tests Learning Outcomes 6.1, 6.2 and 6.3)

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

- A The female bony pelvis is broader and flatter than the male pelvis.
- B The pelvic inlet is narrower than the pelvic outlet.
- C The iliac crest is an important landmark in measuring the progress of the fetus down the birth canal.
- D The sutures in the fetal skull are strong hard joints that hold the skull bones rigidly in place.
- E A newborn baby's pulse can be seen beating in the anterior fontanel.

SAQ 6.3 (tests Learning Outcomes 6.1, 6.2 and 6.3)

List four possible features of the maternal bony pelvis and/or the fetal skull that may result in a difficult labour and delivery.

Study Session 7 Physiological Changes During Pregnancy

Introduction

During pregnancy, a woman's body changes in many ways due to the effect of hormones. These changes can sometimes be uncomfortable, but most of the time they are normal and enable her to nourish and protect the fetus, prepare her body for labour, and develop her breasts for the production of milk.

- Can you recall the definition of a hormone from Study Session 3?
- **Hormones** are signalling chemicals produced in the body, which circulate in the blood. Different hormones control or regulate the activity of different cells or organs.

In this study session, you will learn about some of the changes that occur during pregnancy in the uterus, cervix and vagina, the cardiovascular system, gastrointestinal system, and urinary system, and about changes in the breasts and skin. You will also learn about the implications of all these changes for you as a health worker managing the health of pregnant women. By understanding the normal changes of pregnancy, you can reassure the woman if she is concerned, and also detect and intervene more quickly if you notice any abnormalities. A basic knowledge of these changes and adaptations is also critical for understanding the results of laboratory tests that may be conducted at a health facility during the pregnancy.

Learning Outcomes for Study Session 7

When you have studied this session, you should be able to:

- 7.1 Define and use correctly all of the key words printed in **bold**. (SAQ 7.6)
- 7.2 Describe physiological changes in the female reproductive system during pregnancy and the consequences of these changes for the pregnant woman. (SAQs 7.1 and 7.6)
- 7.3 Describe the average changes in the pregnant woman's body weight. (SAQ 7.2)
- 7.4 Discuss changes in the cardiovascular system during pregnancy, and the effects on blood pressure, cardiac output, blood volume and red blood cell concentration. (SAQs 7.3, 7.4 and 7.6)
- 7.5 Recognise normal and abnormal changes in the pregnant woman's respiration, digestion, urinary system, skin and breasts, including the production of colostrum. (SAQs 7.5 and 7.6)

7.1 Physiological changes in the female reproductive system during pregnancy

7.1.1 Changes in oestrogen and progesterone

In Study Sessions 3, 4 and 5 you learned about the main female reproductive hormones, oestrogen and progesterone, and their functions in preparing the

uterus for pregnancy. Oestrogen and progesterone are also the chief hormones throughout pregnancy.

A woman will produce more oestrogen during one pregnancy than throughout her entire life when not pregnant. During pregnancy, oestrogen promotes maternal blood flow within the uterus and the placenta.

- How does oestrogen play an important role in the development of the fetus?
- By promoting maternal blood flow to the uterus and placenta it ensures that the fetus is supplied with nutrients and oxygen for its development, and that waste products from the fetus are removed in the mother's blood. (You learned about this in Study Session 5.)

A pregnant woman's progesterone levels are also very high. Among other effects, high levels of progesterone cause some internal structures to increase in size, including the uterus, enabling it to accommodate a full-term baby. It has other effects on the blood vessels and joints, which we will discuss later in this study session.

7.1.2 Changes in the uterus, cervix and vagina

The uterus

After conception, the uterus provides a nutritive and protective environment in which the fetus will grow and develop. It increases from the size of a small pear in its non-pregnant state to accommodate a full-term baby at 40 weeks of gestation. The tissues from which the uterus is made continue to grow for the first 20 weeks, and it increases in weight from about 50 to 1,000 gm (grams). After this time, it doesn't get any heavier, but it stretches to accommodate the growing baby, placenta and amniotic fluid. By the time the pregnancy has reached full term, the uterus will have increased to about five times its normal size:

- In height (top to bottom) from 7.5 to 30 cm
 - In width (side to side) from 5 to 23 cm
 - In depth (front to back) from 2.5 to 20 cm.
- What causes these changes?
 - The hormone progesterone is primarily responsible.

At 12 weeks' gestation (near the end of the first *trimester*, i.e. three-month period), the **fundus** (upper margin of the body of the uterus) may be palpated (felt) through the abdomen above the pubic bone (symphysis pubis). The size of the uterus usually reaches its peak at about 36 weeks' gestation (see Figure 7.1).

- After how many weeks of pregnancy can the fundus be palpated at the height of the woman's umbilicus (belly-button), according to Figure 7.1?
- At about 20 weeks.

The uterus may drop slightly as the fetal head settles into the pelvis, preparing for delivery. Notice the position at 40 weeks of gestation, which is shown as a dotted line in Figure 7.1. This dropping is referred to as 'lightening'. It is more noticeable in a **primigravida** (pregnant for the first time) than in a

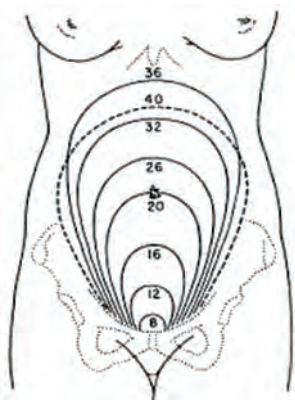


Figure 7.1 Height of the uterus at various weeks of pregnancy.

multigravida (a woman who has been pregnant previously, regardless of outcome).

The cervix

The cervix remains 2.5 cm long throughout pregnancy. In late pregnancy, softening of the cervix occurs in response to increasing painless contractions of its muscular walls.

The vagina

The vagina also becomes more elastic towards the end of pregnancy. These changes enable it to dilate during the second stage of labour, as the baby passes down the birth canal. (You will learn all about this in the next Module on *Labour and Delivery Care*.)

7.2 Pregnancy-related changes in posture and joints

A pregnant woman's entire posture changes as the baby gets bigger. Her abdomen transforms from flat or concave (dished) to very convex (bulging outwards), increasing the curvature of her back. The weight of the fetus, the enlarged uterus, the placenta and the **amniotic fluid** (the bag of waters surrounding the baby), together with the increasing curvature of her back, puts a large strain on the woman's bones and muscles. As a result, many pregnant women get back pain. Too much standing in one place or leaning forward can cause back pain, and so can hard physical work. Most kinds of back pain are normal in pregnancy, but it can also be a warning sign of a kidney infection. (You will learn how to identify kidney infections in Study Session 18.)



In addition, progesterone causes a loosening of ligaments and joints throughout the body. Pregnant women may be at greater risk of sprains and strains because the ligaments are looser, and because their posture has changed.

7.3 Changes in body weight during pregnancy

Continuing weight increase in pregnancy is considered to be one favourable indication of maternal adaptation and fetal growth. However, routine weighing of the mother during pregnancy is not now thought to be necessary, because it does not correlate well with pregnancy outcomes. For example, there can be a slight loss of weight during early pregnancy if the woman experiences much nausea and vomiting (often called '**morning sickness**'). You will learn more about this and other minor disorders of pregnancy in Study Session 12, later in this Module. The expected increase in weight of a healthy woman in an average pregnancy, where there is a single baby, is as follows:



- About 2.0 kg in total in the first 20 weeks
- Then approximately 0.5 kg per week until full term at 40 weeks
- A total of 9–12 kg during the pregnancy.

A woman who is pregnant with more than one baby will have a higher weight gain than a woman with only one fetus. She will also require a higher calorie diet. (You will learn a lot about diet and healthy nutrition in pregnancy in Study Session 14 of this Module.)

A lack of significant weight gain may not be a cause for concern in some women, but it could be an indication that the fetus is not growing properly. Doctors and midwives may refer to this as intrauterine growth restriction (IUGR) of the fetus.

7.4 Changes in the cardiovascular system

The **cardiovascular system** consists of the heart, the blood vessels (veins and arteries), and the blood that circulates around the body. It is the transport system that supplies oxygen and nutritive substances absorbed from the gastrointestinal tract to all the cells, tissues and organs of the body, enabling them to generate the energy they need to perform their functions. It also returns carbon dioxide, the waste product of respiration, to the lungs, where it is breathed out. The chemical processes that go on in the body generate many waste products, which the blood transports to the kidneys and liver, where they are removed. Other functions of the cardiovascular system include the regulation of body temperature, and the circulation and delivery of hormones and other agents that regulate body functions. There are several significant changes in this complex system during pregnancy.

7.4.1 The heart

The heart may increase in size during pregnancy due to an increase in its workload.

- Why do you think the workload of the heart has to increase?
 - Because it has to pump blood through the placenta, fetus and the much larger uterus and abdomen of the pregnant woman.

The amount of blood that is pumped out of the heart each minute is called the **cardiac output**. Table 7.1 shows how it increases during pregnancy.

Table 7.1 Changes in cardiac output during pregnancy

Woman's condition	Cardiac output (litres per minute)
non-pregnant, resting	2.5
end of 1st trimester	5
end of 2nd trimester	6
full-term	7

The increase in cardiac output is caused by two changes in how the heart functions:

- Increase in the resting **heart rate**, i.e. the number of heart beats per minute. The heart rate is about 15 beats per minute higher in the pregnant woman.
- Increase in the **stroke volume**, i.e. the volume of blood pumped out of the heart in a single heart beat. It is about 7 millilitres (ml) larger per heart beat in the pregnant woman.

Cardiac output is calculated by multiplying heart rate and stroke volume.

During the second trimester of pregnancy, the mother's heart at rest is working 40% harder than in her non-pregnant state. Most of this increase results from a more efficiently performing heart, which ejects more blood at each beat.

7.4.2 Blood volume

Blood volume (the total volume of blood in the circulation, measured in litres) increases gradually by 30–50 % in the pregnant woman, so by full term she has about 1.5 litres more blood than before the pregnancy. A higher circulating blood volume is required to provide extra blood flow through the placenta, so nutrients and oxygen can be delivered to the fetus. The increase in blood volume is caused by two changes:

- Increase in the volume of blood plasma (the fluid part of the blood).
- Increase in the number of red blood cells in the circulation.

The volume of blood plasma increases after about the sixth week of pregnancy. It reaches its maximum level of approximately 50% above non-pregnant values by the second trimester, and maintains this until full term.

The total volume of red cells in the circulation increases by about 18% during pregnancy, in response to the extra oxygen requirements made by the maternal, placental and fetal tissues. Red blood cells contain the oxygen-carrying substance called haemoglobin, which is rich in iron (see Box 7.1). Taking iron supplements during pregnancy can result in a much greater increase in red blood cells, up to 30% more than non-pregnant levels.

Haemoglobin is pronounced 'heem-oh-gloh-binn'.

Box 7.1 Iron, haemoglobin and anaemia

Iron is present in all cells and has several important functions, including oxygen transport and storage in the human body. It is the critical component of the oxygen-carrying substance **haemoglobin**, found in all red blood cells. It is the iron in haemoglobin that makes these cells appear red. If the diet is too low in iron, the person cannot make enough red blood cells. Iron is also involved in the storage and release of oxygen in the muscles.

Anaemia is most accurately defined as a low concentration of haemoglobin in the blood, but it is often referred to as a low concentration of red blood cells. Too little iron in the diet is the leading cause of anaemia.

The measurement of haemoglobin is expressed using its chemical symbol (Hb), and its weight in grams (gm) per decilitre (dl) of blood. A decilitre equals 10 millilitres (ml). The World Health Organization recommends that the pregnant woman's haemoglobin should not fall below 11 grams of haemoglobin per decilitre of blood (Hb 11g/dl). (You will learn more about anaemia and its treatment in Study Session 18.)

Although there is a constant increase in the number of red blood cells in the circulation during pregnancy, the increase in the volume of blood plasma is much larger. So even though the pregnant woman has more red blood cells than before she was pregnant, they are *diluted* in the much larger volume of blood plasma.

-
- What effect will this have on the concentration of red blood cells and haemoglobin in the pregnant woman's blood, compared to her non-pregnant self?
 - The concentration of red blood cells and haemoglobin will fall because they are more dilute, so the woman's blood will be slightly anaemic.

This effect is referred to as **physiological anaemia**. It explains why iron in the diet, or from iron tablets, is so important during pregnancy.

7.4.3 Blood pressure in pregnancy

We said earlier that progesterone causes the ligaments and joints to loosen during pregnancy. It also acts with some other natural chemicals in the body to cause the muscular walls of the blood vessels to relax slightly. The result is that there is less resistance to the flow of blood around the body, because the same volume of blood is circulating in slightly wider blood vessels. **Blood pressure (BP)** refers to how hard the blood is 'pushing' on the walls of the major blood vessels as it is pumped around the body by the heart.

- What effect will the slight relaxation of the blood vessel walls have on the pregnant woman's blood pressure?
- It will be *lower* than in her pre-pregnant state, because the same volume of blood has more space in which to circulate.

Lower blood pressure is particularly common in early pregnancy. Many women report occasionally feeling dizzy in the first trimester, because less blood and less oxygen is being pumped to the brain. Progesterone can also cause a sudden larger relaxation in the blood vessels, resulting in an acute feeling of dizziness, or even a brief loss of consciousness (passing out).

Another cause of dizziness can result from lying flat on the back. This is more common after 24 weeks of pregnancy, but it can happen earlier during twin pregnancies, or conditions that increase the volume of amniotic fluid (waters surrounding the fetus). When a pregnant woman is lying flat on her back, the weight of her uterus and its contents compresses the large blood vessel (vena cava) leading from her lower body to the heart. When this blood vessel is squashed, the blood flow back to the heart is reduced, which in turn leads to a reduction in the blood flow out of the heart to the rest of the body.

- If there is suddenly less blood leaving the heart, what will happen to the woman's blood pressure, and how will she feel as a result?
- Lying flat on her back can result in a sudden and dramatic drop in blood pressure, and dizziness or loss of consciousness may occur because not enough oxygen is reaching her brain. After the first trimester, pregnant women are recommended not to lie on their back.

7.4.4 Exercise and blood flow in pregnancy

The weight gain in pregnant women increases the workload on the body from any physical activity. Steady, non-violent exercise is good for the mother because it prepares her body for labour (Figure 7.2), but sudden strong exercise, or working for too many hours without a break, may make her feel dizzy. This is because the reduced blood pressure and slight physiological anaemia cannot keep pace with the demand of her body for more oxygen.



Figure 7.2 Having too much or too little exercise should be avoided in pregnancy.

A pregnant woman should not do exercises where she is lying on her back, due to the compression of the major blood vessels returning blood to her heart. Strong exercise may lead to decreased blood flow to the uterus because blood is diverted to the muscles, but this has not been shown to have any long-term effects on the baby. Pregnant women should not exercise vigorously in hot weather, or if it makes them breathless, or if there are known risk factors such as a history of miscarriage.

7.4.5 Oedema in pregnancy

A combination of the slight increase in the permeability of the smallest of blood vessels (they allow more fluid to leak out into the tissues), the additional weight of the uterus, and the downward force of gravity, slow down the rate at which blood is pumped back to the heart from the lower half of the body. Fluid often collects in the tissues of the legs and feet of pregnant women after the first trimester, instead of being absorbed into the blood circulation. The swelling caused by this collection of fluid is called **oedema**.

It is a common condition in pregnant women, particularly if they stand for a long time during the day. Oedema of the hands may also occur. Advise the woman to rest frequently and to elevate (raise) her feet and legs while sitting. This will improve the return of blood to her heart and decrease swelling of the legs.

Oedema is pronounced 'ee-dee-mah'.



If a pregnant woman experiences severe oedema, including swelling of the face, this is a danger sign that requires immediate referral to the nearest health facility.

7.5 Respiratory changes

During pregnancy, the amount of air moved in and out of the lungs increases by nearly 50% due to two factors:

- each breath contains a larger volume of air
- the rate of breathing (breaths per minute) increases slightly.

During pregnancy, many women find they get short of breath (cannot breathe as deeply as usual). This is because the growing baby crowds the mother's lungs and she has less room to breathe. But if a woman is also weak and tired, or if she is short of breath all of the time, she should be checked for signs of sickness, heart problems, anaemia or poor diet. Get medical advice if you think she may have any of these problems.

7.6 Changes in the gastrointestinal system in pregnancy

As you may remember from your high school biology, food and fluids enter the **gastrointestinal system** in the mouth, pass through the oesophagus, stomach and intestines, and solid waste exits at the anus. This very long tube from mouth to anus is often called the 'gut'. Proteins, fats and carbohydrates in our diet are broken down (digested) in the gut into units small enough to be absorbed from the intestines into nearby blood vessels. It is also the route by which nutritious substances, such as vitamins and minerals, enter the body.

During pregnancy, the muscles in the walls of the gastrointestinal system relax slightly, and the rate at which food is squeezed out of the stomach and along the intestines is slowed down.

- Can you think of a reason why slowing down the passage of food through the gastrointestinal system might be beneficial in pregnancy?
 - It increases the time available for digestion, and it maximises the absorption of nutrients from the diet.

Undesirable effects also result from slow emptying of the stomach, and slow movement of food through the gut.

- Can you suggest one of these undesirable effects?
 - Many pregnant women experience constipation (difficulty in passing stools).

Many women also have nausea in the first months of pregnancy. A burning feeling, or pain in the stomach or between the breasts, is called indigestion (or 'heartburn', although the heart is not involved). It happens because as the pregnancy progresses, the growing baby crowds the mother's stomach and pushes it higher than usual (Figure 7.3). The acids in the mother's stomach that help digest food are pushed up into her chest, where they cause a burning feeling. This is not dangerous and usually goes away after the birth.

If the mother has difficulty with nausea or indigestion, advise her to eat small, frequent meals. The mother should not lie down flat for 1 to 2 hours after eating, because this may cause these symptoms. In Study Session 12 you will learn more about minor disorders of pregnancy such as these, and how to help the woman manage them.

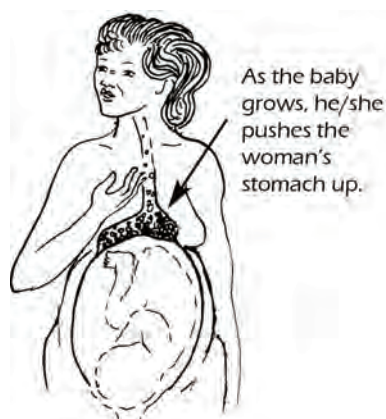


Figure 7.3 The growing baby crowds the mother's stomach and can cause indigestion and heartburn. She may also feel short of breath because the baby crowds her lungs.

7.7 Changes in the urinary system during pregnancy

The **urinary system** consists of the kidneys (a pair of organs on either side of the abdomen near the back), the tubes connecting the kidneys to the bladder where urine is stored, and a tube called the **urethra** that passes urine out of the body. (Look back at Figure 3.1 in Study Session 3, to remind yourself of the position of the bladder and the urethra.) The kidneys extract waste from the blood and turn it into urine. They must work extra hard to filter the mother's own waste products from her blood, plus those of the fetus, and get rid of them in her urine. Therefore, there is also an increase in the amount of urine produced during pregnancy.

Needing to urinate (pee) often is normal, especially in the first and last months of pregnancy. This happens because the growing uterus presses against the bladder. In late pregnancy, a woman often has to get up during the night to urinate, because fluid retained in the legs and feet during the day (oedema) is absorbed into the blood circulation when her legs are raised in bed. The kidneys extract the excess fluid and turn it into urine, so the bladder fills more quickly at night.



7.8 Skin changes

Changes in the woman's hormones, and mechanical stretching of her growing abdomen and breasts, are responsible for several changes in the skin during pregnancy.

7.8.1 Linea nigra

This dark line may appear between the umbilicus (belly-button) and the symphysis pubis (pubic bone); in some pregnant women it may extend as high as the sternum (the bone between the breasts). It is a hormone-induced excess production of brown material (pigment) in the skin cells in this area. After delivery, the line begins to fade, though it may never completely disappear.

7.8.2 Mask of pregnancy (chloasma)

Some women produce a brownish pigmentation of the skin over the face and forehead, known as the 'mask of pregnancy' (or chloasma). It gives a bronze look. It begins about the 16th week of pregnancy and gradually increases, but it usually fades after delivery. You will learn more about it in Study Session 8.

7.8.3 Stretch marks

As the woman's weight increases, stretching of the skin occurs over areas of maximal growth — the abdomen, thighs and breasts. Pink or brownish stretch marks may appear in some women, which can be quite dramatic. They usually fade after delivery, although they never completely disappear.

7.8.4 Sweat glands

Activity of the sweat glands throughout the body usually increases during pregnancy, which causes the woman to perspire (sweat) more profusely than usual, particularly in hot weather or during physical work.

7.9 Changes in the breasts

In early pregnancy, the breasts may feel full or tingle, and they increase in size as pregnancy progresses. The **areola** around the nipples (the circle of pigmented skin) darkens and the diameter increases. The Montgomery's glands (the tiny bumps in the areola) enlarge and tend to protrude (stick out more). The surface blood vessels of the breast may become visible due to increased circulation, and this may give a bluish tint to the breasts.



By the 16th week (during the second trimester), the breasts begin to produce **colostrum**. This is the precursor of breastmilk. It is a yellowish secretion from the nipples, which thickens as pregnancy progresses. It is extremely high in protein and contains **antibodies** (special proteins produced by the mother's immune system) that help to protect the newborn baby from infection. Near the end of pregnancy, the nipples may produce enough colostrum to make wet patches on the woman's clothes. Reassure her that this is normal and a good sign. After the baby is born, colostrum is produced for about the first three days, before the proper milk begins to flow. Make sure that the mother breastfeeds the colostrum to her baby, so he or she gets all the nutrients and antibodies it contains.

In Study Session 8, you will meet some signs of these physiological changes in pregnancy again, when you learn how to diagnose whether a woman is pregnant, and how to gather information about her 'pregnancy history'.

Summary of Study Session 7

In Study Session 7, you have learned that:

- 1 Oestrogen and progesterone are the chief pregnancy hormones.
- 2 High levels of progesterone cause some internal structures to increase in size, including the uterus which changes from the size of a small pear in its non-pregnant state to five times its normal size at full term.
- 3 The expected increase in weight of the mother in an average pregnancy is 9–12 kg.
- 4 A higher circulating blood volume is required to provide extra blood flow through the placenta to the fetus, and the mother also produces more red blood cells.
- 5 The increase in blood volume exceeds the increase in red blood cells, so they are diluted in the much larger volume of blood plasma, causing physiological anaemia. This is one reason why iron supplementation is so important in pregnancy.
- 6 Lower blood pressure is particularly common in early pregnancy because progesterone causes a slight relaxation in the blood vessels. This can cause dizziness and perhaps even a brief loss of consciousness.
- 7 A reduction in blood flow back to the heart may lead to oedema — swelling due to fluid collecting in the legs and feet.
- 8 During pregnancy, many women get short of breath because the growing baby crowds the mother's lungs and she has less room to breathe. She may also experience indigestion as her stomach is pushed higher.
- 9 During pregnancy, the muscles in the walls of the gastrointestinal system relax slightly, and the rate at which food moves along the gut is slowed down. This maximises the absorption of nutrients into the mother's blood, which is good for the fetus, but the mother may also experience nausea or constipation.

- 10 Needing to urinate often is normal, especially in the first and last months of pregnancy, because the growing uterus presses against the bladder. At night, the bladder fills more quickly as fluid (oedema) that collected in the legs during the day is re-absorbed.
- 11 Changes in the woman's hormones, and mechanical stretching of her growing abdomen and breasts, can cause stretch marks in the skin of these areas during pregnancy. Other skin changes may include brown pigmentation and increased sweating.
- 12 In the second trimester, the breasts begin to produce colostrum — a yellowish secretion that thickens as pregnancy progresses. It is rich in proteins and maternal antibodies, and should always be fed to newborn babies.

Self-Assessment Questions (SAQs) for Study Session 7

Now that you have completed this study session, you can assess how well you have achieved its Learning Outcomes by answering these questions. Write your answers in your Study Diary and discuss them with your Tutor at the next Study Support Meeting. You can check your answers with the Notes on the Self-Assessment Questions at the end of this Module.

SAQ 7.1 (tests Learning Outcome 7.2)

What causes back pain in pregnant women?

SAQ 7.2 (tests Learning Outcome 7.3)

A pregnant woman gained 2 kg in the first 20 weeks of pregnancy, then 0.5 kg a week for the next 10 weeks, then 0.1 kg for the last 10 weeks. What is her total weight gain at full term? What does this suggest might be happening?

SAQ 7.3 (tests Learning Outcome 7.4)

Why is it important for pregnant women to have more iron-rich foods in their diet, or take iron tablets?

SAQ 7.4 (tests Learning Outcome 7.4)

What could happen to a pregnant woman if she is lying on her back? Explain your answer.

SAQ 7.5 (tests Learning Outcome 7.5)

What information might help you to make a decision on the need for medical advice when a pregnant woman has shortness of breath?

SAQ 7.6 (tests Learning Outcomes 7.1, 7.2, 7.4 and 7.5)

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

- A Lying flat after a meal is recommended for pregnant women because it helps digestion.
- B Frequent urination in late pregnancy is normal because the uterus pushes down on the bladder.
- C Heart rate, stroke volume and cardiac output all increase during pregnancy.
- D Oedema in pregnancy gets worse during the night.
- E Pigmentation may appear on the face, or as a dark line on the abdomen in some pregnant women.
- F Colostrum should not be fed to newborn babies.
- G Progesterone causes the uterus to increase in size to accommodate the growing fetus.

Study Session 8 Diagnosing Pregnancy and Learning a Pregnant Woman's History

Introduction

This study session begins by providing you with the knowledge to diagnose when a woman is pregnant. You will learn to distinguish between the possible, the probable, and the positive (or sure) signs and symptoms of pregnancy. A **symptom** is an indication of a condition (such as pregnancy), or a disease or disorder, that is noticed by the affected person and which they can tell you about either spontaneously, or if you ask the right questions. By contrast, a **sign** is an indication that only a trained health professional would notice, or be able to detect by conducting a test.

To give good care to a pregnant woman, you also need to find out about her general health and any past pregnancies and births she may have had, and what this pregnancy has been like so far. These details are called a **health history**. The process of gathering all the information and recording it using clear, accessible questions is called **history taking**. In this study session you will learn how to ask focused questions about a pregnant woman's health history. This knowledge will help you give correct and individualised advice to make this pregnancy and birth as safe as possible. You will also recognise the importance of maintaining the woman's trust by keeping what she says to you confidential.

Learning Outcomes for Study Session 8

When you have studied this session, you should be able to:

- 8.1 Define and use correctly all of the key words printed in **bold**. (SAQs 8.1 and 8.4)
- 8.2 Say why it is important to gain the trust and confidence of a woman who comes to you for antenatal care, and give an example of how you can keep or lose her trust. (SAQ 8.1)
- 8.3 Distinguish between the possible, probable and positive signs of pregnancy, and decide whether a woman is possibly or probably pregnant, based on fictional case studies. (SAQ 8.2)
- 8.4 Ask clear, accessible questions to help you get information about possible pregnancy symptoms, or common risk factors that might affect the health of a pregnant woman or her baby. (SAQs 8.1 and 8.5)
- 8.5 Identify the serious risk factors that would make it advisable for a woman to give birth in a health facility rather than at home. (SAQs 8.3 and 8.4)

8.1 Gaining a woman's trust in antenatal care

In order to make a good diagnosis of whether a woman is pregnant, or learn about her health history as part of her antenatal care, you must first gain her trust, and make her feel comfortable to talk to you about her personal details. Begin by introducing yourself and asking her respectfully to talk about herself and her health history. At first, she may not be willing to do this. If she feels shy about her body or about sex, it may be difficult for her to tell you things that you need to know about her health. Try to help her relax and trust you by

listening carefully, answering her questions in language that she understands, keeping what she tells you private, and treating her with respect.

- What could happen if you tell others what she has said to you about her personal history?
 - She could lose trust in you as a health professional. She may be less willing to talk honestly to you the next time you see her.
- How could her loss of trust in you lead to a greater risk for her health or that of her baby?
 - She may not tell you important information about her pregnancy that could help you to identify possible risk factors before they become serious. She might even miss antenatal appointments because she doesn't trust you.

You will be writing down what you learn about each pregnant woman in her antenatal record card (Figure 8.1).

This information may be needed later in the pregnancy, during labour and delivery, or after the baby is born (the postnatal period). Reassure her that you won't let anyone except other health professionals see the notes you have made about her.

First we will suggest the kinds of questions you could ask to help identify whether a woman is pregnant. Then we will explain what other information you will need to ask her about. This is so you can identify any risk factors she may have, and look after her effectively during the pregnancy.

8.2 Finding out if a woman is pregnant

The indications of pregnancy are generally classified into three groups:

- The **possible symptoms**: changes in her body that a woman can identify for herself and tell you about, which may mean she is pregnant, but they could also be caused by something else. You only have the woman's subjective report on which to base your diagnosis. However, at Health Post level, the possible symptoms are often all the evidence that is available to you in the first three to six months.
- The **probable signs and symptoms**: some of these indicators are reported by the woman, but you can also see them for yourself. There is also a pregnancy test that you may be able to conduct, or that could be done at the next level health facility.
- The **positive signs**: these are absolute proof of pregnancy, based on objective findings.

8.2.1 Possible symptoms of pregnancy

The possible symptoms commonly reported by women in the early stages of pregnancy are sometimes also called 'presumptive signs' because pregnancy is often 'presumed' by the health professional on the basis of these subjective reports. But it is important to remember that they are only *possible* indicators of pregnancy.



Figure 8.1 Making good notes is essential when you learn a pregnant woman's health history.

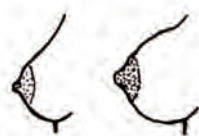
Missing a menstrual period (amenorrhoea)

Missing a menstrual period is often the first symptom that women notice when they become pregnant. If the woman tells you that she has missed a menstrual period (**amenorrhoea**), or stopped menstruating altogether for some months, it is a fairly good indicator of conception in women who usually have regular menstrual cycles. Other possible causes of amenorrhoea are poor nutrition, emotional troubles, or the menopause (change of life) in older women.

Amenorrhoea is pronounced 'ay-men-oh-ree-ah'.

Breast changes

Pregnant women may report feelings of breast tenderness, fullness, tingling and enlargement and darkening of the **areola** (the darker circle of tissue around the nipple). During early pregnancy, the glands of the areola enlarge as a result of hormonal stimulation, and the breasts gradually get bigger to prepare to make milk for the baby. But note that breasts often get bigger just before the monthly menstruation in women who are not pregnant.



Nausea and vomiting

This common symptom occurs in approximately 50% of pregnancies during the first three months. It is usually most severe in the morning, which is why this feeling is often called morning sickness. But it can occur at any time and may be stimulated by cooking odours and spicy smells. Some pregnant women feel nauseous all day. Other possible causes of this symptom are illness or parasites. Severe, frequent vomiting is a danger symptom because the woman can lose weight rapidly. You will learn more about this in Study Session 12.

Tiredness

Women in early pregnancy may report feeling tired and sleepy during the day, and wanting to rest more often than usual when doing their work. Other possible causes are anaemia (see Box 8.1), poor nutrition, emotional troubles, or too much heavy physical work.



Box 8.1 Anaemia

Anaemia is a blood condition that can make a person feel tired all the time. The blood contains red cells which carry oxygen around the body, delivering it to the muscles and organs where they use it to make energy. A person with anaemia doesn't have enough red blood cells, so their body is short of oxygen and it can't make enough energy for normal activity. There are several causes of anaemia, but the most common is shortage of iron in the diet. Iron is needed to make new red blood cells. Anaemia causes problems in pregnancy and birth, but it can be prevented by eating enough foods with protein and iron in them. Pregnant women need a lot of iron so they are routinely given iron tablets. You will learn about nutrition in pregnancy in Study Session 14. The diagnosis and treatment of anaemia is covered in Study Session 18.

Frequent urination

Pregnant women often report needing to urinate more frequently particularly during the first three months and the last one or two months of pregnancy.



Other possible causes of this symptom are stress, a bladder infection, or diabetes (blood sugar disease). You will learn about diagnosing diabetes in Study Session 9, and bladder infections in Study Session 18.

Quickening

Most pregnant women start to feel their baby moving very lightly inside them before they are half-way through the pregnancy. This feeling is known as the baby ‘quickening’. Women who have had a baby before are sensitive to these tiny movements sooner than women who are pregnant for the first time. The first perception of fetal movement usually occurs at 18–20 weeks of pregnancy in *primigravidas* (women who are pregnant for the first time), but it can be as early as 14–16 weeks in *multigravidas* (women who have had more than one pregnancy). Another possible cause of this symptom is gas in the belly.

Chloasma (or the ‘mask of pregnancy’)

Darkening of the skin over the forehead, bridge of the nose, or cheekbones, is called **chloasma**. It is most marked in women with dark complexions (Figure 8.2). Darker patches may also appear on the breast and the belly, especially along the mid-line below the navel. Signs of chloasma usually occur after 16 weeks gestation, (four months of pregnancy) and are intensified by exposure to sunlight, but these changes in the skin are not reliable indicators of pregnancy.

- Could you conclude that a woman was definitely pregnant if she had all of the above symptoms?
- You could not be certain that she is pregnant, because some normal bodily changes or health problems have the same manifestations as these possible symptoms of pregnancy.

Chloasma is pronounced ‘klo-az-mah’.

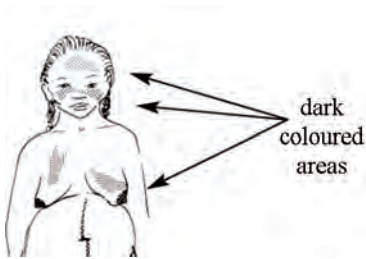


Figure 8.2 Chloasma may indicate pregnancy, but it may be a reaction to sunlight.

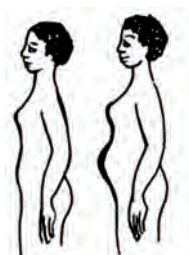
8.2.2 Probable signs and symptoms of pregnancy

These are more reliable than the possible symptoms, but they are not certain indicators of pregnancy.

Abdominal enlargement

There is progressive enlargement of the abdomen (belly) from 7 to 28 weeks of pregnancy. At 16 to 22 weeks, growth may appear more rapid as the uterus rises higher into the abdomen.

- Can you suggest other possible causes of abdominal enlargement?
- The most obvious is that the woman is just getting fatter. But you should also consider whether she could have a cancer, or another type of growth in her belly.



Chorionic is pronounced ‘korr-ee-onn-ik’. Gonadotropin is pronounced ‘gonn-add-oh-troh-pinn’.

Pregnancy test for human chorionic gonadotropin (HCG)

This hormone is produced by a part of the embryo only 8 days after conception, and by the placenta throughout pregnancy. It can be detected by chemical tests that can usually only be done at higher-level health facilities. Pregnancy testing kits may be purchased from some pharmacies, but they are expensive.

The hormone can be detected in the mother's blood and urine eight to ten days after conception, or 40 days after the last menstrual period. When people refer to a 'pregnancy test', the urine test for HCG is usually what they mean. Although it gives a good indication of pregnancy in most cases, the testing kits may give a false result, especially if they have not been stored properly, or are out of date. Also there are some disease conditions that result in secretion of HCG.

Painless uterine contractions

As the uterus enlarges, it becomes globular (round) and often rotates to the right. Painless uterine contractions are felt as tightening or pressure. They usually begin at about 28 weeks' gestation and increase in regularity. These contractions usually disappear with walking or exercise, whereas true labour contractions become more strong and powerful.

8.2.3 Positive signs of pregnancy

A positive diagnosis of pregnancy can be made on the basis of these signs, which are sometimes called 'sure' signs. They cannot generally be detected until after the first 3 months of pregnancy.

Fetal heart tones (FHTs)

The normal fetal heart rate is 120–160 beats per minute. The heartbeat may be detected from 18–20 weeks' gestation by placing a fetoscope (Figure 8.3) on the woman's belly and listening. You will learn how to do this in Study Session 11 and your practical skills training. Hospitals sometimes have a machine called a hand-held Doppler that can detect fetal heart tones as early as 10 weeks' gestation.



Figure 8.3 A one-ear fetoscope

Palpation of the fetus

You should be able to feel (palpate with your hands) fetal movements through the mother's abdominal wall at about 18 weeks of pregnancy, and after 22 weeks the fetal outline can be felt. You will learn how to do this in Study Sessions 10 and 11 and your practical skills training.

Ultrasound examination

Ultrasound examination (or sonography) is one of the most useful technical aids in diagnosing and monitoring pregnancy, but it can only be done in a health facility with the right equipment. Sound waves that are so high you cannot hear them are passed through the mother's abdomen by the machine and they 'bounce' back off the baby. A computer turns these sound waves into an image of the fetal outline; the placenta and umbilical cord can also be seen. Fetal wellbeing can be monitored by ultrasound as the pregnancy progresses.

- Which of the signs and symptoms of pregnancy in Sections 8.2.1 to 8.2.3 can you use in your kebele to help you diagnose pregnancy at the community level?
- You can base your diagnosis on a combination of the possible symptoms that women tell you about (amenorrhoea, breast changes, nausea and vomiting, especially morning sickness, frequent urination, tiredness in the daytime, quickening of the fetus, and chloasma); and the probable signs and symptoms of abdominal enlargement and the woman experiencing painless uterine contractions. The positive signs that you can detect at

community level at 18 to 22 weeks' gestation are hearing fetal heart tones with a fetoscope, and palpating the fetus through the mother's abdominal wall.

Activity 8.1 Asking questions about possible symptoms of pregnancy

Allow about 10 minutes for this activity.

In your Study Diary, write down the questions you would ask a woman if you are trying to find out if she is possibly pregnant. Remember to use respectful language and words that she will understand.

Discuss your questions with your Tutor at your next Study Support Meeting.

This activity relates to Self-Assessment Question 8.5 at the end of this study session.

8.3 Identifying possible risk factors in pregnancy

Let's assume you have decided that a woman is probably pregnant, and that you need to take her health history in order to plan her antenatal care. An important aim of history taking is to identify whether she has any risk factors that could lead to complications during the pregnancy, or at labour and delivery, or in the postnatal period. Asking clearly focused questions will help you do this.

8.3.1 How old is she?

Pregnancy can cause problems for women of any age. But very young women and much older women tend to have more problems.

Girls who become pregnant before they are 17 years old may not have finished growing themselves. A girl's pelvis might not be grown enough to give birth normally. Girls are more likely to have other problems too — like pre-eclampsia (see Box 8.2), long labours, and babies born too early. Girls who get pregnant when they are very young can be wonderful and caring mothers, but many of them will need extra advice and support.

Older mothers may also have more problems in pregnancy and birth.

Box 8.2 Pre-eclampsia and eclampsia

Pre-eclampsia is a serious condition characterised by high blood pressure (hypertension), swelling of the hands, feet and even the face, and significant amounts of protein in the urine (proteinuria). It usually develops in the last 3 months of pregnancy. Women with this condition feel very unwell, often reporting severe headaches, nausea and vomiting.

If untreated, pre-eclampsia can progress to **eclampsia**, in which all of the above symptoms worsen and the woman develops mental confusion, visual disturbances and convulsions (fits). Eclampsia is life-threatening for the woman and her unborn baby.



It may be safer for older women and very young women to give birth in a well-equipped health facility rather than at home.



If you suspect a pregnant woman may be developing pre-eclampsia you should refer her to the nearest health facility immediately.



Eclampsia, pre-eclampsia, and other types of diseases due to high blood pressure, are known as hypertensive disorders of pregnancy; they are discussed in detail in Study Session 19.

8.3.2 How many children has she had?

Women who have already had one or two babies, and whose children were born alive and healthy, usually have the fewest problems giving birth. Other women may have more problems. First births are often more difficult than later births. Watch carefully for danger signs and have transportation available for emergencies.

8.3.3 Has she had any miscarriages?

A **miscarriage** (spontaneous abortion) is when a pregnancy ends before the woman is 28 weeks' pregnant, while the baby is still too small to live outside the mother without very specialised hospital intensive care. Spontaneous abortion is common and often happens before the woman even knows she is pregnant.

It is usually difficult to know why a miscarriage happens, but some causes of miscarriage are preventable. Malaria, sexually transmitted infections, injury, violence and stress can all cause a pregnancy to end spontaneously. Sometimes miscarriages happen because a woman has been near poisons or toxic chemicals. For example, women who work on farms often breathe or handle pesticides, and they tend to have more miscarriages than women who are not exposed to chemicals. Some miscarriages can be prevented by treating women for illness or infection, or by helping them to avoid exposure to chemicals or violence.

8.3.4 Has she ever had an abortion?

If a person, or the woman herself, does something to her body to end a pregnancy, this is called an **abortion**. Where abortion is legal and available, a woman can have a safe abortion that will not usually endanger her future pregnancies.

In places where abortion is illegal, a woman trying to end a pregnancy may harm herself, or turn to someone who does not give abortions safely (Figure 8.4, on the next page). Unsafe abortions can cause heavy bleeding, serious infection, infertility, or even death. Study Session 20 will teach you how to help a woman after an unsafe abortion.



For these reasons, it may be safer for a woman who is having her first baby, or who has had five or more babies already, to give birth in a health facility.

Some women have one miscarriage after another, and you may not know why. Refer her to the nearest health facility to find the cause, and to help her carry this pregnancy all the way through.

A woman who was sick, injured, or bled heavily after any kind of abortion, may have scars in her uterus that could cause problems in this pregnancy or birth. It is probably safer for her to give birth in a hospital.



Figure 8.4 Infection is a serious risk from an unsafe abortion, because dirty fingers or instruments may be put into the woman's body.

8.3.5 Has she had any problems with past pregnancies or births?

If a woman has had problems with past pregnancies or births, she may have problems with this birth too. Ask the mother to tell you the story of each of her past pregnancies and births. Let her tell you everything: the good *and* bad. Then ask the following questions to learn more about problems in past pregnancies, and what to be prepared for during this one. Write down what you learn. All these problems are explained more fully in other study sessions in this Module.

Was she tired or weak or anaemic?

Extreme tiredness or weakness in pregnancy is usually caused by anaemia (see Box 8.1 earlier). If she had anaemia in another pregnancy, she is likely to have it again this time.

Did she have high blood pressure, swelling or convulsions?

If she had high blood pressure in a past pregnancy, she is likely to get it again. High blood pressure can be a sign of pre-eclampsia (see Box 8.2 earlier). Check her blood pressure and other signs of pre-eclampsia regularly and be prepared to refer her to a hospital if it develops.

Did she have diabetes?

If she had **diabetes** (too much sugar in the blood) in a past pregnancy, she is more likely to get it again. When blood sugar is too high, some of it gets into the urine when the blood is filtered in the kidneys. You should be able to test a pregnant woman's urine to see if there is sugar in it. (We teach you how to do this in Study Session 9.) A more reliable test can be done at a health facility. Diabetes can lead to miscarriage, or other problems with the mother or baby after birth.

Did she have a very long labour or a long pushing stage?

Was her labour longer than 24 hours for a first baby, or longer than 12 hours for other babies? Did she push for more than two hours? Was the baby in a difficult position or very big? Was she very afraid? Ask if her long labour caused problems for her or her baby. If that birth was safe for her and the baby was OK, then she will probably not have a problem with this birth. If



If she had convulsions in a past pregnancy or birth, she probably had eclampsia (Box 8.2), and she should definitely give birth in a hospital.

that birth was difficult, ask her if she knows why the labour was long. Did she have anaemia?

Did she have fistula?

If she had a long labour, did it cause a **fistula** (an abnormal opening communicating between the vagina, and either the urinary bladder, or the rectum, or the urethra, or the ureter)? This is more likely to happen in women who had the harmful traditional practice of female genital mutilation when they were children. Urine or stools pass through the fistula into the vagina and leak out continuously, unless the fistula is closed by a surgical operation.



Past history of a fistula means she should definitely have this birth in a hospital.

Did she have a very short labour (less than 3 hours)?

If the mother had a very short labour in the past, make sure that she and her family know what to do if you do not get there in time, and they cannot get her to a health facility. You can teach the family how to deliver a baby in an emergency. You will learn how to do this in the next Module, *Labour and Delivery Care*.

Did she have an early birth?

If she had a baby born more than a month early, ask her if she had a discharge from her vagina. This could be a symptom of a vaginal infection, which can lead to early births. Be ready in case this baby is early too, and watch for signs of labour, described in the next Module, *Labour and Delivery Care*.

Did she have a small baby (less than 2.5 kilograms or 5 pounds)?

Find out if the baby was born early (it is normal for early babies to be small). If the baby was small but it came on time, ask the mother if she had anaemia (Box 8.1), high blood pressure, or pre-eclampsia (Box 8.2). Also ask if she had enough to eat, or if she smoked cigarettes, or used drugs. Any of these things could have made the previous baby small.

Check the size of her abdomen to see if this baby is growing normally. (You will learn how to do this in Study Session 11.) If you think this baby may be very small for its gestational age, the mother should give birth in a hospital, because small babies can develop more health problems than normal weight babies. (The Module on *Postnatal Care* will explain why, and what you can do to help.)



Did she have a big baby (over 4 kilograms or 9 pounds)?

Ask if the birth was difficult. If it was not, this birth will probably be OK too. But having a large baby may be a sign that the mother has diabetes. Check carefully to see if this baby seems big too. Test her urine for sugar, and if possible have the mother tested for diabetes in a health facility.

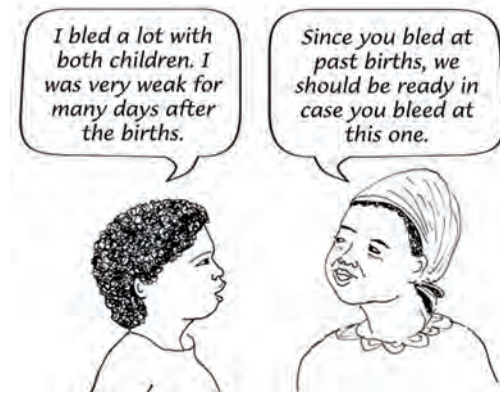
- Can you explain why the baby may grow large if the mother has diabetes?
- We said earlier that diabetes in the mother causes too much sugar in her blood. The baby is fed by nutrients from her blood, so it gets too much sugar and may become fat.



If possible, a woman who bled heavily before should have this baby in a hospital.

Did she have heavy bleeding before or after the birth?

If she bled a lot in a past pregnancy or birth, it is more likely to happen again. Ask her to tell you as much as she can remember about her bleeding. Did she need medical help? Was she anaemic afterwards? Was she too weak to stand? The answers to these questions will help you prepare for what may happen at this birth. Be ready to treat her for heavy bleeding after the birth. The Module on *Labour and Delivery Care* will explain how to do this.



It is better if a woman who had a retained placenta after a previous birth gives birth in a hospital next time.

Did she have any problems with the placenta (afterbirth)?

If the woman's placenta did not come out easily in a past birth, she may have the same problem again. Tell her to watch out for signs of bleeding during this pregnancy, and to seek help from a health professional immediately if it happens.

Did she have a fever or infection of the vagina or uterus?

This birth may be fine, but if she had an infection of the vagina or uterus during or after a previous birth, she has more risk of infection again this time. Be sure to check her for signs of vaginal infection. (Study Session 9 explains how to do this.)

Postnatal depression is a serious health problem and she must be referred to the next level health facility.

Was she very sad (depressed) after the birth?

If a woman became depressed after a past birth, it may happen again. Be prepared to help if this happens. (Counselling is covered in Study Session 14.)

If you think there may be a risk to her next baby, refer her to the nearest health facility.

Did the baby get sick or die before, during or after the birth?

Find out everything you can about the circumstances of the baby's sickness or death. If the woman was seen by health professionals at the time, what did they tell her had caused it? Does she have her own ideas about what happened, and why?

Did her baby have birth defects?

Some birth defects just happen and no one knows why. Others run in the family. Ask about the type of birth defect and if anyone else in her or the baby's father's family has that birth defect. The next baby may have the same problems. Some defects are caused by illnesses like herpes or rubella. If the woman had herpes or rubella in a past pregnancy, reassure her that these infections will probably not cause birth defects in this pregnancy. Pregnant women should try to avoid contact with people who are sick. Other causes of birth defects are exposure to toxic chemicals, drugs or medicines, or they may

be due to poor nutrition during the pregnancy. Eating a healthy diet in pregnancy is covered in Study Session 14.

Did she have caesarean surgery (birth by operation)?

In **caesarean surgery** a doctor cuts open the woman's belly and uterus to get the baby out. Sometimes a caesarean surgery is done because the baby does not fit through the mother's pelvis. Sometimes it is done because the baby is in danger and must be born very quickly. After the baby is out, the doctor sews the uterus and belly closed. This leaves one scar on the uterus and a second scar on the belly (Figure 8.5).



It is safest for a woman who has had a previous caesarean to give birth in a hospital again next time.

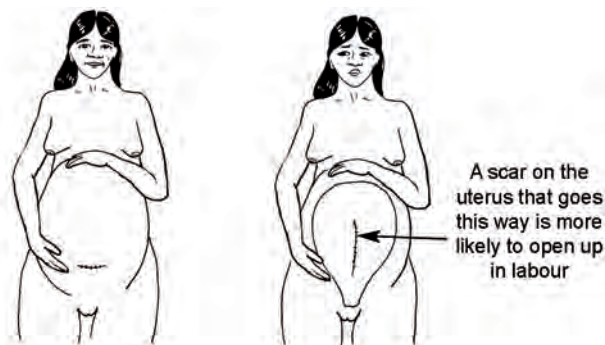


Figure 8.5 A caesarean operation leaves one scar on the belly (left) and another on the uterus (right).

Most women can have a safe vaginal birth even if they had a caesarean birth with a previous baby. But there is a very small chance that the scar on the uterus may tear open (rupture) during labour. If this happens, the woman will bleed inside and she and her baby could die.

8.3.6 Does she have any other health problems?

Most women are in good health and are able to give birth without risk to themselves or their babies. However, it is an important part of your role as a health professional to identify women who are at higher risk because they have a current or past health problem. If a pregnant woman is sick with any of the following problems, now or in the past, she should get medical help to plan for her needs during pregnancy, and decide if she should give birth in a hospital:

- Diabetes
- HIV/AIDS
- Bladder or kidney infection
- Malaria
- Fever over 37.5°C (100.4°F) for more than two days, or frequent fevers
- High blood pressure
- Pre-eclampsia or eclampsia
- Liver disease (hepatitis, especially hepatitis B)
- Heart problems
- Untreated tuberculosis (TB)
- Deformity of the hips or lower back.

8.3.7 Questions of your own

You probably have some questions of your own that you want to ask the pregnant women you meet, but that we did not include in this study session. For example, if there is hepatitis B in your community, you may want to ask the woman if she has hepatitis B, or tell her how to prevent it. Think about the information you need to know in order to give her good antenatal care, and prepare for labour, delivery and the postnatal period.

Later in this module, Study Session 13 will explain the detailed schedule of four antenatal visits recommended for focused antenatal care (FANC), and the guidelines on what to cover in each visit. You will learn how to make clear, systematic notes on the integrated care card that you will complete every time you visit a pregnant woman, and during her labour, delivery and postnatally. But first you need to know how to examine her and her baby, as the next study sessions describe.

Summary of Study Session 8

In Study Session 8, you have learned that:

- 1 It is important to maintain the trust of the woman when you question her about her health history; keep your notes confidential and don't tell anyone else what she says.
- 2 The questions you ask should be respectful and in accessible language the woman can understand.
- 3 Making a pregnancy diagnosis is based on a combination of possible symptoms reported by the woman, and probable and positive signs and symptoms that you observe yourself, or which can be confirmed by a physical examination or chemical test.
- 4 The most commonly reported possible symptoms of early pregnancy are stopping monthly bleeding; breast changes; nausea and vomiting, especially in the morning; feeling tired during the day; urinating more often; quickening (feeling light movements of the baby); and chloasma.
- 5 The probable signs and symptoms of pregnancy are abdominal enlargement; a positive pregnancy test for the hormone HCG; and painless uterine contractions. The positive (sure) signs are detection of fetal heart tones; palpation of the fetus; and visual confirmation by ultrasound examination, where facilities exist.
- 6 Very young or older women, first-time mothers, and women who have had many previous births are more likely to experience antenatal problems, and should generally be referred to a health facility for labour and delivery.
- 7 It is important to ask the woman clearly focused questions to identify other risk factors, such as, previous miscarriage or abortion; very large or small babies at birth; a prolonged or very short labour; a fistula; caesarian surgery or heavy bleeding before or after the birth; retained placenta; postnatal depression; a baby who died or had birth defects; or a history of medical conditions such as high blood pressure, diabetes, anaemia, pre-eclampsia or eclampsia, infections, and heart, kidney or liver problems.

Self-Assessment Questions (SAQs) for Study Session 8

Now that you have completed this study session, you can assess how well you have achieved its Learning Outcomes by answering the questions that follow Case Study 8.1. Write your answers in your Study Diary and discuss them with your Tutor at the next Study Support Meeting. You can check your answers with the Notes on the Self-Assessment Questions at the end of this Module.

Case Study 8.1 Is Mrs X pregnant?

Mrs X is 39 years old and has been married for 15 years. She has one child who was born 10 years ago and she is hoping very much that at last she is pregnant again. Mrs X says she and her husband have not used contraception and she doesn't think she has had any miscarriages in that time. She hasn't had her monthly bleeding for the past nine weeks. When you ask her about any changes in her body since her last menstrual period, she says she hasn't noticed anything, but she has been feeling nauseous when she first gets up in the morning and she is more tired than usual. Mrs X tells you that her first baby was born after a labour of 30 hours and he weighed 4 kilograms. She also remembers that she was given iron tablets to take, but she doesn't know why.

SAQ 8.1 (tests Learning Outcomes 8.1, 8.2 and 8.4)

- What is wrong with asking Mrs X 'In your previous pregnancy, did you have pre-eclampsia'?
- How could asking the question in those words damage her trust in you?
- Rewrite this question to avoid causing the problems you identified.

SAQ 8.2 (tests Learning Outcome 8.3)

- What are the possible symptoms of pregnancy in Mrs X's case study?
- Is there anything in her history that suggests she may *not* be pregnant?
- How could she find out quickly whether she probably is pregnant?

SAQs 8.3, 8.4 and 8.5 are on the next page.

SAQ 8.3 (tests Learning Outcome 8.5)

If Mrs X's pregnancy is confirmed, do any of the features of her history suggest that she should be advised to give birth in a health facility this time? Explain why or why not.

SAQ 8.4 (tests Learning Outcomes 8.1 and 8.5)

Explain why Mrs X was given iron tablets during her previous pregnancy. Is this a sign that she had a serious risk factor at that time?

SAQ 8.5 (tests Learning Outcome 8.4)

What questions did you write in your Study Diary when you completed Activity 8.1? Did you take care to use language that women in your community can understand?

Study Session 9 General Assessment of the Pregnant Woman

Introduction

This study session shows you how to conduct a general assessment of the pregnant woman's health status during an antenatal visit. You should make all of these assessments every time you see her for antenatal care. For each assessment, we first describe the signs and symptoms that indicate the pregnant woman is in good health. Then we describe the warning signs and symptoms that may indicate health problems that may lead to a serious complication of pregnancy, including anaemia, diabetes, poor nutrition, iodine deficiency, hypertension, fever, infection, lung and kidney problems.

Later in this module, you will learn about the most serious complications of pregnancy in more detail — HIV infection in Study Session 16; premature rupture of the fetal membranes in Study Session 17; anaemia, malaria and urinary tract infections in Study Session 18; hypertension, pre-eclampsia and eclampsia in Study Session 19; and bleeding in early and late pregnancy in Study Sessions 20 and 21.

Learning Outcomes for Study Session 9

When you have studied this session, you should be able to:

- 9.1 Define and use correctly all of the key words printed in **bold**. (SAQ 9.1)
- 9.2 Know how to assess a pregnant woman for pallor, nutritional status, pulse rate, blood pressure, temperature, shortness of breath, and sugar in the urine. (SAQs 9.2 and 9.3)
- 9.3 Identify the healthy signs and symptoms of pregnancy and the possible warning signs and symptoms of pregnancy complications, based on these assessments. (SAQs 9.2 and 9.3)

9.1 Checking for symptoms of poor nutrition or lack of iodine

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

Warning symptoms

- Not wanting to eat
- Not gaining weight
- Weakness and general ill-health
- Sores, rashes, or other skin problems
- Sore or bleeding gums
- Stomach problems or diarrhoea



Figure 9.1 Goitre may be a warning sign of lack of iodine in the diet.

- Burning or numbness of the feet.

The effects of iodine deficiency are:

- **Goitre** (swelling in the front of the neck caused by iodine deficiency; Figure 9.1)
- Short children
- Children with deafness
- Children with cretinism, a disability that affects thinking.

If you suspect that a pregnant woman's health is poor due to inadequate nutrition, or lack of iodine in her diet, advise her about good nutrition and iodine supplementation. You will learn how to do this in Study Session 14 of this Module.

9.2 Checking her weight

Healthy weight gain

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

Warning sign

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

9.3 Checking her temperature

Body temperature is a measurement of how hot or cold the *internal* tissues of the body are. Although it varies a little bit in hot or cold weather, or if the person is wearing too many or too few clothes, or doing heavy physical work, it generally stays close to a value known as 'normal' temperature, unless the person is ill. Body temperature is measured using an instrument called a **thermometer** (Figure 9.2a), which has a 'bulb' at one end, usually filled with a silver liquid metal called mercury. (Some glass thermometers contain a red dye instead, and some use digital technology — see Figure 9.2b.) In a glass thermometer, when the bulb of mercury is warmed by a person's body, the mercury expands and rises up the thin glass tube, which is marked with numbers showing the person's body temperature.

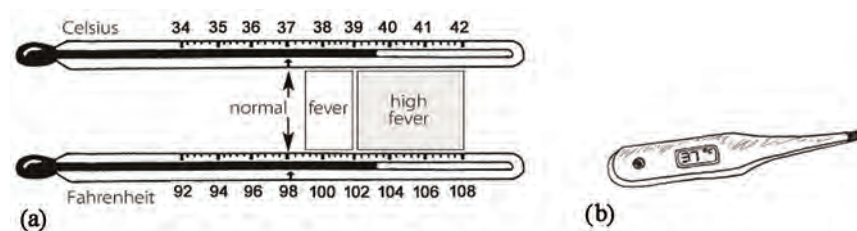


Figure 9.2 (a) Glass thermometers may measure temperature in degrees Celsius (top) or Fahrenheit (below). (b) A digital thermometer shows the temperature as a number in a window.



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

Healthy temperature

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

Warning sign

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

9.3.1 How to check her temperature

If you don't have a thermometer, put the back of one hand on the woman's forehead, and the other on your own, or that of another healthy person (Figure 9.3). If the woman has a fever, you should be able to feel that her skin is hotter than that of a healthy person.

If you have a glass thermometer, clean it well with soap and clean water, or alcohol. Hold the thermometer with the 'bulb' containing the silver mercury pointing away from your hand. Shake it with a snap of the wrist (Figure 9.4), until the top of the thin column of silver mercury falls well below 'normal' body temperature, i.e. less than 36°C (or 96°F).

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

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

- What temperature is showing in Figure 9.2a?
- The mercury has risen to about 39.6°C – a high fever.

Always clean the thermometer with soap and cool water, or with alcohol, after you use it. Do not use hot water — it can break the thermometer! Mercury is a very poisonous metal. Be careful with glass thermometers, and if they break, do not pick up the mercury with your bare hands. Sweep the mercury into a jar and bury it. Do not let children play with thermometers or mercury. Get a digital thermometer if you can (Figure 9.2b).

9.3.2 What to do if the woman has a fever

A fever can be caused by:

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

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

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



Figure 9.3 You can easily feel if she is hotter than you.



Figure 9.4 Shake the mercury to below 36°C.



If the fever does not come down in 8 hours, refer her to a health centre.

9.4 Checking her pulse

The **pulse** tells you how fast the heart is beating. Every time the heart beats (contracts) it pushes blood out into the arteries. You can feel each 'pulse' by pressing gently on an artery with your fingers. Everyone's pulse is different. That is normal. You can find the pulse in the throat or wrist, as shown in Figure 9.5.

Healthy pulse

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

Warning sign

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

9.4.1 How to measure her pulse rate

Wait until the woman is resting and relaxed. Put the pads of two fingers on the pulse (Figure 9.6). Do not use your thumbs, because there is a little pulse in your own thumbs which could confuse you.



Figure 9.6 Make sure the woman is sitting in a relaxed position when you measure her pulse rate.

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

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

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

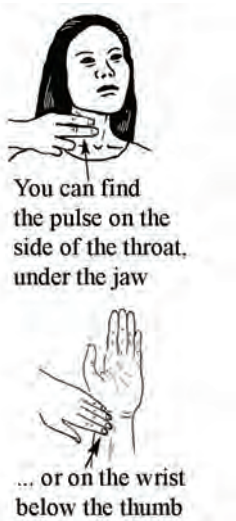


Figure 9.5 Use two or three fingers (never your thumb) to feel the pulse in the neck or inside of the wrist.

9.4.2 What to do if the woman has a fast pulse

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

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



If you do not know what is causing the fast pulse rate (above 100 beats per minute), refer the woman to the nearest health centre.

9.5 Checking for signs of anaemia

When someone has **anaemia**, it usually means the person has not been able to eat enough foods with iron. Iron helps the red blood cells carry oxygen from the air we breathe to all parts of the body. Some kinds of anaemia are caused by illness, not lack of iron. And some kinds of anaemia are inherited (genetic) and cannot be cured by eating iron-rich foods or taking iron pills. You will learn about a blood test for anaemia, and the treatment of anaemia during pregnancy, in Study Session 18, later in this Module.

Healthy signs and symptoms

General good health and plenty of energy. The woman does not have pallor (see below).

Warning signs and symptoms

- Pallor — paleness inside the eyelids, pale fingernails and gums (Figure 9.7)
- Dizziness or fainting
- Weakness or tiredness
- Fast pulse (over 100 beats a minute)
- Difficulty breathing (shortness of breath).



Figure 9.7 Pallor may be a sign of anaemia.

9.6 Checking for shortness of breath

Healthy respiration

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

- What do you think causes this?
 - As the baby gets bigger, it squeezes the lungs so there is less room to breathe. Breathing may get easier when the baby drops lower in the belly shortly before labour begins.

Warning symptom

If shortness of breath is making a pregnant woman uncomfortable, this is a warning symptom, especially if she has other signs of illness (Figure 9.8).



Figure 9.8 Shortness of breath can be a warning symptom.



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

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

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

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

Shortness of breath can also be caused by:

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

9.7 Checking her blood pressure

Blood pressure (BP) refers to how hard the blood is 'pushing' on the walls of the major blood vessels as it is pumped around the body by the heart. The pressure is measured in millimetres (mm) of mercury (a liquid silver metal, which has the chemical symbol Hg), so blood pressure measurements are expressed as a number followed by mmHg. We will show you how to measure blood pressure in Section 9.7.1.

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

Healthy blood pressure

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

Warning signs

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

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

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

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

When a woman has high blood pressure during pregnancy, it is harder for her blood to bring food and oxygen to the baby via the placenta. (You learned about this in Study Session 5.) The baby then grows too slowly. Very high blood pressure can also cause the woman to have kidney problems, bleeding in the uterus before birth, or bleeding in the brain (stroke). It can also be a sign of pre-eclampsia, which can cause premature birth, bleeding, convulsions, or even death for the mother.

9.7.1 How to check blood pressure

There are several types of blood pressure equipment (Figure 9.9).

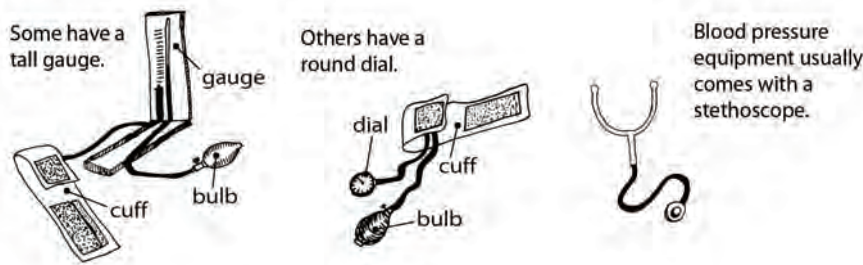


Figure 9.9 Blood pressure equipment may have a tall gauge (left) or a round one (middle). You will also need a stethoscope (right).

When you take the woman's blood pressure, first tell her what you are going to do, and why. Make sure she is sitting or lying comfortably and feels relaxed. Figure 9.10 shows the process step by step.

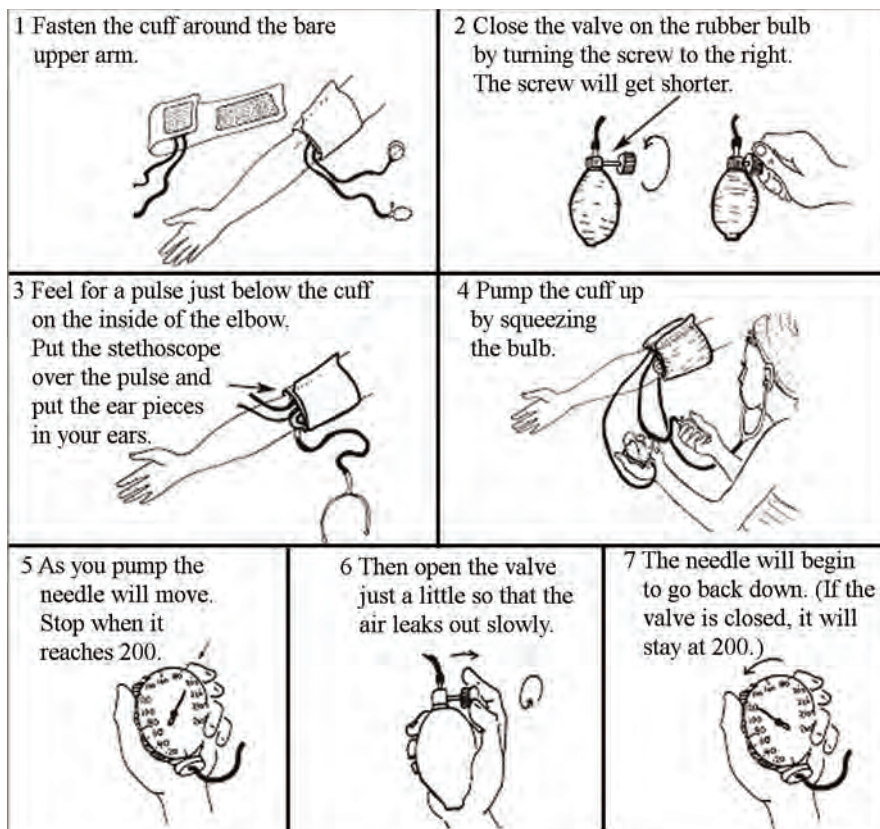


Figure 9.10 Diagrams 1 to 7 show you how to measure blood pressure.

As the air leaks out, you will start to hear the woman's pulse through your stethoscope. Notice where the needle is (see Figure 9.11 on the next page), or where the column of mercury stops if you have a tall gauge (as on the left of Figure 9.9).



If a woman's blood pressure is ever higher than 140/90, then it is too high and can be a warning sign. She needs to be referred to a health centre.

Sept 13	$\frac{100}{60}$	This woman's blood pressure goes up and down a little from month to month. This is normal.
Oct 12	$\frac{110}{62}$	
Nov 15	$\frac{94}{58}$	
Dec 10	$\frac{100}{66}$	
Jan 12	$\frac{110}{72}$	

Figure 9.12 Record the woman's blood pressure as shown in this example.



Figure 9.13 Frequent urination may be a warning symptom of diabetes.

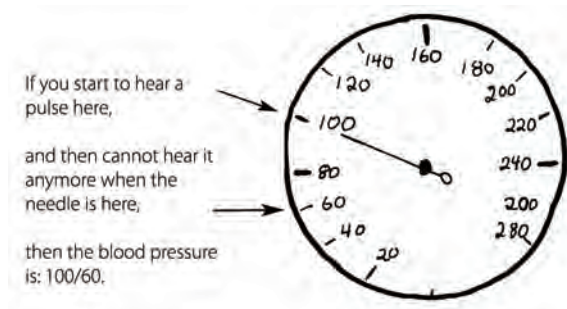


Figure 9.11 This gauge is round, and the pressure is indicated by a needle. The other type of blood pressure equipment has a tall gauge with a vertical column of silver mercury and numbers at the side (left image of Figure 9.9); the top of the silver column indicates the blood pressure.

You can record the woman's blood pressure:

- when you start to hear the pulse (this will be the top number), and
 - when the pulse disappears or gets very soft (this will be the bottom number). Check the woman's blood pressure at each visit.
 - Write the blood pressure down on her antenatal record card so you can check for changes over time (see the example in Figure 9.12). If her blood pressure is going up, ask her to come back every week until you are sure that it is not still rising.
- Look carefully at Figure 9.12. Is there a month in which this woman's blood pressure is high enough to be a warning sign?
 - No. The top number never goes above 110, and the bottom number never goes above 72. It is normal for each number to vary a little bit from month to month.

9.8 Checking for diabetes

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

Warning signs and symptoms

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

- She had diabetes in a past pregnancy.
- One of her past babies was born very big (more than 4 kilograms); this is because the excess sugar in the mother's blood makes the baby put on excess weight.
- One of her past babies was very ill or died at birth and no one knows why.
- She is fat.
- She is thirsty all the time.
- She has frequent itching and a bad smell coming from her vagina.
- Her wounds heal slowly.
- She has to urinate more often than other pregnant women (Figure 9.13).
- Her uterus is bigger than normal for how many months she has been pregnant.

9.8.1 Urine tests for diabetes

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

The dipstick test

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

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

A simple urine test she can do at home

If a woman has the warning signs and symptoms listed on the previous page, but she seems reluctant to visit a health centre for the blood test, or you don’t have dipsticks to test her urine, you can advise her on a simple test she can do at home. Ask her to urinate into a clean container like a pot or a cup, and leave the container outside. If ants climb into the container (Figure 9.14), there is probably sugar in the woman’s urine — a sign of diabetes. Tell the woman to make sure she tells you if the sign is there! Seeing the evidence herself may be enough to convince her to go to the health centre for confirmation of the diagnosis and to get treatment.



Figure 9.14 Ants are attracted to sugar in the urine of someone with diabetes.

9.8.2 How to help a woman with diabetes

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



If you think that a woman has diabetes, she should get medical help. She should plan to have her baby in a hospital.

9.9 Checking for a vaginal infection

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

Warning symptoms

If a pregnant woman has an infection in her vagina, the signs are:

- Whitish or curd-like discharge
- Bad-smelling discharge

If a pregnant woman has an abnormal discharge, or reports any of the other symptoms listed above, refer her to the nearest health centre as soon as possible.

- Itching of the external genitalia (look back at Figure 3.2 in Study Session 3 to remind yourself of the anatomy of the female genital area)
- The vulva could be swollen
- There may be burning during urination
- The woman may report she has pain during sex.

9.10 Conclusion

In this study session, you have learned how to make a routine assessment of a pregnant woman at an antenatal visit, and identify healthy or warning signs and symptoms and the possible actions you should undertake. You have learned how to assess women for poor nutrition, pallor, shortness of breath, hypertension, fever, diabetes and vaginal infection. You have learned how to measure temperature, pulse and blood pressure, and test for sugar in the urine. In the next study session, you will learn how to conduct an examination of the pregnant woman's abdomen to measure the height of her uterus. This helps you to know whether the fetus is growing normally during the pregnancy.

Summary of Study Session 9

In Study Session 9, you have learned that:

- 1 At every antenatal visit you should assess all pregnant women for signs and symptoms of poor nutrition or iodine deficiency, including pallor, lack of energy and goitre.
- 2 Most women gain 9–12 kg during a normal pregnancy, but weight gain is not a reliable indicator of pregnancy outcome. Sudden weight gain near the end of pregnancy is a warning of possible pre-eclampsia and the woman should be referred to a health centre.
- 3 Fever (a temperature of above 37.5°C) should be treated initially with fluids, paracetamol and cold sponging. Refer a pregnant woman to a health centre if her temperature stays high. She needs to be screened for infections such as malaria.
- 4 If the pulse rate rises above 100 beats per minute, it is a sign of ill health and the woman needs referral to a health centre.
- 5 Signs and symptoms of anaemia include pallor, tiredness, fast pulse and shortness of breath. Refer pregnant women with these characteristics.
- 6 Shortness of breath is usual near the end of pregnancy as the growing baby crowds the mother's lungs. Refer her if it causes major discomfort.
- 7 If the blood pressure of a pregnant woman reaches 140/90 mmHg or higher, she has hypertension. All hypertension in pregnancy is a serious illness, which requires immediate referral to a health centre.
- 8 Abnormal vaginal discharge, itching or swelling of the external genitalia, and burning or pain when urinating or during sex, are symptoms of vaginal infection, and the woman should be referred.

Self-Assessment Questions (SAQs) for Study Session 9

Now that you have completed this study session, you can assess how well you have achieved its Learning Outcomes by answering these questions. Write your answers in your Study Diary and discuss them with your Tutor at the next Study Support Meeting. You can check your answers with the Notes on the Self-Assessment Questions at the end of this Module.

SAQ 9.1 (tests Learning Outcome 9.1)

Match each of the diagnoses in list A with its associated warning sign or symptom in list B by drawing arrows between them.

A	B
Pre-eclampsia	pallor
Anaemia	neck swelling
Goitre	fever
Malaria	larger uterus than expected for this stage of pregnancy
Diabetes	high blood pressure

SAQ 9.2 (tests Learning Outcomes 9.2 and 9.3)

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

- A Maternal goitre is caused by iron deficiency.
- B Maternal diabetes often results in a big baby.
- C Shortness of breath may be caused by anaemia, a heart problem, lung infection or a blood clot.
- D A blood pressure of 90/50 mmHg is a sign of good health.
- E A pulse rate of 80 beats per minute or less is a possible warning sign of anaemia.
- F Blood pressure and pulse rate should be measured when the woman is sitting comfortably.

SAQ 9.3 (tests Learning Outcomes 9.2 and 9.3)

At an antenatal visit to see Zufan, you record the following measurements:

- Temperature: 37.2°C
- Pulse rate: 96 beats a minute
- Blood pressure: 142/100 mmHg

Should you refer Zufan to a health centre? Explain why or why not.

Study Session 10 Estimating Gestational Age from Fundal Height Measurement

Introduction

In this study session, you will learn how to carry out an important measurement that should be done at every antenatal visit — measuring the height of the top of the mother’s uterus as a way of assessing whether her baby is growing normally. We teach you two ways of doing this — using your fingers, and using a soft measuring tape. This will enable you to estimate the stage of pregnancy she has reached, and check the accuracy of the due date calculated from the mother’s last normal menstrual period. Then we discuss possible reasons for the uterus growing too quickly or too slowly, and what actions you should take if you suspect that something may be wrong.

Learning Outcomes for Study Session 10

When you have studied this session, you should be able to:

- 10.1 Define and use correctly all of the key words printed in **bold**. (SAQ 10.1)
- 10.2 Know how to measure fundal height using the finger method and a soft measuring tape. (SAQ 10.1)
- 10.3 Interpret fundal height measurements to assess normal fetal growth in relation to gestational age. (SAQ 10.2)
- 10.4 Identify possible causes of abnormal fundal height measurements and take the appropriate actions. (SAQ 10.3)

10.1 What does measuring the height of the mother’s uterus tell us?

The purpose of measuring the height of the mother’s uterus is to determine if the baby is growing normally at each stage of the pregnancy. When you measure the uterus, you check to see where the top of the uterus is.

Healthy signs

- The height of the uterus matches the **gestational age** of the fetus, i.e. the number of weeks or months of pregnancy (gestation).
- The top of the uterus rises in the mother’s abdomen by about two finger-widths, or 4 cm every month.

Warning signs

- The height of the uterus does not match the number of weeks or months of pregnancy.
- The top of the uterus rises more than, or less than, two finger-widths or 4 cm every month.

- Do you remember what the domed region at the top of the uterus is called? (You learned this in Study Session 3.)
- It is called the **fundus**.

When you measure how high the top of the uterus has reached in the mother's abdomen, you are measuring the **fundal height**. This is a much more accurate way of estimating fetal growth than weighing the mother. Measuring the fundal height will show you three things:

- How many months the woman is pregnant now.
- The probable due date. If you were able to figure out the due date from the mother's last monthly bleeding, measuring the height of the top of the uterus can help you see if this due date is probably correct. If you were unable to figure out her due date from her **last normal menstrual period (LNMP)**, measuring the fundal height can help you figure out a probable due date. This should be done during the first antenatal check-up.
- How fast the baby is growing. At each antenatal check-up, measure the fundal height to see if the baby is growing at a normal rate. If it is growing very fast or very slowly, there may be a problem.

As the baby grows inside the uterus, you can feel the uterus grow bigger in the mother's abdomen. The top of the uterus moves about two finger-widths or 4 cm higher each month (Box 10.1).

Box 10.1 Changes in fundal height in a normal pregnancy

At about three months (13–14 weeks), the top of the uterus is usually just above the mother's pubic bone (where her pubic hair begins).

At about five months (20–22 weeks), the top of the uterus is usually right at the mother's bellybutton (umbilicus or navel).

At about eight to nine months (36–40 weeks), the top of the uterus is almost up to the bottom of the mother's ribs.

Babies may drop lower in the weeks just before birth. You can look back at Figure 7.1 in Study Session 7 to see a diagram of fundal height at various weeks of gestation.

10.2 How to measure the fundal height

To feel the uterus, have the mother lie on her back with some support under her head and knees. Explain to her what you are going to do (and why) before you begin touching her abdomen. Your touch should be firm but gentle. Walk your fingers up the side of her abdomen (Figure 10.1 on the next page) until you feel the top of her abdomen under the skin. It will feel like a hard ball. You can feel the top by curving your fingers gently into the abdomen.

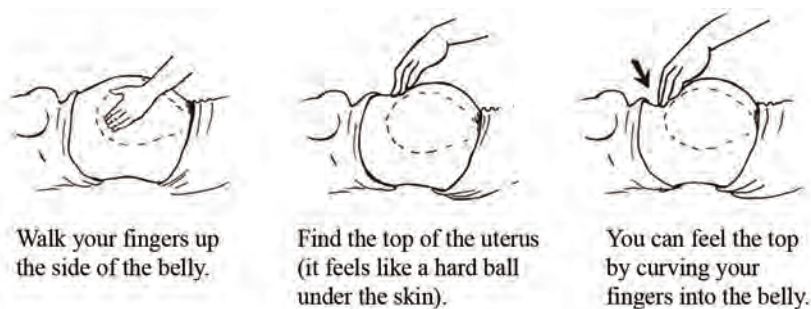


Figure 10.1 With the woman lying on her back, begin by finding the top of the uterus with your fingers. Then see how many months pregnant the woman is by comparing the number of fingers with Figure 10.2 (each line is about the width of two fingers).

10.2.1 How to measure fundal height using the finger method

If the top of the uterus is *below* the bellybutton, measure how many fingers *below* the bellybutton it is. If the top of the uterus is *above* the bellybutton, measure how many fingers *above* the bellybutton it is.

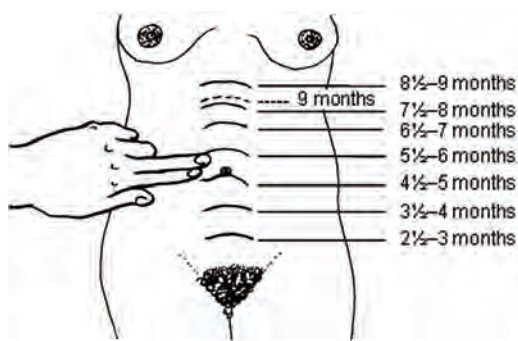


Figure 10.2 Measuring fundal height using the finger method. The woman is lying on her back. Each line represents the width of two fingers.

- Look carefully at Figure 10.2. If the baby is growing normally, by how many finger-widths should the uterus rise in the **second trimester** (3–6 months of pregnancy, or 15–27 completed weeks of gestation)?
- Fundal height should increase by 6 finger-widths (two finger-widths every month) in the second trimester.
- How many fingers above the bellybutton should the top of the uterus be at 7 months' gestation?
- See Figure 10.3 for the answer.
- How do you explain the position of the dotted line at 9 months in Figure 10.2, which is below the line showing fundal height at 8½ to 9 months?
- Babies may drop lower in the weeks just before birth (look back at Box 10.1).



Figure 10.3 Fundal height at 7 months' gestation.

- Look at the diagrams in Figure 10.4(a) and (b). How many weeks pregnant is the woman in each case, based on the finger method of measuring fundal height shown in Figure 10.2?

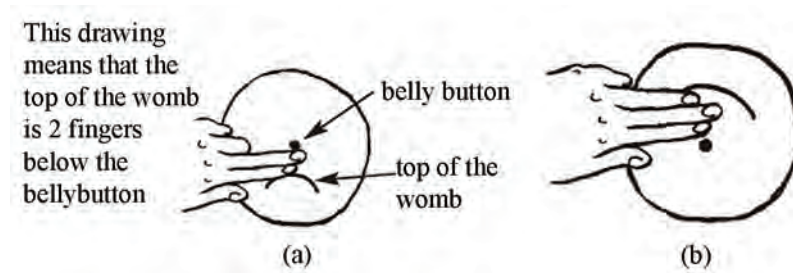


Figure 10.4 (a) and (b) How many months of pregnancy do you think each of these diagrams shows?

- In Figure 10.4(a) the woman is about 4½ months pregnant. In Figure 10.4(b) she is about 6½ months pregnant (three fingers above the bellybutton).

When you measure fundal height at every antenatal visit, write down the number of fingers you used to measure the height of the uterus on the woman's antenatal record card. Put a '+' (plus) sign in front of the number if the top of the uterus is *above* the bellybutton. Put a '-' (minus) sign in front of the number if the top of the uterus is *below* the bellybutton.

- How would you record the measurements shown in Figure 10.4(a) and (b)?
- The measurement in Figure 10.4(a) would be recorded as -2. The measurement in Figure 10.4(b) would be +3.

Limitations of the finger method

You need to be aware that the finger method for estimating **gestational age** (the number of weeks/months of pregnancy) has some limitations that affect its accuracy.

- Look at your own hands. Can you suggest why the finger method might give a different estimate of gestational age if two different health workers used this method to measure the *same* woman's fundal height?
- Because of the big variation in the thickness of our fingers, there could be up to three weeks difference between the fundal height measurement of the same woman made by two different people. (This is known as 'inter-observer variation', i.e. variation between different observers.)

Even if the *same* health worker measures the fundal height of the *same* woman several times on the *same* day, the answer may be different each time, because the finger method is not very precise. (This is known as 'intra-observer variation', i.e. variation by a single observer at different times.)

Finally, you might have realised that the distance between the symphysis pubis (pubic bone) and the umbilicus (bellybutton) varies between women when they are *not* pregnant, and this variation affects the accuracy of the fundal height measurement using the finger method. For example, it assumes

that the distance between the pubic symphysis and the umbilicus is 20 cm at 20 weeks' gestation, but it can be as long as 30 cm and as short as 14 cm.

To overcome these limitations, it is recommended that you measure fundal height using a soft tape measure if you have one, as described next.

10.2.2 How to measure fundal height using a soft tape measure

You can use this method when the top of the uterus grows as high as the woman's bellybutton.

During the second half of pregnancy, the size of the uterus in centimetres is close to the number of weeks that the woman has been pregnant. For example, if it has been 24 weeks since her last normal menstrual period, the uterus will usually measure 22–26 cm. The uterus should grow about 1 cm every week, or 4 cm every month.

- 1 Lay a cloth or soft plastic measuring tape on the mother's abdomen, holding the 0 (zero) on the tape at the top of the pubic bone (see the arrow in Figure 10.5a).
- 2 Follow the curve of her abdomen, and hold the tape at the top of her uterus (Figure 10.5b).
- 3 Write down the number of centimetres (cm) from the top of the pubic bone to the top of the uterus.



Figure 10.5 (a) The arrow points to the top of the pubic bone. Place the 0 (zero) of the tape measure here. (b) Follow the curve of the woman's abdomen and hold the tape at the top of her uterus.

Doctors, nurses and many midwives are taught to count pregnancy by weeks instead of months. They start counting at the first day of the last normal menstrual period (LNMP), even though the woman probably got pregnant two weeks later. Counting this way makes most pregnancies 40 weeks long (or you can say a normal *gestation* is 40 weeks).

10.3 What if the size of the uterus is not what you expected?

If you are measuring correctly and you do not find the top of the uterus where you expect it to be, based on the date the woman gave you for her LNMP, it could mean three different things:

- The due date you got by counting from the LNMP could be wrong.

- The uterus (and the baby) could be growing too fast.
- The uterus (and the baby) could be growing too slowly.

10.3.1 The due date you got by counting from the LNMP is wrong

There are several reasons why a due date figured from the LNMP could be wrong. Sometimes women do not remember the date of their LNMP correctly. Sometimes a woman misses her menstruation for another reason, and then gets pregnant later. This woman could really be *less* pregnant than you thought, so the uterus is *smaller* than you expect. Or sometimes a woman has a little bleeding after she gets pregnant. If she assumed that was her LNMP, this woman will be one or two months *more* pregnant than you thought. The uterus will be *bigger* than you expect.

If the due date does not match the size of the uterus at the first visit, make a note. Wait and measure the uterus again in two to four weeks. If the uterus grows about two finger-widths or 1 cm a month, the due date that you got from feeling the top of the uterus is probably correct. The due date you got by counting from the LNMP was probably *wrong*.

10.3.2 The uterus is growing too quickly

If the uterus grows more than 2 finger-widths a month, or more than 1 cm a week, several different causes are possible:

- The mother may have twins.
- The mother may have diabetes.
- The mother may have too much water (amniotic fluid) in the uterus.
- The mother may have a molar pregnancy (a tumour instead of a baby).

The mother may have twins

It can be very difficult to know for sure that a mother is pregnant with twins. Signs of twins are that:

- The uterus grows faster or larger than normal.
- You can feel two heads or two bottoms when you feel the mother's abdomen.
- You can hear two heartbeats. This is not easy to detect, but it may be possible in the last few months.

We will show you how to listen to the fetal heartbeat through the mother's abdomen in Study Session 11. For now, we are focusing on twins as a possible reason for the uterus being larger than expected. Here are two ways to try to hear the heartbeats of twins:

- 1 Find the heartbeat of one baby. Ask a helper to listen for other places where the heartbeat is easy to hear. If she hears a heartbeat, ask her to listen to one place while you listen to the other. Each of you can tap the rhythm of the heartbeat with your hand. If the rhythms are the same, you may be listening to the same baby. If the rhythms are not exactly the same, you may be hearing two different babies (Figure 10.6).
- 2 If you do not have a helper, but you have a watch with a second hand, or a homemade timer, try timing each heartbeat separately. If the heartbeats are not the same, you may be hearing two different babies.

Remember, due dates are not exact. Women often give birth up to 2 or 3 weeks before or after their due date. This is usually safe.



If you think there might be twins, even if you can find only one heartbeat, refer the woman to the nearest health centre.



Figure 10.6 Tapping the rhythm of the fetal heartbeats may tell you if there is one baby or two.

Because twin births are often more difficult or dangerous than single births, it is safer for the woman to go to a hospital to give birth. Since twins are more likely to be born early, the mother should try to have transportation ready at all times after the 6th month. If the hospital is far away, the mother may wish to move closer in the last months of pregnancy. Be sure to have a plan for how to get help in an emergency.

The mother may have diabetes

You learned about the warning signs of diabetes in Study Session 9.

- If a woman had *all* the warning signs of diabetes, what would you expect to find?
- She had diabetes in a past pregnancy. One of her past babies was born very big (more than 4 kilograms), or was ill or died at birth and no one knows why. She is fat. She is thirsty all the time. She has frequent itching and a bad smell coming from her vagina. Her wounds heal slowly. She has to urinate more often than other pregnant women. Her uterus is bigger than normal for how many months she has been pregnant. She has sugar in her urine when you do the dipstick test (Section 9.8.1 of Study Session 9).



Refer the woman to a health centre if you suspect she may have diabetes.

Too much water in the uterus

Too much water (amniotic fluid) is not always a problem, but it can cause the uterus to stretch too much. Then the uterus cannot contract enough to push the baby out, or to stop the bleeding after the birth. In rare cases, it can mean that the baby will have birth defects. Try to refer the woman to the nearest health facility that can give her a sonogram (ultrasound examination) if the uterus is measuring too big and you do not suspect twins.

Molar pregnancy (tumour)

Sometimes a woman gets pregnant, but a tumour grows instead of a baby. This is called a **molar pregnancy** (Figure 10.7). Blood spotting and tissue (sometimes shaped like grapes) may be discharged from her vagina.

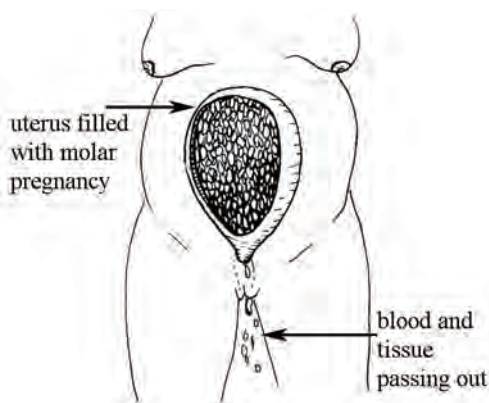


Figure 10.7 A molar pregnancy (tumour) growing in the uterus instead of a baby.

Other signs of a molar pregnancy are that:

- No fetal heartbeat can be heard.
- No baby can be felt.
- The woman has had nausea all through the pregnancy.

If you detect the signs and symptoms of a molar pregnancy, refer the woman to a hospital as soon as possible. The tumour can become a cancer and kill her, sometimes very quickly. A surgeon can remove the tumour to save the woman's life.

- She has spotting of blood, and tissue shaped like bunches of grapes coming from her vagina.

10.3.3 The uterus is growing too slowly

Slow growth can be a sign of one of these problems:

- The mother may have too little water (amniotic fluid) in the uterus. Sometimes there is less water than usual, and everything is still OK. At other times, too little water can mean the baby is not normal, or will have problems during the labour.
- The mother may have a poor diet. Find out what kind of food the mother has been eating. If she is too poor to get enough good food, try to find some way to help her and her baby. Healthy mothers and children make the whole community stronger.
- The mother may have high blood pressure (hypertension). High blood pressure can keep the baby from getting the nutrition it needs to grow well. You learned how to check her blood pressure in the previous study session.
- The mother may be drinking alcohol, smoking, or using drugs. These can cause a baby to be small. Try to find some way to help her to stop these damaging behaviours.
- The baby may be dead. Dead babies do not grow, so the uterus stops getting bigger.



If you do not have the right equipment to check her blood pressure, and the uterus is growing too slowly, refer her to the nearest health centre for evaluation.

If you suspect that the baby may have died, refer the mother to a health centre for the stillbirth.

How to tell if the baby is dead

If the mother is five months pregnant or more, ask if she has felt the baby move recently. If the baby has not moved for two days, something may be wrong. If the mother is more than seven months pregnant, or if you heard the baby's heartbeat at an earlier visit, listen for the heartbeat again.

If the woman reports no fetal movements and you cannot hear the heartbeat, the baby may have died. If so, it is important for a dead baby (stillbirth) to be delivered soon, because the woman may bleed more than other mothers, and she is at more risk of infection.

When a mother loses a baby, she needs love, care and understanding (Figure 10.8). Make sure that she does not go through labour alone. If she gives birth to a dead baby in the hospital, someone she trusts should stay there with her during the birth.



Figure 10.8 When a mother loses a baby, she needs love, care and understanding.

10.4 Conclusion

In this study session, you have learned how to measure the fundal height, using your fingers and a measuring tape. You have also learned to interpret of your measurements and take the appropriate actions. In the next study session you will learn how to assess the position of the baby by palpating (feeling) the mother's abdomen and listening to the position of the fetal heartbeat.

Summary of Study Session 10

In Study Session 10, you have learned that:

- 1 Measuring the fundal height tells you the duration of the pregnancy, how fast the baby is growing, and the probable due date.
- 2 Remember to position the woman correctly before measuring the fundal height. The fundus of the uterus grows on average two finger-widths for each month of pregnancy.
- 3 If the fundal height is not equal to the gestational age, you need to check the duration of pregnancy from the last normal menstrual period (LNMP). Having the wrong date is one of the main reasons for discrepancy between fundal height and gestational age.
- 4 If the fundal height is bigger than expected for gestational age, the mother may have given you the wrong LNMP, or she may have twins, diabetes, too much water in the uterus, or a molar pregnancy.
- 5 If the fundal height is smaller than expected for gestational age, the mother may have given you the wrong LNMP, she may have too little amniotic fluid surrounding the fetus, raised blood pressure, poor nutrition, she may be drinking alcohol or taking other harmful drugs, or the baby may be dead.

Self-Assessment Questions (SAQs) for Study Session 10

Now that you have completed this study session, you can assess how well you have achieved its Learning Outcomes by answering the questions below Case Study 10.1. Write your answers in your Study Diary and discuss them with your Tutor at the next Study Support Meeting. You can check your answers with the Notes on the Self-Assessment Questions at the end of this Module.

Case Study 10.1 Abebech

Abebech is a pregnant woman, whose duration of gestation based on her last normal menstrual period (LNMP) is six months. When you examine her, you can feel that the fundus is four finger-widths above her bellybutton and you can hear a fetal heartbeat clearly.

SAQ 10.1 (tests Learning Outcomes 10.1 and 10.2)

- (a) What is your assessment of the gestational age of Abebech's baby using fundal height measurement?
- (b) How many centimetres would Abebech's abdomen measure from her pubic bone to the top of her uterus in order to confirm your fundal height measurement?

SAQ 10.2 (tests Learning Outcome 10.3)

Is the gestational age of Abebech's baby based on fundal height measurement consistent with the gestational age calculated from her LNMP?

SAQ 10.3 (tests Learning Outcome 10.4)

What possible explanations can you give for your findings in Abebech's case, and what actions should you take?

Study Session 11 Assessing the Fetus

Introduction

In this study session, we turn our attention to the physical examination of the mother in order to find out about the position and health of her baby. You will learn how to examine the mother's abdomen in order to determine whether the fetus is lying head up, head down, or sideways in her uterus. Listening to the fetal heartbeat can also give you information about the baby's position and its wellbeing. At the end of the study session we guide you about what to do if you suspect that the baby's position may lead to a difficult or dangerous birth, or if you suspect the woman may be having twins.

Learning Outcomes for Study Session 11

When you have studied this session, you should be able to:

- 11.1 Define and use correctly all of the key words printed in **bold**. (SAQ 11.1)
- 11.2 Know how to identify normal and abnormal lie of the fetus using palpation and auscultation. (SAQs 11.1 and 11.2)
- 11.3 Know how to assess fetal well-being by auscultation and fetal kick. (SAQs 11.1, 11.3 and 11.4)
- 11.4 Identify fetal conditions that require referral to the nearest health centre. (SAQ 11.4)

11.1 Finding the baby's position in the uterus

The position of the baby in the uterus is known as the **fetal lie**. The purpose of finding the fetal lie is to identify whether there are any danger signs that could make labour and delivery difficult and put the mother and baby at risk.

Healthy signs

- There is only one baby in the uterus.
- The baby is head down at the time of birth.

Warning signs

- The baby is feet or bottom down at the time of birth.
- The baby is lying sideways at the time of birth.
- The mother has twins or triplets. You already know how to listen for two fetal heartbeats (Study Session 10).

There are two methods for finding the baby's position — feeling the mother's abdomen (**palpation**), and listening (**auscultation**) to where the fetal heartbeat is strongest. You may need to use both methods to be sure of the position of the baby.

Auscultation is pronounced 'oss-kool-tay-shun'.

11.2 Feeling the mother's abdomen

It may be difficult to find the position of the baby before the sixth or seventh month of gestation, and it is not important until 36 weeks (eight months) because it is normal for the baby to move around until the final month. Once the pregnancy is at six or seven months, it will be easier to feel the baby and find its position in the uterus.

To begin, help the mother lie on her back and give her support under her knees and head. Make sure she is comfortable. The questions you are trying to answer when you examine her are:

- Is the baby vertical (up and down)? This is known as a **vertical lie**.
- Or is it lying sideways across her belly? This is a **transverse lie**.
- Is the baby facing the mother's front, or her back?
- Is the baby head down (**cephalic presentation**) or bottom down (**breech presentation**)?

11.2.1 Is the baby vertical?

Most babies are lying vertically by the seventh month, with the baby's head towards the cervix of the uterus. This is the safest position for a normal delivery. To find out if the baby is vertical, lay one hand flat on each side of the mother's abdomen. Press in gently but firmly, first with one hand, and then with the other (Figure 11.1a). Check the shape carefully. Do the ends of the baby seem to be in the mother's sides (Figure 11.1b)? If so, the baby is probably lying sideways. Many babies lie sideways in the first months, but most turn head down by eight months or so. Babies cannot be born through the vagina from the sideways position. A baby that is sideways and cannot be turned when labour starts must be born by caesarean surgery in a hospital.



If the baby is lying sideways after eight months' gestation, refer the woman to a Health Centre.

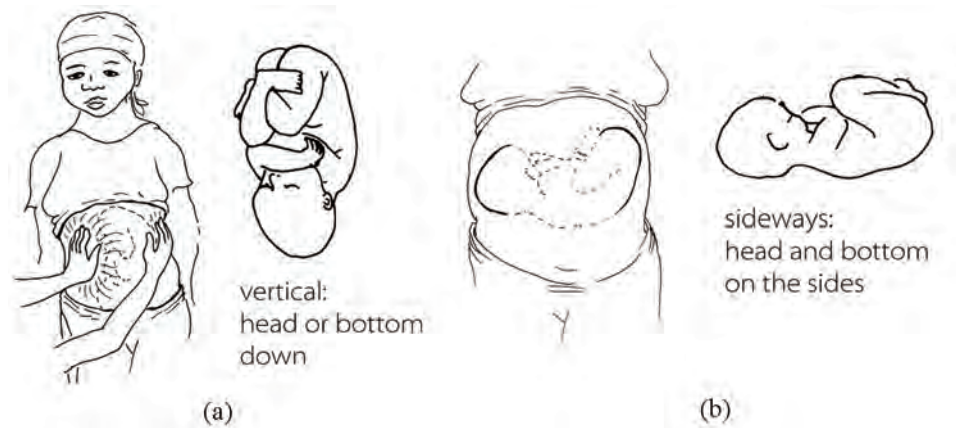


Figure 11.1 (a) Feel the mother's belly with your hands on each side, pushing gently with each hand in turn. You should be able to feel the baby lying vertically — ideally head down. (b) If the baby is lying sideways, you can usually feel its head and bottom in the mother's sides.

It can be difficult to feel the position of the baby if the mother has very strong muscles on her abdomen, or if she has a lot of fat on her abdomen. If you have a hard time feeling the position, ask the mother to take a deep breath and let it out slowly, and to relax her body as you palpate (feel) her abdomen.

11.2.2 Is the baby facing the mother's front, or her back?

Next, feel the mother's abdomen for a large, hard shape (the baby's back). If you can feel it (Figure 11.2a), the baby is facing the mother's back. If you cannot feel the baby's back, feel for a lot of small lumps (Figure 11.2b). If you feel a lot of small lumps instead of a large, hard shape, it probably means that you are feeling the baby's arms and legs, which tell you that it is facing the mother's front.

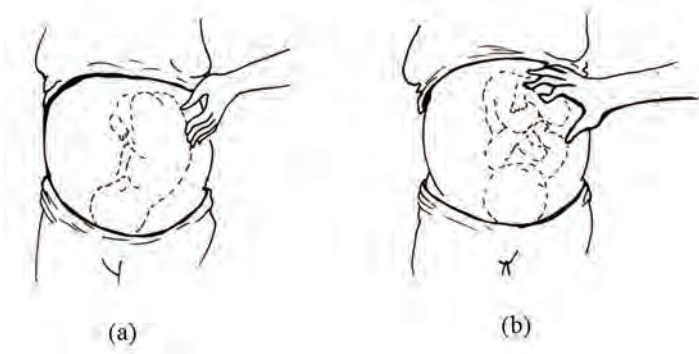


Figure 11.2 (a) If you can feel a large hard lump, the baby is facing towards the mother's back. (b) If you can feel a lot of small lumps, the baby is facing towards the mother's front.

11.2.3 Is the baby head down or bottom down?

By the last month before birth, most babies are lying with their head towards the cervix of the uterus (Figure 11.3a). The head down position is called a cephalic presentation, and if the part of the fetal skull called the vertex comes down the birth canal first, it is the easiest presentation for childbirth. Doctors and midwives refer to the part of the baby that is pointing into the cervix of the uterus as the **presenting part**. In Figure 11.3a, the presenting part is the baby's head, and in Figure 11.3b, the presenting part is the baby's bottom.

You will learn about other presentations (face, brow, shoulder) in the Module on *Labour and Delivery Care*.

- Which part of the fetal skull is the *vertex*? (Think back to Study Session 6. You may wish to look again at Figure 6.5, which shows the bones of the fetal skull.)
- The **vertex** is the area of the fetal skull midway between the **anterior fontanel** (the space between the bones at the front of the baby's head), and the **posterior fontanel** (the space between the bones at the back of the baby's head).

11.2.4 Feeling for the baby's head

By the seventh or eighth month, the baby's head has usually moved down in the mother's pelvis. Here is how to feel for the baby's head:

- 1 Find the mother's pubic bone with your fingers. You can feel it just under the skin under the mother's pubic hair (Figure 11.4).
- 2 As she breathes out, press deeply just above her pubic bone (see Figure 11.5 on the next page). Be gentle and stop if you hurt her. If you feel a round, hard object that you can move a little from side to side, it is

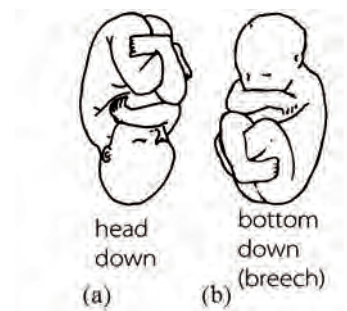


Figure 11.3 (a) Cephalic presentation. (b) Breech presentation.



Figure 11.4 Finding the mother's pubic bone with your fingers.

probably the back or side of the baby's head. If you do not feel anything in the mother's lower belly, the baby may be lying sideways.



Figure 11.5 Press firmly with your fingers just above the pubic bone to see if you can feel the baby's head.

3 If the shape is not clearly round, it may be the baby's face or the baby's bottom that you can feel. Or sometimes the baby's bottom is up, but the head is not straight down (Figure 11.6a and b). The head may be bent to the side, or the chin may be up (Figure 11.6c). These could be signs that the baby will not fit through the mother's pelvis at birth.

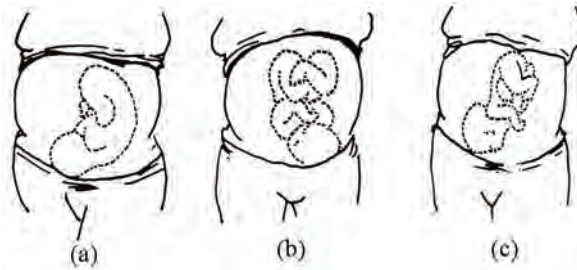


Figure 11.6 If the baby is lying vertically and head down, but you can't feel the baby's head, it may be bent to the side (a) facing the mother's back, (b) facing her front, or (c) with its chin up.

4 If the lower part of the baby is not too deep in the mother's pelvis, try moving that part of the baby from side to side, using gentle rocking movements with your hands on either side of the lower part of her abdomen (Figure 11.7). If moving the lower part of the baby makes its whole back move, then the baby may be breech. If the back does not move, then the baby may be head down.

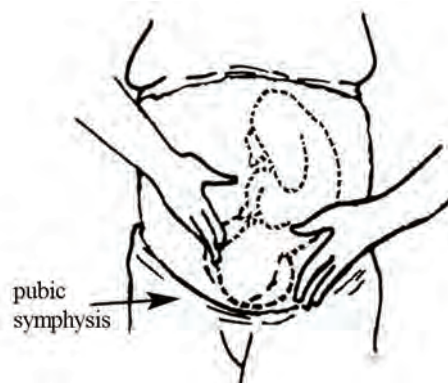


Figure 11.7 If the baby's back does not move when you 'rock' the lower part of the abdomen, then the baby may be head down.

5 Now feel the top of the mother's uterus (the fundus), just below her ribs. Does it feel round and hard, like a head? Or is it a different shape — like a bottom, a back, or legs? If the top of the uterus feels more like a

head than what you felt in the mother's lower belly, the baby may be breech.

6 Put one hand on the baby's back. At the same time, with your other hand, push the top end of the baby gently sideways (Figure 11.8). If the whole of the baby's back moves when you move the top end, the baby is probably in the head-down position (Figure 11.8a). If the back stays where it is while you move the upper part of the baby (Figure 11.8b), you may be moving the head. This is because the neck can bend while the back stays in place. If you are moving the head at the top of the uterus, then the baby is breech.

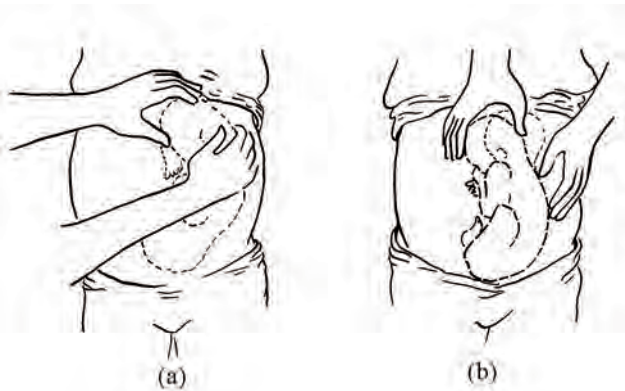


Figure 11.8 (a) If the baby is head down, then you should be able to move its whole back by gently pushing the top of the baby sideways. (b) If you can move the top of the baby without moving its back, then it is probably in the breech position.

7 When you check the baby's position, you might think you feel two heads or two bottoms. The mother may have twins.

- Think back to Study Session 10. What should you do if you suspect that a woman is having twins?
- Refer the mother to a health centre immediately.

11.2.5 Asking the mother about the baby's kicks

Doctors and midwives refer to **fetal kick** (not kicks) as an indicator of fetal wellbeing, and it may also indicate the fetal lie.

As you feel the mother's abdomen, try to imagine the different positions the baby might be in. Imagine where the baby's hands and legs might be. Imagine how each position would feel to the mother when the baby kicks. Then ask the mother where she feels the strongest kicks and where she feels smaller movements. Is this where you think the legs and hands probably are (see Figure 11.9 on the next page)?

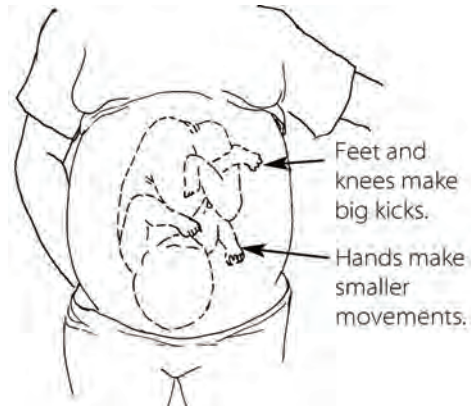


Figure 11.9 The place where the mother feels the strongest kicks may tell you the position of the baby's feet and legs.

If the baby is healthy and getting adequate nutrients from the mother, it moves in the uterus in such a way that the woman feels it as a kick. Fetal kick is often clearly felt after the mother has eaten a meal, and when she has rested very well and is lying on her side.

If the woman tells you the baby is not moving as it used to, or is not moving at all, it could be sick or it may have died.



Refer the woman to a health centre if she no longer feels the baby kicking inside her.

11.3 Listening for the baby's heartbeat

The baby's heartbeat gives information about the baby's position inside the mother, and about the health of the baby. Listen to the heartbeat at each antenatal visit, starting at five months. Doctors and midwives often refer to the **fetal heartbeat**.

By the last two months of pregnancy, you can often hear the fetal heartbeat in a quiet room by putting your ear on the mother's abdomen (Figure 11.10a). The heartbeat will be easier to hear if you have a stethoscope (Figure 11.10b) or a fetoscope (Figure 11.10c and d). If you don't have a fetoscope, you can make a simple one from wood, clay, or a hollow tube of bamboo.

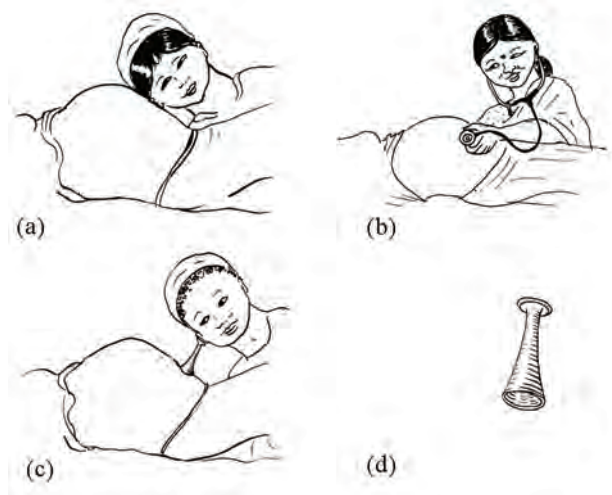


Figure 11.10 Listening to the fetal heartbeat with (a) your ear on the mother's abdomen, or (b) with a stethoscope, or (c) and (d) with a fetoscope.

The fetal heartbeat is quiet and quick. It may sound like a watch ticking under a pillow, only faster. The fetal heartbeat is about twice as fast as a healthy adult heartbeat — usually 120 to 160 beats a minute. There is no need to

count the heartbeats until the woman goes into labour. Hearing a clear fetal heartbeat during an antenatal visit just confirms that the baby is alive.

If you hear a ‘swishy’ sound (shee-oo, shee-oo, shee-oo), you are probably hearing the baby’s pulse in the umbilical cord. Cord sounds tell you how fast the baby’s heart is beating, but they do not help you find the baby’s position.

If the heartbeat sounds slow, you are probably hearing the mother’s pulse instead of the baby’s. Try listening to a different place on her abdomen.

11.3.1 Finding the baby’s position by listening to the heartbeat

Think about which way the baby seems to be lying. Then start listening for the heartbeat near the spot where you think the baby’s heart should be. You may need to listen in many places on the mother’s abdomen before you find the spot where the heartbeat is the most loud and clear (Figure 11.11).

Is the heartbeat loudest above or below the mother’s bellybutton? If you hear the heartbeat loudest *below* the mother’s bellybutton, the baby is probably head down (Figure 11.12a). If you hear the heartbeat loudest *above* the mother’s bellybutton, the baby may be in the breech position (Figure 11.12b).

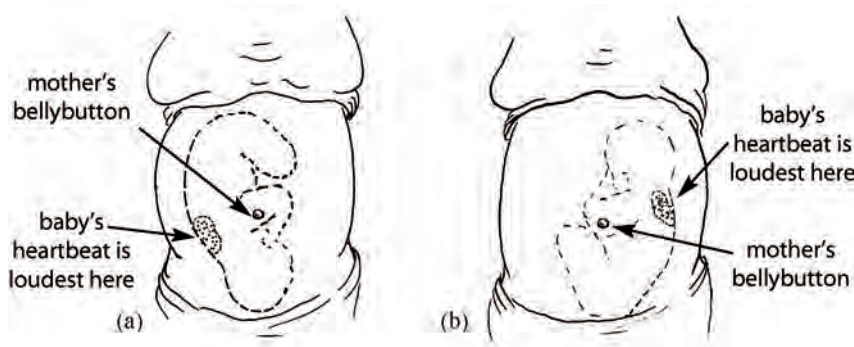


Figure 11.12 (a) If the fetal heartbeat is loudest below the mother’s bellybutton, the baby is probably in the vertex position. (b) If it is loudest above her bellybutton, the baby may be breech.

Sometimes when the baby is facing the mother’s front, the heartbeat is harder to find because the baby’s arms and legs get in the way. Listen near the mother’s sides, or directly in the middle of her abdomen, to hear the fetal heartbeat.

11.4 What to do if you find warning signs

11.4.1 Baby is breech

Breech babies are often born without any trouble, especially if the mother has had other children and her births were easy. But breech babies are more likely to get stuck, or have other serious problems.



Figure 11.11 The baby’s heartbeat is loudest in its upper chest or upper back, depending on which way the baby is facing.



If the baby is breech at 36 weeks (8 months), refer the woman to a health centre. Don’t try to turn a breech baby (see Box 11.1 on the next page).

Box 11.1 Don't try to turn a breech baby!

Only a midwife, health officer or physician who has been trained to turn a breech baby should try to do so, and it should be done in a hospital. Trying to turn the baby by pushing on the uterus is very dangerous. Even a midwife, health officer or physician should not try to turn a baby if the mother's water has broken, or if she has had vaginal bleeding, high blood pressure, surgery on her uterus, or caesarean surgery.

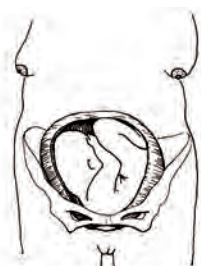
If the baby is not head down when labour starts, it is safer for the mother to give birth in a hospital. The midwife, health officer or physician can use forceps (pulling tools) if the baby gets stuck. Or they can do a caesarean surgery.



A baby lying sideways must be delivered by caesarean surgery in a hospital. Do not attempt to turn a sideways baby by hand. This is just as dangerous as trying to turn a breech baby, and should be done only by a doctor in a hospital.

11.4.2 Baby is lying sideways

Sideways babies cannot fit through the mother's pelvis to be born (Figure 11.13). If you try to deliver the baby without surgery, the mother's uterus will rupture during labour, and she and the baby will die without medical care. If the baby turns head down at any time — even on the day the mother goes into labour — it is OK for her to give birth at home or at the Health Post.



This baby must be born by caesarean surgery.

Figure 11.13 If the baby is lying sideways (transverse lie) by eight months, you should make arrangements for a hospital birth by caesarean surgery.

11.4.3 Twins

Think back to what you learned in Study Session 10 about twin pregnancy.

- What are the three signs of twin pregnancy?
 - The uterus grows faster or larger than normal. You can feel two heads or two bottoms when you feel the mother's belly. You can hear two heartbeats (this is not easy, but it may be possible in the last few months).
- What are the two ways to try to hear the heartbeats of twins?
 - Find the heartbeat of one baby. Ask a helper to listen for other places where the heartbeat is easy to hear, and both of you tap the rhythm of the heartbeats.

Use a watch to help you count the two heartbeats.

11.5 After the antenatal check-up

After you have finished checking the fetus and the mother, and following the instructions for any warning signs, find out if the woman has any more questions, or needs to talk about anything else. If she has any warning signs, carefully explain what the warning sign is, and what she must do to care for herself. If this is a return antenatal check-up, evaluate what you did for her at the previous check-up. Decide what else you may need to do for her. If she needs to be referred to a higher-level health facility, be sure she knows where and when to go.



11.6 Conclusion

In this session, you have learned how to examine the abdomen of a pregnant woman so that you can determine the position of the baby, its presenting part (head or bottom, or whether it is lying sideways), and how to check the wellbeing of the fetus by listening to the fetal heartbeat and asking the mother about fetal kick.

Summary of Study Session 11

In Study Session 11, you have learned that:

- 1 It is reassuring to find one baby in the uterus and that the head of the fetus is down in the last month of pregnancy. Most babies are lying vertically by the seventh month with their head towards the cervix of the uterus. By the seventh or eighth month, the baby's head has usually moved down in the mother's pelvis. This is the safest position for a normal delivery.
- 2 In any other situation, i.e. the baby is bottom down (breech), or lying sideways (transverse), refer the mother to the nearest health facility. Do not attempt to turn a breech or transverse baby.
- 3 The position in the mother's abdomen where she can feel the baby kicking can help you determine its position. Fetal kick is also a sign of fetal health. If the baby stops kicking it may be sick or have died, and the mother needs urgent referral.
- 4 The baby's heartbeat gives information about the baby's position inside the mother, and whether it is alive. Hearing two heartbeats is a sign of twins. Listen to the heartbeat at each antenatal visit, starting at five months.
- 5 By the last two months of pregnancy, you can often hear the baby's heartbeat in a quiet room by putting your ear on the mother's belly. The heartbeat will be easier to hear if you have a stethoscope or a fetoscope.
- 6 The normal fetal heart rate is usually about 120 to 160 beats per minute.

Self-Assessment Questions (SAQs) for Study Session 11

Now that you have completed this study session, you can assess how well you have achieved its Learning Outcomes by answering these questions. Write your answers in your Study Diary and discuss them with your Tutor at the next Study Support Meeting. You can check your answers with the Notes on the Self-Assessment Questions at the end of this Module.

SAQ 11.1 (tests Learning Outcomes 11.1, 11.2 and 11.3)

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

- A Listening to the fetal heartbeat using a stethoscope is called auscultation.
- B When the fetal head is down and the bottom of the fetus is up in the fundus, it is called a vertical lie.
- C In a vertex presentation, the presenting part is the baby's bottom.
- D The fetal heart rate is normally 120 to 160 beats a minute.
- E If the fetal heartbeat sounds loudest below the mother's bellybutton, the fetal lie is probably breech.

Case Study 11.1 Bekelech

Read the following case study carefully, and then answer SAQs 11.2 to 11.4.

Bekelech came for her antenatal check-up at the eighth month of pregnancy. When you palpated her abdomen, you found a hard, round mass in the fundus of the uterus, and a soft, irregular, bulky mass towards the symphysis pubic. Bekelech told you that in the past week the baby's kick had decreased, and when you listened to her abdomen with a fetoscope you could not hear the fetal heartbeat.

SAQ 11.2 (tests Learning Outcome 11.2)

- (a) Is the fetal lie in Bekelech's case vertical or transverse? Explain how you reached your conclusion.
- (b) What is the presenting part in this case?
- (c) What do you call a fetus presenting in such a manner?

SAQ 11.3 (tests Learning Outcome 11.3)

Where would you listen to the fetal heartbeat to confirm your diagnosis of how Bekelech's baby is presenting, and why?

SAQ 11.4 (tests Learning Outcomes 11.3 and 11.4)

What do you suspect is the condition of Bekelech's baby, and what action should you take?

Study Session 12

Minor Disorders of Pregnancy

Introduction

During pregnancy, a woman's body changes in many ways — as you learned in Study Session 7. These changes can sometimes be uncomfortable, but most of the time they are normal. They can occur at any time during the pregnancy. In this study session, you will learn about some of the most common minor disorders of pregnancy, and discuss ways to help women feel better, or at least to stop worrying about them. We will also explain how to tell when a woman's discomfort may be a sign that there could be a problem that requires further investigation and management, or even that something dangerous is happening with her pregnancy. Most of the minor disorders during pregnancy can be minimised with good education and prompt treatment. You should also know about some remedies that are dangerous for pregnant women and may hurt the baby.

Learning Outcomes for Study Session 12

When you have studied this session, you should be able to:

- 12.1 Define and use correctly all of the key words printed in **bold**. (SAQ 12.1)
- 12.2 Identify minor disorders or problems that women could develop during pregnancy and describe their relevant management. (SAQs 12.2 and 12.3)

12.1 Digestive and food-related disorders

There are several very common disorders of pregnancy that relate to food, or the digestion of food. Another way of classifying these disorders is to think of them as affecting the gastrointestinal system.

12.1.1 Nausea, vomiting and hyperemesis gravidarum

Many women have nausea and vomiting in the first trimester (3 months) of pregnancy, which is often called **morning sickness**. It happens commonly in the morning when the woman gets out of bed. Excessive salivation is an infrequent but troublesome complaint which is associated with a condition called **hyperemesis gravidarum** — caused by severe and frequent nausea and vomiting during pregnancy.

The diagnosis of hyperemesis gravidarum is made if the woman loses 5 kg or more of her body weight due to frequent vomiting, loss of body fluids and nausea, making her fearful of eating, and is confirmed by the appearance of acidic chemicals (called ketone bodies) in her urine. The body starts to produce ketone bodies when it begins to break down proteins in a person's muscles because there is no other energy source to keep them alive. The ketone bodies can be detected in urine by a dipstick test, which you can do in the woman's home or at the Health Post if you have been provided with the appropriate dipsticks and shown how to 'read' the colour change if ketone bodies are present. A positive test result means she must be referred immediately to get replacements for the nutrition, body fluids and essential

Hyperemesis is pronounced 'hyper-em-ee-sis' and means 'excessive vomiting'. Gravidarum is pronounced 'gra-vid-ah-room' and means 'during pregnancy'.



Hyperemesis gravidarum is a serious disorder, for which the woman needs to be admitted to hospital or a health centre.

chemicals that she has lost, and receive preventive treatment to avoid further occurrence.

Management of mild nausea

If the nausea is mild, encourage the woman to try any of these remedies:

- Before bed or during the night, eat a food that contains protein, such as beans, nuts or cheese.
- Eat a few bananas, dry bread, dry kita, or other grain food upon waking up in the morning.
- Eat many small meals instead of two or three larger ones, and take small sips of liquid often.
- Drink a cup of mint, cinnamon or ginger tea two or three times a day, before meals. Put a teaspoon of mint leaves, or a stick of cinnamon, in a cup of boiling water and let the tea sit for a few minutes before drinking it. To make ginger tea, boil crushed or sliced ginger root in water for at least 15 minutes.



12.1.2 Food dislikes and food cravings

A pregnant woman may suddenly dislike a food that she usually likes. It is OK not to eat that food, and she will probably begin to like it again after the birth. She should be careful that the rest of her diet contains a lot of nutritious food. You will learn what advice to give women about good nutrition during pregnancy in Study Session 14.

Pica is pronounced 'pye-kah'.

A **food craving** (also known as pica) is a strong desire to eat a certain food, or even something that is not food at all, like black soil, chalk or clay (Figure 12.1). If a woman gets a craving for nutritious foods (like beans, eggs, fruits or vegetables), it is OK for her to eat as much as she wants.



Figure 12.1 Food cravings are common in early pregnancy.

A woman who craves to eat things that are not food, like soil or clay, should be advised not to eat them. They may poison her and her baby. They may also give her parasites, like worms, that can make her sick. Encourage her to eat iron-rich and calcium-rich foods instead (see the advice in Figure 12.1).

12.1.3 Heartburn

A burning feeling or pain in the stomach, or between the breasts, is called indigestion or **heartburn**. Heartburn happens because the growing baby crowds the mother's stomach and pushes it higher than usual (Figure 12.2). The acids in the mother's stomach that help digest food are pushed up into her chest, where they cause a burning feeling. Reassure her that this is not dangerous and usually goes away after the birth.

Management

Here are some things a woman can try to make herself feel more comfortable:

- Keep her stomach less full by eating smaller meals more often, and by eating foods and drinking liquids separately.
- Avoid eating spicy or greasy foods, drinking coffee, or smoking cigarettes, as all of them can irritate the stomach.
- Regularly eat papaya or pineapple, which have enzymes (special chemicals) that help the stomach to digest food.
- Keep her head higher than her stomach when lying down or sleeping. This will keep her stomach acids in her stomach and out of her chest.
- Calm the acids in the stomach by drinking milk, or taking a low-salt antacid (stomach-calming liquid or tablet) that contains no aspirin, but advise her to try other methods before using drugs like antacids.



Figure 12.2 Heartburn in pregnancy may be due to the baby crowding the mother's stomach.

12.1.4 Constipation

Some pregnant women have difficulty in passing stools. This is called **constipation**. It is caused by hormonal changes that decrease the rhythmic muscular movements of the gut (peristalsis), which push food along the intestines. This results in an increase in 'emptying time', how long it takes for a meal to be digested and the waste matter expelled as stools.

Management

To prevent or treat constipation, a pregnant woman should:

- Eat more fruits and vegetables.
- Eat whole grains (brown rice and whole wheat, instead of white rice or white flour).
- Drink at least eight cups of clean water a day.
- Walk, move and exercise every day.
- Try home or plant-based remedies that will soften the stool or make it slippery, e.g. remedies made from telba seed, certain fruits, or fibre plants like gomen.

12.2 Swollen veins

There are many reasons why pregnant women may develop swollen veins in different parts of the body. Here are two of the most common.

12.2.1 Varicosities (varicose veins)

Swollen blue veins that appear in the legs are called **varicosities**, or varicose veins, and are very common in pregnancy. Sometimes these veins hurt. Pressure by the enlarging uterus on the veins that return blood to the heart from the legs is a major factor in the development of varicosities in the leg



Genital varicosities can cause bleeding if they tear during birth, so refer a woman who has this problem to a health centre.

veins. Very rarely, swollen veins may develop in the external genitalia and these are very painful.

Management

If the swollen veins are in the legs, they may feel better if the woman puts her feet up often. Strong stockings or elastic bandages may also help. If the swollen veins are around the genitals, a panty-girdle or sanitary pad may help to support them.

12.2.2 Haemorrhoids (piles)

Haemorrhoids (also known as piles) are swollen veins around the anus. They may burn, hurt, or itch. Sometimes they bleed when the woman passes a stool, especially if she is constipated. Sitting or standing a lot can make haemorrhoids worse.

Management

The woman should try to avoid getting constipated by eating a lot of fruit and vegetables and drinking plenty of fluids. Straining to pass hard stools makes haemorrhoids worse. Sitting in a cool bath or lying down can help.



12.3 Aches and pains

12.3.1 Back pain

Many pregnant women get back pain. The weight of the baby, the uterus and the amniotic fluid, changes her posture and puts a strain on the woman's bones and muscles. Too much standing in one place, or leaning forward, or hard physical work, can cause back pain. Most kinds of back pain are normal in pregnancy, but it could also be caused by a kidney infection.

Management

Encourage the woman's husband, children, other family members or friends to massage the woman's back. A warm cloth or hot water bottle on her back may also feel good. Her family can also help by doing some of the heavy work, such as carrying small children, washing clothes, farming, and milling grain. A tight girdle, or a belt worn about the hips, together with frequent bed rest, may relieve severe back pain.

12.3.2 Joint pain

Hormones in the third trimester (six to nine months of pregnancy) act on the woman's joints so they get softer and looser. This makes her joints more flexible, including the joints between the bones in her pelvis (recall the anatomy of the pelvis in Study Session 6, particularly Figure 6.1).

- Why do you think this natural loosening of the joints in the pelvis is beneficial in late pregnancy?
- It helps to create a more flexible space in the pelvis for the baby to pass down the birth canal during labour and delivery.

Sometimes a pregnant woman's joints get too loose and uncomfortable, especially the hips, and she may develop an unstable pelvis, which produces pain. Joint pain is not dangerous, but the woman can more easily sprain her ankles or other joints.

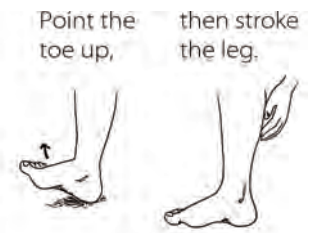
12.3.3 Leg cramps

Many pregnant women get foot or leg cramps — sharp sudden pain and tightening of a muscle. These cramps especially come at night, or when women stretch and point their toes. To stop the cramp, flex the foot (point it upward) and then gently stroke the leg to help it relax (do not stroke hard).

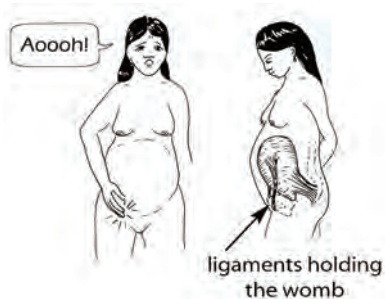
Management

To prevent more cramps, a woman should not point her toes (even when stretching), and she should eat more foods high in calcium and potassium, which can help.

- Can you list some calcium-rich foods?
- Yellow vegetables such as yams and carrots, lime, milk, curd, yogurt, cheese, green leafy vegetables, bone meal and egg shells, molasses, soybeans and sardines.



12.3.4 Sudden pain in the side of the lower belly



The uterus is held in place ‘suspended’ by ligaments on each side. Ligaments are like ropes that attach the uterus to the mother’s abdomen. A sudden movement will sometimes cause a sharp pain in these ligaments. This is not dangerous. The pain will usually stop in a few minutes. It may help to stroke the belly gently, or to put a warm cloth on it.

12.3.5 Abdominal cramps in early pregnancy

It is normal to have mild abdominal cramps (like mild monthly bleeding cramps) at times during the first trimester of pregnancy. These cramps happen because the uterus is growing. However, cramps that are regular (come and go in a pattern), or constant (always there), or are very strong or painful, or come with spotting or bleeding from the vagina, are warning signs.



The woman may have an ectopic pregnancy implanted in a fallopian tube, or she may be having a miscarriage. She should get medical help immediately.

12.3.6 Headaches and migraines

Headaches are common in pregnancy, but are usually harmless. Headaches may stop if the woman rests and relaxes more, drinks more juice or water, or gently massages her temples. It is OK for a pregnant woman to take two paracetamol tablets with a glass of water once in a while. However, headaches late in pregnancy may be a warning sign of pre-eclampsia, especially if there is also high blood pressure, or swelling of the face or hands. Pre-eclampsia is discussed in detail later in this Module, in Study Session 19.

Some women have migraine headaches. These are strong headaches, often on the side of the head. The woman may see spots and feel nauseated. Bright light or sunshine can make them worse. Migraines may get worse in pregnancy.



If you suspect pre-eclampsia, refer the woman to the nearest health facility immediately.

Management

Unfortunately, migraine medicine is very dangerous in pregnancy. It can cause labour to start too soon, and it may also harm the baby. It is better for a pregnant woman with a migraine to take 500 to 1,000 mg (milligrams) of paracetamol with a glass of water, and rest in a dark room. Although coffee and black tea are usually not healthy in pregnancy, they are OK occasionally, and they may help to cure a migraine.

12.4 Minor disorders in other body systems

12.4.1 Oedema

Swelling of the feet and ankles is very common in pregnancy, especially in the afternoon, or in hot weather. It is due to **oedema**, the retention of fluids in the body tissues. Under the force of gravity, the retained fluid tends to sink down the body and collect in the feet. Advise the woman to sit with her feet raised as often as possible, to allow the fluid to be absorbed back into the circulatory system. Swelling of the feet is usually not dangerous, but severe swelling when the woman wakes up in the morning, or swelling of the hands and face at any time, can be signs of pre-eclampsia, which is a very serious (even life-threatening) condition.

Management

Swelling in the feet may improve if the woman puts her feet up for a few minutes at least two or three times a day, avoids eating packaged foods that are very salty, and drinks more water or fruit juices.

12.4.2 Frequency of urination

Urinary frequency is a common complaint throughout pregnancy, especially in the first and last months. This happens because the growing fetus and uterus presses against the bladder. It will stop once the baby is born. If urinating hurts, itches, or burns, the woman may have a bladder infection. The diagnosis and management of urinary tract infections are discussed in Study Session 18.

12.4.3 Vaginal discharge

Discharge is the wetness all women have from the vagina. A woman's body uses this discharge to clean itself from the inside. For most women, the discharge changes during their monthly cycle. Pregnant women often have a lot of discharge, especially near the end of pregnancy. It may be clear or yellowish. This is normal. However, the discharge can be a sign of an infection if it is white, grey, green, lumpy, or has a bad smell, or if the vagina itches or burns.

12.4.4 Feeling hot or sweating a lot

Feeling hot is very common in pregnancy, and as long as there are no other warning signs (such as signs of infection), the woman should not worry. She can dress in cool clothes, bathe frequently, use a paper fan or a large leaf, and drink plenty of water and other fluids.



If you suspect that oedema might be a sign of pre-eclampsia, refer the woman to the nearest health facility immediately.



You should refer all suspected cases of vaginal infection to the nearest health facility.



12.4.5 Dyspnoea (shortness of breath)

Many women get short of breath (cannot breathe as deeply as usual) when they are pregnant. This condition is called **dyspnoea**.

Dyspnoea is pronounced 'dissp-nee-ah'.

- Why do you think shortness of breath is a common problem, especially later in pregnancy?
- Breathlessness is because the growing baby crowds the mother's lungs, and she has less room to breathe.

Management

Reassure women who are breathless near the end of pregnancy that this is normal. But if a woman is also weak and tired, or if she is short of breath all of the time, she should be checked for signs of sickness, heart problems, anaemia, or poor diet. Get medical advice if you think she may have any of these problems.

12.4.6 Difficulty in getting up and down

It is better if a pregnant woman does not lie flat on her back, because it can be difficult for her to get up again, and because when a woman is on her back, the weight of the uterus presses on the big blood vessels that return blood to her heart. This can temporarily reduce the supply of oxygen to her brain, and she may feel dizzy. If the woman wants to be on her back, she should put something behind her back and under her knees so she is not lying completely flat.

A pregnant woman should also be careful how she gets up. She should not sit up like the woman in Figure 12.3(a). Instead, she should roll to the side and push herself up with her hands, as in Figure 12.3(b).

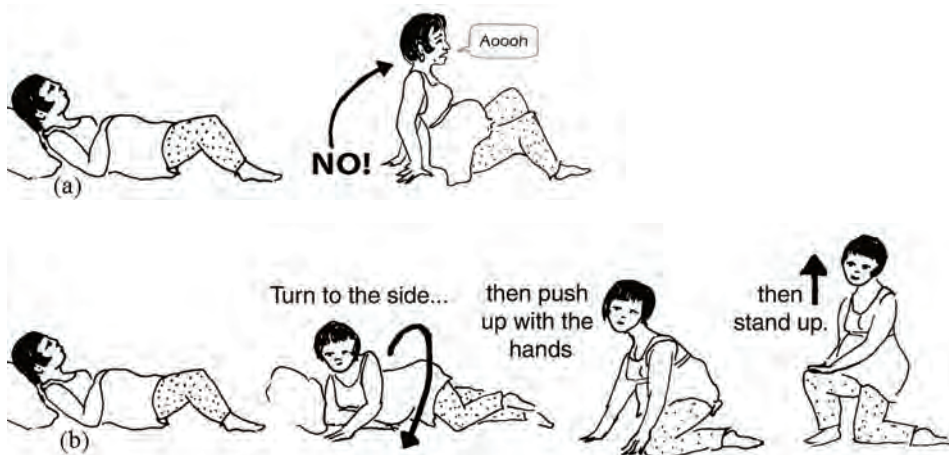


Figure 12.3 (a) Getting up without turning onto one side first can tear the muscles of the abdomen. (b) Turning to the side and pushing up with the hands is much safer and more comfortable.

12.4.7 Chloasma (the mask of pregnancy)

You already know what chloasma looks like from Study Session 8. Reassure the woman that the dark colouration is not harmful and that usually most of the colour goes away after the birth. A woman may be able to avoid developing dark areas on her face by wearing a hat when she goes out in the sun.

12.5 Changing feelings and emotions

Pregnancy is an important time in a woman's life. Her baby is growing inside her, her body is changing, and she needs more food and more rest. As a woman's body changes, her relationships, her sexuality, and her work life can change too.

12.5.1 Sudden changes in feelings

Pregnancy can make women very emotional. Some women laugh or cry for no clear reason. Some feel depressed, angry, or irritable. Odd laughing or crying, and other sudden mood changes or strong feelings, are normal. They usually pass quickly. But do not ignore a woman's feelings simply because she is pregnant. Her feelings are real.



12.5.2 Worry and fear

Many women worry when they are pregnant, especially about the baby's health and about giving birth. A woman's worries about other problems in her life may also become stronger when she is pregnant. Such worries are normal. They do not mean that something bad will happen. Women with these feelings need emotional support, like someone to listen to their worries and encourage them to feel hopeful. They may also need help to solve the problems they are having in their lives, like problems with their partners, money, drugs or alcohol, or other issues.

12.5.3 Sleep problems

Some pregnant women feel sleepy much of the day. This is normal during the first three months. Their bodies are telling them to slow down and rest. There is no need to intervene unless the woman also feels weak, which may be a sign that she has a more serious problem, like a sickness, depression or anaemia.

Sometimes pregnant women have problems in sleeping; they may find it difficult to get to sleep, or they wake up after a short time and cannot get back to sleep. This problem is called insomnia.

Management of insomnia

If a pregnant woman cannot sleep because she is uncomfortable or restless, it may help if:

- She lies on her side with something comfortable between her knees and at her lower back. She can use a pillow, a rolled-up blanket, banana leaves, or some other padding.
- Someone gives her a massage.
- She drinks herbal teas that help her sleep.

12.5.4 Strange dreams and nightmares

Pregnant women may have strong, vivid dreams. They can be beautiful, strange, or frightening. For many people, dreams are an important way of understanding themselves and the world. Some people believe that dreams can tell us about the future, or give us messages from spirits. But usually, when something happens in a dream, it does not mean that it will happen to us in life. The events in the dream may be telling us what we are afraid of, or what we desire. Or they may simply be stories our minds make up while we sleep.



Pregnant women who are having frightening dreams may need someone to talk to about their hopes, fears and feelings.

12.5.5 Forgetfulness

Some women are more likely to forget things when they are pregnant. For most women, this is not a big problem. But some may worry if they do not know it is normal. No one knows why women become more forgetful when they are pregnant, but it is common.

12.5.6 Feelings about sex

Some women do not want much sex when they are pregnant. Others want sex more than usual. Both feelings are normal. Having sex, and not having sex, are both OK for the woman and her baby. Sex is not dangerous for the baby. Sometimes sex is uncomfortable in pregnancy. A woman and her partner can try different positions for making love. It may feel better with the woman on top, or in a sitting or standing position, or with the woman lying on her side. When a pregnant woman has sex, it is important to avoid infection by advising her to have safe sex by using condoms to prevent HIV/AIDS and other sexually transmitted infections.



12.6 Conclusion

The techniques you learned earlier (in Study Session 8) will enable you to ask sensitive questions when women come to you for antenatal care, so you can discover if they have any minor disorders that you can help them to manage. Effective questioning will also reveal danger signs that require referral to a health facility. In the next study session, you will increase your skills in dealing with clients when we teach you about the health promotion issues you will need to discuss with pregnant women in your community.

Summary of Study Session 12

In Study Session 12, you have learned that:

- 1 A woman's body changes during pregnancy. These changes can sometimes cause discomfort, but mostly they are normal and will resolve themselves after the baby is born.
- 2 You can minimise most of the minor disorders during pregnancy with advice on diet, exercise, and with simple home remedies that are known to be safe and help women feel better.
- 3 Sometimes these minor problems may become more serious, or signal a serious underlying health problem that needs referral to a health facility.
- 4 Some remedies (e.g. migraine medicine) are dangerous for pregnant women, and may hurt the baby as well as the mother.
- 5 Minor disorders of pregnancy that you may encounter in dealing with pregnant women can be categorised according to which of the body systems is involved.
 - Gastrointestinal disorders include nausea and vomiting, dislike of some foods, heartburn, pica (food cravings), constipation and haemorrhoids (piles).
 - Musculoskeletal and skin disorders include back pain, aches and pains in the joints, difficulty in getting up and down, feeling hot or sweating a lot,

the mask of pregnancy (chloasma), sudden pain in the side of the lower belly, cramps in early pregnancy, and leg cramps.

- Cardiovascular disorders include varicosities, and dyspnoea (shortness of breath).
- Genitourinary disorders include frequency of urination, and vaginal discharge (wetness from the vagina).
- Nervous system disorders include sleepiness and insomnia, headaches, changing feelings and emotions, worry and fear, strange dreams and nightmares, forgetfulness, and changing feelings about sex.

Self-Assessment Questions (SAQs) for Study Session 12

Now that you have completed this study session, you can assess how well you have achieved its Learning Outcomes by answering these questions. Write your answers in your Study Diary and discuss them with your Tutor at the next Study Support Meeting. You can check your answers with the Notes on the Self-Assessment Questions at the end of this Module.

SAQ 12.1 (tests Learning Outcomes 12.1 and 12.2)

A 22-year old pregnant woman at 34 weeks of gestation tells you that she craves to eat clay soil. She also tells you that she has developed darker brown patches on her face, and that her feet and ankles swell up during the day.

- (a) Identify the minor disorders of pregnancy this woman is displaying, using their medical names.
- (b) What advice should you give her to manage her symptoms?

SAQ 12.2 (tests Learning Outcomes 12.1 and 12.2)

Match each disorder in List A with the correct management in List B by drawing an arrow between them

A	B
Haemorrhoids	Flex the foot and gently stroke the leg
Insomnia	Drink herbal teas that help her to sleep
Leg cramps	Take two paracetamol tablets with a glass of water
Mild headache	Eat a lot of vegetables and fruits, and sit in a cool bath
Varicosities in the legs	Dress in cool clothes, bathe frequently, and use a fan
Sweating a lot	Put the feet up and wear strong stockings

Notes on the Self-Assessment Questions (SAQs) for Antenatal Care, Part I

Study Session I

SAQ 1.1

D is the correct answer. By 2005, the MMR for Ethiopia was 673 per 100,000 live births — well below the average of 900 per 100,000 live births for Africa as a whole, but still one of the highest in the world. In 2008, the global average MMR was 400 maternal deaths per 100,000 live births.

SAQ 1.2

(a) The total number of pregnant women in this catchment area is calculated as 4% of the 10,000 population. To calculate 4% of 10,000, you multiply 10,000 by 4 and divide the result by 100. This is as follows:

$$\begin{aligned} \text{Number of pregnant women} &= \text{Total number of population} \times \frac{4}{100} \\ &= 10,000 \times \frac{4}{100} \\ &= 400 \text{ pregnant women} \end{aligned}$$

Therefore, this community is expected to have 400 pregnant women in one year, who are eligible for antenatal care, delivery and postnatal care.

(b) You calculate the ANC coverage rate as the total number of pregnant women attended at least once during their pregnancy by the HEPs for reasons relating to the pregnancy, divided by the total number of expected pregnancies in the same year. The result is expressed as a percentage by multiplying by 100. You can calculate it as:

$$\begin{aligned} \text{Antenatal care coverage rate} &= \frac{\text{Number of first antenatal visits}}{\text{Total number of expected pregnancies}} \times 100 \\ &= \frac{150}{400} \times 100 \\ &= 37.5\% \end{aligned}$$

Only 37.5% of the pregnant women in this catchment area received one antenatal visit. These Health Extension Practitioners need to improve the antenatal care coverage rate in their *kebele*!

SAQ 1.3

First calculate the expected total number of pregnant women in the 8,000 population in the community, as shown below:

$$\begin{aligned}\text{Number of pregnant women} &= \text{Total number of population} \times \frac{4}{100} \\ &= 8,000 \times \frac{4}{100} \\ &= 320 \text{ pregnant women}\end{aligned}$$

Therefore, this community is expected to have 320 pregnant women in one year, who are eligible for antenatal care, delivery and postnatal care. Then calculate the number of antenatal visits the HEPs would make in one year if they achieved the focused antenatal care coverage rate of 4 visits for every pregnant woman.

$320 \times 4 =$ a total of 1,280 antenatal visits.

SAQ 1.4

$$\text{(a) MMR} = \frac{\text{Number of maternal deaths in Region Y in 2005}}{\text{Number of live births in the same year and area}} \times 100,000 \text{ live births}$$

$$\begin{aligned}\text{The MMR in Region Y in the year 2007} &= 480/60,000 \times 100,000 \\ &= 800 \text{ maternal deaths per } 100,000 \text{ live births}\end{aligned}$$

Neonatal mortality rate =

$$\frac{\text{Number of neonatal deaths in Region Y in 2005}}{\text{Number of live births in the same year and area}} \times 1,000 \text{ live births}$$

$$\begin{aligned}\text{The neonatal mortality rate in Region Y in the year 2007} &= 960/60,000 \times 1,000 \\ &= 16 \text{ neonatal deaths per } 1,000 \text{ live births}\end{aligned}$$

(b) Maternal mortality in Region Y was 800 maternal deaths per 100,000 live births, which is *worse* than the Ethiopian national average of 673 per 100,000 live births in 2005. It was doing *better* than the national average for neonatal deaths in 2005 – 16 newborns died in every 1000 live births, compared to 39 per 1000 nationally.

Study Session 2

SAQ 2.1

(a) You may have suggested routine health screening activities such as taking the pregnant woman's temperature and pulse, measuring her blood pressure, or testing her urine for the presence of sugar. (You will learn how to do all of these activities in later study sessions in this Module.)

(b) You may have suggested giving pregnant women iron tablets to prevent anaemia, or giving out insecticide-treated bed nets to prevent malaria. There are many other good examples.

SAQ 2.2

Promotion of antenatal care benefits the community because it:

- Creates awareness in the whole community about the health services provided for pregnant women, and during labour, delivery and the postnatal period.
- Enables pregnant women and their male partners to make informed decisions about utilising the service.
- Improves the health and well-being of pregnant women and reduces maternal and newborn deaths and complications.

SAQ 2.3

Group discussion is the best method in this example. The steps you should take are as follows:

- Prepare your presentation to meet the needs of the specific audience — in this case, pregnant women.
- Smile, and try to make eye contact with everybody at the start. Introduce yourself, and ask each woman to say who she is.
- Start with what the women already know about a safe place to deliver a baby, and build on or add what they do not know; for example, tell them about the danger signs that mean they should have the baby in a health facility.
- Concentrate on what can be done and achieved in the time available.
- Encourage the women to express their ideas freely. Encourage those women who usually keep quiet to share their thoughts. Keep everyone involved in two-way communication. Listen carefully to what they say.
- At the end, summarise the points raised and decisions taken, try to ensure that any remaining questions are answered, and thank everyone for attending.

Study Session 3

SAQ 3.1

The correct labels for Figure 3.5 are as follows:

- a is the vagina
- b is the cervix
- c is the uterus
- d is the ovary
- e is the fundus
- f is the ovarian suspensory ligament
- g is the fallopian tube
- h is the fimbriae
- i is the ovarian ligament.

SAQ 3.2

The uterus is anterior to (in front of) and superior to (above) the rectum. An alternative way of expressing the same positions is to say that the rectum is posterior to (behind) and inferior to (below) the uterus.

SAQ 3.3

The structures removed in female genital mutilation are usually the clitoris and the labia minora. The scarring that results as the cuts heal interferes with the normal ability of the vulva to stretch during childbirth to allow the baby to pass through the birth canal. As a result, the birth can be obstructed and the vagina can tear, causing severe pain and loss of blood. In some cases, a fistula (hole in the vaginal wall) can tear open, and blood loss can put the woman's life at risk.

SAQ 3.4

A is *false*. Infection in the uterus can get into the pelvic cavity by passing outwards through the fallopian tubes, which are open at the ends. Infection in the uterus can pass down the vagina, and usually appears as a bad-smelling discharge from the vaginal opening in the vulva.

B is true. The perineum is a muscular area between the vaginal opening and the anus.

C is true. The maturation of an ovum is controlled by the female reproductive hormones.

D is true. Glands in the cervix produce secretions which lubricate the vagina.

E is *false*. The fundus is the name for the domed top of the uterus. The narrow neck at the bottom of the uterus is called the cervix.

Study Session 4

SAQ 4.1

Table 4.1 completed.

Phase of the menstrual cycle	Days (1 = first day of the LNMP)
Follicular phase of the ovarian cycle	1–14
Luteal phase of the ovarian cycle	15–28
Menstrual phase of the uterine cycle	1–5
Proliferative phase of the uterine cycle	6–14
Secretory phase of the uterine cycle	15–28

SAQ 4.2

A woman may feel cramping pains in her abdomen when she is menstruating because the muscular walls of the uterus (the myometrium) contract to help cut off the blood supply to the endometrium, causing it to break away from the uterus.

SAQ 4.3

The relatively high concentration of artificially produced oestrogen and progesterone in contraceptive pills prevents pregnancy by activating a negative feedback mechanism on the hypothalamus in the brain. High levels of oestrogen and progesterone mimic the situation that occurs in pregnancy. They suppress the production of gonadotropin-releasing hormone (GnRH) from the hypothalamus, so the pituitary gland stops producing FSH and LH. This in turn stops the ovaries from maturing any more ova, so ovulation does not occur, and the woman cannot get pregnant as long as she takes the contraceptive pills regularly as prescribed.

SAQ 4.4

In a pregnant woman, the placenta continuously produces the hormone HCG, which causes the corpus luteum in the ovary to produce progesterone throughout the pregnancy. Progesterone maintains the endometrium as a thick fatty layer, so menstruation ceases during pregnancy because the endometrium remains attached to the uterus, where it assists in nourishing and protecting the growing fetus.

Study Session 5

SAQ 5.1

A is *false*. The energy for moving the sperm's tail comes from the mitochondria in the structure between the head and the tail.

B is true. Contractions in the muscular walls of the uterus and fallopian tubes assist sperm to move rapidly towards the ovum.

C is true. Implantation occurs when the blastocyst burrows into the endometrium and successfully establishes the early placenta.

D is *false*. The umbilical vein transports oxygenated blood from the placenta back to the fetus. The deoxygenated blood from the fetus is carried to the placenta by the two umbilical arteries.

E is *false*. The placenta cannot prevent the transfer of all harmful substances from the mother to the fetal circulation; for example, alcohol and other drugs and chemicals can diffuse through the placenta.

SAQ 5.2

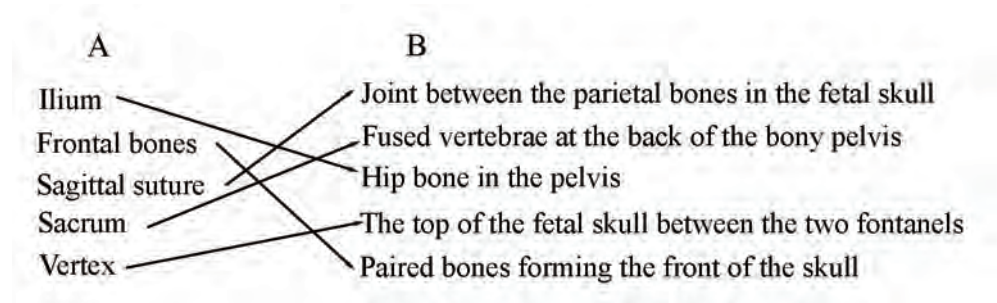
Mrs A had unprotected sex on day 18 of her menstrual cycle. Ovulation occurs in most women around day 14, so she probably had sex within three to four days after ovulation. The ovum survives for only 12–24 hours unless it is fertilised, so if she ovulated as expected around day 14, then it is unlikely that the ovum was still alive when she had sex on day 18. Therefore, it is unlikely that she will be pregnant this time. But if her ovulation was later than expected, pregnancy is a possibility. Advise her about the risks of unprotected sex in terms of unwanted pregnancy and sexually transmitted infections.

SAQ 5.3

You should explain to Mrs P that although her blood is not in direct contact with that of her baby, the two bloods are very close together in the placenta. Only the thickness of the baby's blood vessel walls separates them. The walls are so thin that small substances like alcohol and khat can pass through them, from her blood to the baby's blood. Tell her that this is also how good substances like oxygen and nutrients get into her baby from her own blood, so staying healthy and eating enough food is important for her baby's development. If she stops taking alcohol and chewing khat, her baby will be much healthier. If she continues taking these harmful substances, the baby could be born with birth defects, or it could even die.

Study Session 6

SAQ 6.1



SAQ 6.2

A is true. The female bony pelvis is broader and flatter than the male pelvis.

B is *false*. The pelvic inlet is wider (not narrower) than the pelvic outlet.

C is *false*. The iliac crest is the protuberance at the front of each hip bone; it is not important in measuring the progress of the fetus down the birth canal.

D is *false*. The sutures in the fetal skull 'give' a little under the pressure in the birth canal, allowing the skull bones to move to a small extent. This makes it easier for the baby's head to pass through the mother's bony pelvis.

E is true. A newborn baby's pulse can be seen beating in the anterior fontanel.

SAQ 6.3

The possible features of the maternal bony pelvis and/or the fetal skull that may result in a difficult labour and delivery include (you only had to suggest four):

- A narrow or deformed pelvis
- Abnormal growth of tissue in the pelvic cavity
- A large fetal skull
- A brow, face, breech or shoulder presentation of the fetus
- A fetus that does not present the widest part of its skull to the widest part of the pelvic inlet, and then rotate to do the same in the pelvic outlet.

Study Session 7

SAQ 7.1

Back pain is common in pregnant women because their posture changes to accommodate the weight of the growing uterus. The back curves inwards and the belly curves outwards, putting strain on the back, which can cause pain.

SAQ 7.2

This woman's weight gain was normal for the first 30 weeks of her pregnancy: she gained 2 kg in the first 20 weeks and 0.5 kg every week for the next ten weeks. However, she would be expected to gain 0.5 kg every week from 30–40 weeks, but her weight gain slowed down to 0.1 kg per week in this period. It is not possible to tell whether this slow weight gain near the end of pregnancy is a sign that the fetus is not developing normally, but it should certainly be investigated at a health facility. Some women have normal pregnancies without gaining much weight, but in others it is a sign of intrauterine growth restriction (IUGR) of the fetus.

SAQ 7.3

Pregnant women normally experience mild physiological anaemia because their blood volume increases faster than the rise in the number of red blood cells in their circulation. Iron is required for the production of haemoglobin, the oxygen-carrying substance in red blood cells. If a woman doesn't have enough iron in her body, she won't be able to make enough red blood cells, so her anaemia could become serious. Eating a diet containing plenty of iron-rich foods, or taking iron tablets, helps her to make enough red blood cells to carry the oxygen she and her growing fetus need.

SAQ 7.4

If a pregnant woman is lying on her back, the weight of her uterus presses down on the major blood vessel (the vena cava) returning blood from her body to her heart. This in turn leads to less blood being pumped out of her heart to the rest of her body, so her blood pressure drops suddenly. She may experience dizziness, or even a loss of consciousness, because not enough oxygen is reaching her brain.

SAQ 7.5

Shortness of breath is common in pregnancy as the uterus grows and crowds the mother's lungs, so she has less room in which to breathe. But if she is also weak, tired and short of breath all the time, you should refer her to seek medical advice. She could be anaemic, or have heart problems, or possibly her diet is poor.

SAQ 7.6

A is *false*. Lying flat after a meal is not recommended in pregnancy and it does not help digestion. The contents of the pregnant woman's stomach will be pushed upwards into her oesophagus in her chest if she is lying down, and the acids that digest her food can cause a burning sensation known as 'heartburn'.

B is true. Frequent urination in late pregnancy is normal because the uterus pushes down on the bladder and it can hold less urine.

C is true. Heart rate, stroke volume and cardiac output all increase during pregnancy, because the woman's larger body, uterus and the fetus all need a larger blood flow to provide them with nutrients and oxygen.

D is *false*. Oedema in pregnancy usually *improves* during the night. The fluids that collect in the woman's legs during the daytime are absorbed into her blood stream when her legs are raised in bed at night.

E is true. Pigmentation may appear on the face, or as a dark line on the abdomen in some pregnant women.

F is *false*. Colostrum should always be fed to newborn babies. It is rich in proteins and contains the mother's antibodies, which help to protect the baby from infection.

G is true. Progesterone causes the uterus to increase in size to accommodate the growing fetus.

Study Session 8

SAQ 8.1

(a) Someone who is not a health professional is unlikely to know what 'pre-eclampsia' means, so she won't understand the question. She might say 'no' because she doesn't want you to think she is ignorant. You could miss learning vital information about her risk factors if your questions are not accessible.

(b) She may worry that you will think she is stupid because she doesn't know this medical term. This may make her uncomfortable about sharing personal information with you.

(c) We don't know exactly how you rewrote the question (there are various equally good ways of saying it), but you might have used words like this:

'In your previous pregnancy, did a health professional ever tell you that your blood pressure was high, or that you had protein in your urine? Did you ever experience bad headaches, nausea or vomiting, and swelling of your feet, hands or face?'

SAQ 8.2

(a) Mrs X reports three possible symptoms of pregnancy: amenorrhoea (no period for nine weeks); nausea in the mornings; and abnormal tiredness during the day.

(b) She has wanted another baby for the past ten years, but despite not using contraception she has not conceived, so she may not be pregnant now.

(c) The quickest way to find out if she is pregnant would be to go to the nearest health facility, where they could do a pregnancy test on her urine to see if it contains the hormone HCG, which is produced by the embryo and placenta. This test is not conclusive, but it is a probable sign of pregnancy.

SAQ 8.3

If Mrs X is pregnant, she should be advised to give birth in a health facility this time, because of her age (she is an older mother at 39 years); she had a long first labour (over 24 hours); and her first baby was large (4 kg). All three risk factors make it more likely that she will have difficulties in delivering her second baby.

SAQ 8.4

Mrs X was given iron tablets during her first pregnancy as a routine precaution against her developing anaemia (shortage of red blood cells). Iron boosts the supply of red blood cells to carry oxygen around her body and that of the growing baby. All pregnant women should ideally be given iron tablets, so this is not a sign of a serious risk factor in Mrs X's case.

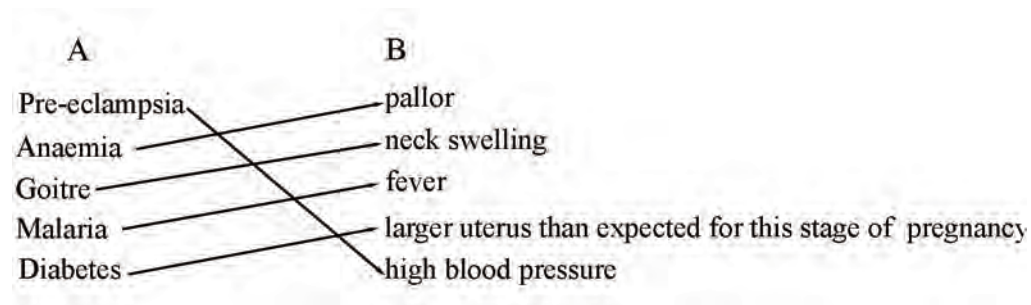
SAQ 8.5

We can't predict exactly what questions you wrote in your Study Diary, or what words you used, so your questions could be a bit different from ours (below), and still be equally good. The important point is that the language you used should be understandable by the women in your community. You should ask questions such as the following:

- When was your last monthly bleeding? Have you missed a month yet?
- Have your breasts got any larger recently, or do they feel tender?
- Have you felt sick, especially in the mornings when you wake up?
- Have you felt unusually tired or sleepy during the day?
- Have you needed to pee (pass water) more than usual?
- Have you felt any light movements in your belly?
- Has your belly got any bigger lately?

Study Session 9

SAQ 9.1



Each diagnosis is linked to its warning sign.

SAQ 9.2

A is *false*. Goitre is caused by iodine deficiency, and not by iron deficiency.

B is true. Maternal diabetes often results in a big baby because the mother has too much sugar in her blood, which makes the baby fat.

C is true. Shortness of breath may be caused by anaemia, a heart problem, lung infection or a blood clot.

D is *false*. A blood pressure of 90/50 mmHg is very low, and is a characteristic sign of heavy bleeding or shock. In such a case the woman has to be referred to a health centre right away.

E is *false*. Normal resting pulse rate is 60–80 beats a minute. A fast pulse (100 beats a minute or above) may be a sign of anaemia.

F is true. Blood pressure and pulse rate should be measured when the woman is sitting comfortably.

SAQ 9.3

You should refer Zufan immediately. Although her temperature is close to normal and gives no cause for concern, her pulse rate is faster than normal, and her blood pressure is very high — the top and the bottom numbers are both above the warning level of 140/90 mmHg.

Study Session 10**SAQ 10.1**

(a) The gestational age based on the fundal height measurement is seven months.

(b) If Abebech is really seven months pregnant, you would expect her abdomen to measure about 28 cm from her pubic bone to the top of the uterus, i.e. approximately one centimetre for each week of pregnancy dated from the LNMP. Remember the measurement may range from 26–30 cm.

SAQ 10.2

The gestational age based on fundal height is one month more than expected from the date of the LNMP. Therefore, the uterus is bigger than expected from the date of the LNMP.

SAQ 10.3

The uterus may be bigger than expected because the date of the LNMP may be incorrect, and Abebech is really seven months pregnant. This is not a problem, but it is important to investigate other possible explanations. For example, she may have too much amniotic fluid (water) surrounding the baby in the uterus; you should refer her to a health facility where she can have an ultrasound examination to find out if this is the problem. Or she could have a twin pregnancy. You can hear one fetal heartbeat clearly, so get someone else to help you listen to Abebech's abdomen to see if you can hear two fetal heartbeats. If you suspect she is having twins, refer her to the nearest health facility.

Study Session 11**SAQ 11.1**

A True. Listening to the fetal heart beat using a stethoscope is called auscultation.

B True. When the fetal head is down and the bottom of the fetus is up in the fundus, it is called a vertical lie.

C *False*. In a vertex presentation, the presenting part is the baby's head.

D True. The fetal heart rate is normally 120 to 160 beats a minute.

E *False*. In a breech presentation, the fetal heartbeat sounds loudest *above* the mother's bellybutton.

SAQ 11.2

- (a) The hard, round mass in the fundus of the uterus is most likely to be the baby's back, and the soft irregular shapes towards the pubic symphysis are its arms and legs. This is a vertical lie.
- (b) The bottom is the presenting part.
- (c) This is called a breech presentation.

SAQ 11.3

You would listen for the fetal heartbeat *above* Bekelech's bellybutton because, if the baby is breech, its heartbeat will sound loudest there. (Look again at Figure 11.12 if you are not sure why this is so.)

SAQ 11.4

The baby may be sick, or even dead, because Bekelech says it isn't kicking and you can't hear a fetal heartbeat. You should refer her to a health facility immediately.

Study Session 12

SAQ 12.1

(a) The medical names for the minor disorders of pregnancy that this woman is displaying are pica, chloasma, and oedema.

(b) Management:

Pica: Clay soil is not food, and it may give her parasites that can make her sick. You should advise her not to eat clay, but encourage her to eat iron-rich foods (like chicken, fish, pumpkin, beans, peas, meat — especially liver, kidney, and other organ meats — and whole grain products) and calcium-rich foods (like yellow vegetables, milk, curd, yogurt, cheese, and green leafy vegetables).

Chloasma: Reassure her that the brown patches are normal and they will fade after the baby is born. She can minimise them by wearing a hat when she is in bright sunlight.

Oedema: Advise her to put her feet up for a few minutes at least two or three times a day. This will help the fluid in her lower legs to be absorbed back into her circulation. Encourage her to eat fewer packaged foods that are very salty and to drink more water or fruit juices.

SAQ 12.2

Each of the minor disorders in List A has been connected by an arrow to the correct management in List B.

