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### Learning Objectives

At the conclusion of this chapter, the reader will be able to discuss the following:

- Approach to a focused and evidence-based antenatal care that is cost-effective and efficient for developing countries
- Current protocols for regular assessment, diagnostic testing, interventions and preventive care in each trimester of pregnancy
- The relevance of incorporating research evidence from developed countries and of due consideration for prevailing local conditions and circumstances in the provision of antenatal care
- The value of an expanded, multidisciplinary, community-based maternal health programme that includes birth centres, well-woman clinics, teen pregnancy care and family planning services

weight infants and other preventable health problems in both developed and developing countries [2, 3]. Comprehensive maternity care includes the following:

1. Appropriate diagnosis of pregnancy followed by an initial thorough assessment in early pregnancy.
2. Periodic examination including screening tests as appropriate through the course of gestation.
3. Patient education addressing pregnancy care, labour and delivery, nutrition and exercise, and early infant care.
4. Provision of emergency obstetric care and management of the patient during labour, delivery and the postpartum period. Ideally, obstetric care should commence before pregnancy as preconception visits where family and medical history for both parents and a physical examination of the prospective mother are done. Pre-existing conditions that may influence conception and/or pregnancy are identified, and appropriate management plans are formulated with the goal of achieving a 'normal' low-risk pregnancy.

## 10.1 Introduction

Antenatal care (ANC) is a major component of integrated maternal health within sexual and reproductive health which is a vital element of primary healthcare. It is preventive healthcare the goal of which is to identify and treat potential pregnancy-related health problems throughout the course of the pregnancy while promoting healthy lifestyles that benefit both mother and child [1]. The improved access to family planning and contraceptive services and availability of routine antenatal care have played a large part in reducing maternal and perinatal morbidity and mortality, low birth

The concept of pre-pregnancy evaluation is particularly relevant to developing countries with a substantial proportion of unplanned pregnancies and where individuals initially seek care after pregnancy has begun. Besides poor care during pregnancy, delivery and the puerperium, the high maternal and perinatal mortality and morbidity in most developing countries are partly due to many women becoming pregnant with underlying undiagnosed and untreated medical and surgical conditions [2, 3].

While global strategies seek to reduce maternal mortality through universal access to antenatal care [4, 5], progress has been slow in developing countries where antenatal care coverage is often less than 50% [6]. Some investigators have suggested that there may be a lack of congruency between service provision and the social and cultural context of some women in low- and middle-income countries [7]. Therefore, it is imperative to design the process and structure of antenatal care in developing countries to (1) promote access to care;

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(2) enhance patient education and involvement in their care; (3) provide a team approach to ongoing maternal and foetal surveillance and (4) establish uniform protocols for screening for high-risk conditions, along with organised plans to address complications that may arise in pregnancy.

Several aspects of antenatal care are becoming evidence-based rather than relying on traditional models of care that are not supported by rigorous scientific evidence [8, 9]. The purpose of this chapter is to discuss the provision of antenatal care that is practically and contextually consistent with local beliefs, experiences and resources, and would be well utilised at both secondary and tertiary care centres in countries. The challenge for healthcare professionals working in rural and district hospitals and health centres is to tailor their practices to limited resources while maintaining an appropriate standard of care. As much as possible, an evidence-based approach that is grounded in achieving the best outcomes for both mother and infant must form the basis for antenatal care rather than long-standing traditional practices. Recognising the relative dearth of well-conducted randomised clinical trials to guide the provision of antenatal care, the Cochrane Pregnancy and Childbirth Database has been aggressively seeking ways to rectify the gap in evidence through a partnership with researchers in developing countries [10, 11]. Although the research output of developing country authors has increased to 40%, many health problems relevant to the developing world and the best ways to address them remain largely neglected [12]. While it could be argued that developing countries should obtain evidence for prevailing health problems locally, existing databases from developed countries provide a framework for such efforts. Healthcare professionals in low-resource countries must appreciate the limitations of local circumstances in using such evidence and evidence-based clinical guidelines for decision making.

Antenatal care is an excellent example of preventive healthcare, as it deals mainly with healthy individuals with an emphasis on the practice of health promotion. Besides, it includes the application of the principles of screening and early treatment of clinical complications. Rather than being limited to clinical interventions within a health facility, preventive actions can occur at various levels – from the home for family decisions to the community, and for public-wide actions such as the availability of transportation to health facilities. While some progress has been made toward meeting the United Nations Millennium Development Goal 5 targets of reducing maternal deaths by three quarters and universal access to reproductive health, the World Health Organization (WHO) reported that while maternal mortality has declined worldwide by 45%, in 2015 around 830 women die every day from problems in pregnancy and childbirth

[13]. Only 5% of the women who died lived in high-income countries, the rest of the women lived in low-income countries [13]. Action for safe maternal care remains an urgent health priority in most developing countries.

Recently, a series of evidence-based algorithms and practice guidelines were developed for effective pregnancy and childbirth care [14]. The guidelines have the potential to improve outcomes of antenatal care for mothers and their newborns, particularly, in low resource countries. Caution should be exercised when using such guidelines and databases in the provision of care because of the limited contribution of the small number of patients from developing countries to their development. Present and planned contribution of studies from developing countries would improve the applicability of such clinical practice guidelines to local circumstances. This is most likely to occur when physicians take an active role in understanding and responding to the process of evidence-based practice based on the application of research-derived evidence to achieve the most effective clinical outcomes [10].

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## 10.2 Preconception Care

Preconception care aims at identifying and reducing modifiable factors that can adversely affect pregnancy outcomes. Major professional organisations worldwide have endorsed pre-conception counselling as an integral component of care for all women contemplating pregnancy. A preconception care programme has the potential to assist women who want to become pregnant by advising them about risk factors, healthy lifestyles and assessing readiness for pregnancy. It includes a comprehensive history and physical examination with the initiation of health promotion interventions prior to conception. Preconception care operates within a variety of settings and modalities to achieve the following:

- Evaluation of medical conditions such as hypertension and diabetes that may adversely affect pregnancy outcomes.
- Risk assessment of high-risk health behaviours and counselling on health promotion activities such as smoking and alcohol cessation, cessation of non-prescription drugs and review of prescription medications with adverse effects on pregnancy.
- Dietary counselling including treatment of anaemia, pre-pregnancy weight problems and use of folic acid (400 µg) daily by women of childbearing age, preconception and during the first trimester. This is associated with a reduced incidence of first and subsequent neural tube defects.

- Screening for infectious diseases is important for patients at risk including tuberculosis that remains prevalent in many developing countries. Vaccination for the prevention of congenital infections such as congenital rubella syndrome, varicella and similar perinatal infections. Screening, prevention and treatment of infections such as hepatitis and acquired human immunodeficiency virus (HIV) can be achieved at this time to improve birth outcomes and prevent mother-to-child transmission of infection.
- Genetic counselling for conditions such as sickle cell disease and thalassaemia that are prevalent in some populations in developing countries should be an integral component of preconception care.

Counselling is tailored to the educational level of the patient, and risk factor reduction is emphasised as an important component of counselling. Healthcare providers must address the social as well as medical ramifications of pregnancy for both the mother and the foetus. A large proportion of pregnancies are unintended and unplanned in both developed and developing countries. Comparison of women whose pregnancies were intended to those with unintended pregnancies shows that the latter are more likely to report cigarette smoking and less likely to report daily vitamin intake. Women with unintended pregnancies are less likely to decrease consumption of caffeinated beverages [14]. Preconception care can further enhance pregnancy outcomes by optimising health during the most critical period of organogenesis, that is, between 17 and 56 days after conception.

A multidisciplinary approach to preconception and antenatal care can be achieved and effective in developing countries. Preconception care is most cost-effectively provided as an integral part of primary care services during routine health promotion. It may be introduced during routine screening, through patient education literature, family planning clinics, pre-employment assessment and in group health promotion classes. Nurses, midwives, social workers, nutritionists and health educators complement physicians in providing preconception care. This cost-effective approach appears to be acceptable to most women of childbearing age in developing countries.

Research data supporting the efficacy of preconception care are limited, but it has been shown to reduce perinatal mortality and morbidity in certain populations [15]. Much of the research on maternal outcomes focus on the events of pregnancy and delivery. Good maternal healthcare requires attention to physical, psychological and social factors. The rapport that often develops between patients and healthcare providers in the preconception period assists during difficult decision-making in pregnancy. Preconception programmes play an important role in reducing maternal and infant mor-

tality and require appropriate priority in the allocation of resources for maternal health.

### 10.3 Organisation and Standardisation of Antenatal Care

Antenatal visits are embraced by pregnant women for the reassurance they receive besides providing opportunities for improving confidence and building rapport between healthcare providers and pregnant women. Continuity of care is promoted as being vital to good care. Medical surveillance throughout pregnancy is the foundation of antenatal care and is enhanced by emotional and psychosocial support. Organising integrated antenatal care is a challenge for most developing countries in view of the need to adapt to prevailing local circumstances. The philosophy of antenatal care developed mainly after the proposals of Ballantyne in 1902 and was originally for surveillance of medical complications during pregnancy and for preventing preterm labour [1]. Current models of antenatal care have evolved and expanded to include educational evaluation, psychological, social and financial support and health promotion, with little research to support their effectiveness. For more than three decades, there has been increasing scepticism of many tasks that are routinely included in antenatal care [16, 17]. Unfortunately, much of the controversy regarding antenatal care has focused on the timing and frequency of antenatal visits, whereas the content of antenatal care and the effectiveness of its actual delivery are more important. It is evident that much of the improvement in maternal health during the last century can be attributed to increased standards of living, and improved hygiene and nutrition. Nevertheless, the role of medical care should not be underestimated as exemplified by the higher levels of preventable maternal mortality among a North American religious group that opposed the provision of such care [18]. With continuing emphasis on evidence-based care, it is most appropriate to critically assess antenatal care with the aim of proposing an objective framework of care after considering local circumstances and implementation challenges.

Healthcare professionals including specialists must have a community perspective in their work, and in the case of antenatal care, constantly seek out unbooked patients, that is, patients lacking antenatal care, who are at increased risk of experiencing complications during pregnancy and delivery [14]. Further, the involvement of healthcare professionals in health centres and dispensaries increases access to antenatal services besides improving supervision and on-the-job training for staff based in peripheral and rural clinics. The value of home-based maternal record cards should not be underestimated. Quality of care should be a central feature of tasks,

and clinical audit should be performed regularly to promote optimum utilisation of limited resources. Clinical management of difficult cases is facilitated by the availability of protocols for dealing with those situations.

Standardised antenatal care has been shown to minimise variability of care and ensure the quality and cost-effectiveness of care. Other potential applications include the education of individuals or groups developing quality indicators, improving the allocation of resources such as insurance payment decisions and reducing the risk of liability for care that is perceived to be substandard. For example, some pregnant women are eager to have supplementary care and certain tests, as substantiated by their willingness to pay for ultrasound examinations [19]. In the context of publicly provided services, the value of any intervention should be seen from the perspective of clinical needs relative to available resources. Throughout this chapter, we emphasise the philosophy of cost-effective, evidence-based antenatal care for developing countries.

A standardisation of antenatal medical records for primary care physicians is urgently needed in most developing countries. Antenatal records document the medical risks, behaviour and psychosocial situations of the patient and serve as a reminder for testing, counselling, and educational and medical services that are needed. Most antenatal records have a flow sheet that allows the clinician to follow important parameters during pregnancy. It is essential that women be given their antenatal records to have control over their health besides serving as an important tool of communication for healthcare teams [20]. Measurement processes are evolving to focus on how healthcare systems function in an integrated fashion instead of strictly on the approach or belief of individual physician or healthcare provider. Medical records are essential to evidence-based care, standardisation of care, and communication among healthcare professionals, especially using current information communication technologies. Whereas patient-held records are valuable to increase the involvement of pregnant women in their care, it is crucial to exploit linkages between databases of health facilities, especially with laboratories and imaging units, for efficient effective delivery of clinical services through improvement of quality of care.

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## 10.4 Education, Counselling and Support

In general, pregnant women have certain expectations from the healthcare providers including respect for their sociocultural values, being treated with respect, and psychosocial and emotional support, besides education, counselling and medical treatment. Information from providers is more likely to be positively received in the aforementioned context by

women as part of a consultation process. Therefore, antenatal care should offer great potential for behavioural changes for health promotion. Reducing or ceasing unhealthy personal habits such as smoking, alcohol consumption and the use of untested local herbal remedies should be encouraged. Foetal alcohol syndrome characterised by microcephaly, mental retardation, facial deformities and growth restriction is well-established preventable sequelae of alcohol consumption during pregnancy. Furthermore, smoking cessation efforts have been shown to be beneficial through individual or group counselling, supplemented by information booklets and community-wide approach for smoking control.

Similarly, appropriate advice is provided to pregnant women for improved nutrition. This nutritional support includes education on breastfeeding of the baby and the promotion of healthy nutrition throughout the course of pregnancy. This approach is of paramount importance in developing countries with high infant mortality attributable to infant nutritional deficiencies, besides infection from the unsafe water supply. Given the rising prevalence of single mothers in developing countries, access to social services and financial and psychological support are needed to assist individual mothers.

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## 10.5 Antenatal Care Plans

Antenatal care must be tailored to each woman's needs and local circumstances. It is important to develop a care plan appropriate to the woman's situation and integrate antenatal care into the existing healthcare system to achieve its effectiveness. Current efforts focus on designing antenatal care involving fewer routine visits for low-risk women. This approach may lead to patient convenience and reduce costs besides enhancing compliance with ongoing care. The WHO recommends that pregnant women should all receive four antenatal visits to identify and treat clinical problems and give immunisations and appropriate medical interventions [21].

Several studies [21–23] have suggested that in women who book early for antenatal care, it might be possible to reduce the total number of antenatal visits without having any negative effect on infant health. As part of its work to help define and strengthen antenatal care, the WHO convened a working group to formulate recommendations for prenatal care at health centre levels. In a published report [22], the group agreed on the timing and content of focused prenatal care for all women as well as risk factors for medical conditions that would require special care. There is a need for a reduced schedule of visits (Table 10.1) for low-risk women in developing countries and a focus on greater maternal and professional satisfaction with this care plan.

**Table 10.1** Frequency of antenatal visits in low-risk pregnancy

| Visit        | Gestational age (weeks) |
|--------------|-------------------------|
| First visit  | 16                      |
| Second visit | 24–28                   |
| Third visit  | 32                      |
| Fourth visit | 36                      |

Emphasis must be placed on the role and appropriateness of midwives and allied health workers as providers of antenatal care services in developing countries. Also, it is imperative to educate and empower the entire community to address factors that contribute to maternal morbidity and mortality. Uncertainty remains as to the clinical effectiveness of reduced visit schedules for rare pregnancy problems. Operational research and evaluation of prenatal care practices are underway to identify the most effective and efficient way to provide antenatal care services [23, 24].

## 10.6 The Initial (Booking) Visit (Up to 16-Weeks Gestation)

Following the diagnosis of pregnancy, the first prenatal visit should occur during the first trimester. The focus of this visit, as for most of the antenatal care, is to identify all risk factors involving the mother and foetus. Once identified, high-risk pregnancies require individual specialised care beyond what could be provided by the community nurse, midwife or general physician. A thorough comprehensive medical history is necessary with particular attention to chronic illness, surgical procedures with attention to abdominal and pelvic operations and blood transfusions. It is important to obtain a detailed menstrual and gynaecological history including a history of sexually transmitted infections. Details of previous pregnancies and deliveries are important to ascertain risk. Genetic risk factors include maternal and paternal age, and past and family history of birth defects. Finally, social history must include substance use, nutrition, and lifestyle factors and stresses.

## 10.7 World Health Organization [22]

A comprehensive physical examination is performed at the first visit. Most pregnant women in developing countries might not have had a thorough physical examination since early childhood. Abnormal general physical findings such as anaemia, high blood pressure or heart murmur require further evaluation. A pelvic examination is carried out at the booking visit. Besides estimating the gestational age using uterine size, pelvic examination provides a unique opportunity for women in developing countries to have a Papanicolaou

smear for cervical cancer screening. The common myth that a vaginal examination in pregnancy may be associated with spontaneous abortion has no scientific basis.

Appropriate laboratory investigations are ordered at the booking visit; again, the focus is on risk identification (Table 10.2). Abnormalities noted by history or on physical examination may require direct laboratory testing and follow-up. For example, women with uncertain dates may require ultrasonography for pregnancy dating. Routine counselling and education and the offering of HIV testing for pregnant women in developing countries have a great potential for reducing mother-to-infant transmission. With the proven effectiveness of antiretroviral agents in reducing the risk of vertical transmission of HIV from mother to foetus, there is a good reason to screen all pregnant women for HIV so that appropriate therapy can be administered. Initial management during the first antenatal visit includes advice on diet, exercise, work and lifestyle. Appropriate tests are requested and an outline of a formal plan for the rest of the pregnancy and how to access support services are discussed.

**Table 10.2** Laboratory tests during antenatal care

| Test                      | Rationale  |
|---------------------------|--|
| <i>(First trimester)</i>  |  |
| Blood group and type      | Determines ABO and RH incompatibility  |
| Blood antibody screen     | Detects isoimmunisation  |
| Haematocrit               | Detects maternal anaemia   |
| Haemoglobin               |  |
| Electrophoresis           | Screens for haemoglobinopathy  |
| Hepatitis B, C surface    |  |
| Antigen                   | Screens for infection  |
| Wasserman test            | Screens for maternal infection   |
| HIV test                  | Screens for maternal infection   |
| Rubella titre             | Detects maternal immunity  |
| Chlamydia test            | Screens for maternal infection   |
| Gonorrhoea test           | Screens for maternal infection   |
| Urine culture             | Detects asymptomatic bacteriuria   |
| Papanicolaou smear        | Screens for cervical cancer  |
| <i>(Second trimester)</i> |  |
| Maternal serum screen     |  |
| Or cell-free DNA          | Screens for chromosomal anomalies and neural tube defect                         |
| Ultrasonography           | Pregnancy dating, placental localisation, screens for major structural anomalies |
| <i>(Third trimester)</i>  |  |
| Glucose screen (50–)      | Screens for gestational diabetes   |
| Blood antibody screen     | Screens for isoimmunisation  |
| Group B streptococcus     | Detects carriers   |



## 10.8 Risk Scoring

Serious attempts to develop a scoring system for identifying risk factors in pregnancy began in the 1970s [23]. While risk scoring systems enable risk groups to be identified, they were too crude to be of value regarding caring for the individual woman. Current obstetric risk scoring systems do not make a precise prediction of an abnormal outcome, and therefore, cannot be used in formal decision analysis. An accurate assessment of foetal risk using a risk scoring system is limited by geographic and individual factors and the interdependency of most obstetric variables. However, where obstetrical care resources are limited and large numbers of high-risk pregnant women are scattered throughout remote areas, it would appear that risk scoring assists positively with decisions regarding the best use of resources.

Although clear evidence is lacking, there is a strong indication that favours the application of a modification of the WHO criteria for classifying women for the basic component of the new antenatal care model (Table 10.3) in developing countries, with limited availability of experienced caregivers to provide antenatal care [22, 23]. Risk scoring has also been proposed as a means of best utilisation of sparse human and material resources. It may be used to identify women who do not require an intensive programme of antenatal care that may be triaged to various healthcare providers based on the risk score.

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## 10.9 Second Visit (24–28 weeks)

For patients with normal findings at the initial visit, our proposed care schedule of subsequent visits is shown in Table 10.1. Evidence from developing countries suggests that early onset of antenatal care and having subsequent three to four visits provide significant consistent and effective care for preventing perinatal problems [24–26]. Patients with high-risk pregnancies and those with ongoing complications are seen more frequently. During the visits, the results of routine tests are reviewed, health behaviour is reinforced and appropriate therapy provided as needed. Physical examination is limited to checking the blood pressure, maternal weight, assessing foetal growth by measuring the symphysis-fundal height in centimetres, verifying foetal cardiac activity and assessing peripheral oedema. The only routine laboratory test performed at every antenatal visit is the determination of proteinuria and glycosuria. Education continues to be important and patients must be made aware of warning signs such as vaginal bleeding, abnormal vaginal discharge, swelling and headaches. When appropriate, genetic testing is offered and performed at this time. Recent studies suggest that early amniocentesis and chorionic villus

sampling are associated with a significant increase of foetal loss as compared to later amniocentesis. Second trimester (15–18 weeks) screening of a pregnant woman's serum for markers of congenital anomalies such as trisomy 21 (Down's syndrome) and neural tube defects is increasingly being utilised in developing countries as an important component of antenatal care. While assessing maternal blood for foetal cell-free DNA testing is new and limited to specialised centres, the most commonly utilised protocol is the triple marker screen, which measures serum levels of alpha-foetoprotein (AFP), unconjugated estriol (uE3) and beta human chorionic gonadotropin (beta-HCG). The results of these tests are used to derive a value known as a multiple of the median (MoM). An algorithm that combines maternal age with the test value can be used to calculate the risk for chromosomal disorders such as trisomy 21 and 18. Alpha-foetoprotein alone corrected for maternal weight, race, insulin-dependent diabetes, and multiple pregnancies can be used to predict the risk of neural tube defect.

Prenatal screening is best performed within an integrated programme providing biochemical testing in conjunction with knowledgeable, experienced counsellors, expert ultrasonographers and physicians with special expertise in maternal-foetal medicine and neonatal care. Prenatal screening provides patients with the information they need to make informed pregnancy decisions and, when necessary, organise support and resources essential to the care of an infant with special needs.

Routine ultrasound examination for congenital anomalies consists of a screening procedure performed on the total obstetrical population usually at 18–20 weeks of gestation, as opposed to the selective use of ultrasound that might provide more information for a problem that is suspected on clinical grounds. As the risk for foetal malformation is present in all pregnant women, many experts hold the opinion that antenatal ultrasound screening should be universal. However, screening may either lead to unnecessary anxiety if there is a false positive result or a false sense of security if there is a false negative result. There is extensive published work showing neither improvement in perinatal morbidity nor an overall reduction in unnecessary intervention with routine ultrasound. The role of ultrasonography and its validity as a screening test for foetal malformation in a low-risk population remains the subject of debate [27].

Notwithstanding the beneficial impact of prenatal screening, developing countries with limited financial and human resources must be cautious in introducing widespread screening services for pregnant women. In view of doubtful value in the investment of scarce resources, because the outcome might not justify the input, consideration must be given to health economics and health resource utilisation.

**Table 10.3** Classifying form. Criteria for classifying women in the basic component of the new antenatal care model [22, 23]

Name of patient: \_\_\_\_\_ Clinic record number: 

|  |  |  |  |  |  |
|--|--|--|--|--|--|
|  |  |  |  |  |  |
|--|--|--|--|--|--|

Address: \_\_\_\_\_ Telephone: \_\_\_\_\_

**INSTRUCTIONS:** Answer all of the following questions by placing a cross mark in the corresponding box.

| <b>OBSTETRIC HISTORY</b>  | <b>No</b>                | <b>Yes</b>               |
|---|--------------------------|--------------------------|
| 1. Previous stillbirth or neonatal loss?  | <input type="checkbox"/> | <input type="checkbox"/> |
| 2. History of 3 or more consecutive spontaneous abortions?  | <input type="checkbox"/> | <input type="checkbox"/> |
| 3. Birthweight of last baby < 2500 g?   | <input type="checkbox"/> | <input type="checkbox"/> |
| 4. Birthweight of last baby < 4500 g?   | <input type="checkbox"/> | <input type="checkbox"/> |
| 5. Last pregnancy: hospital admission for hypertension or pre-e clampsia/e clampsia?  | <input type="checkbox"/> | <input type="checkbox"/> |
| 6. Previous surgery on reproductive tract?<br>(Myomectomy, removal of septum, cone biopsy, classical CS, cervical cerclage) | <input type="checkbox"/> | <input type="checkbox"/> |

| <b>CURRENT PREGNANCY</b>  | <b>No</b>                | <b>Yes</b>               |
|---|--------------------------|--------------------------|
| 7. Diagnosed or suspected multiple pregnancy?                   | <input type="checkbox"/> | <input type="checkbox"/> |
| 8. Age less than 16 years?                                      | <input type="checkbox"/> | <input type="checkbox"/> |
| 9. Age more than 40 years?                                      | <input type="checkbox"/> | <input type="checkbox"/> |
| 10. Isoimmunization Rh (-) in current or in previous pregnancy? | <input type="checkbox"/> | <input type="checkbox"/> |
| 11. Vaginal bleeding?   | <input type="checkbox"/> | <input type="checkbox"/> |
| 12. Pelvic mass?  | <input type="checkbox"/> | <input type="checkbox"/> |
| 13. Diastolic blood pressure 90mm Hg or more at booking?        | <input type="checkbox"/> | <input type="checkbox"/> |

| <b>GENERAL MEDICAL</b>  | <b>No</b>                | <b>Yes</b>               |
|---|--------------------------|--------------------------|
| 14. Insulin-dependent diabetes mellitus?                        | <input type="checkbox"/> | <input type="checkbox"/> |
| 15. Renal disease?  | <input type="checkbox"/> | <input type="checkbox"/> |
| 16. Cardiac disease?  | <input type="checkbox"/> | <input type="checkbox"/> |
| 17. Known 'substance' abuse (including heavy alcohol drinking)? | <input type="checkbox"/> | <input type="checkbox"/> |
| 18. Any other severe medical disease or condition?              | <input type="checkbox"/> | <input type="checkbox"/> |

Please specify \_\_\_\_\_  
\_\_\_\_\_

A "Yes" answer to any ONE of the above questions (i.e. ONE shadd box marked with a cross) means that the Woman is not eligible for the basic component of the new antenatal care model.

Is the woman eligible? (circle) **NO** **YES**

If NO, she is referred to \_\_\_\_\_

Date \_\_\_\_\_ Name \_\_\_\_\_ Signature \_\_\_\_\_  
(staff responsible for ANC)

### 10.10 Third Visit (32 weeks)

During this period, advice and counselling provided during earlier visits are reinforced. Physical examination during the visit includes measurement of blood pressure, foetal growth by fundal height, documentation of foetal heart activity, and assessment of the presentation of the foetus. Foetal movement awareness and charting are initiated. The status of screening procedures for gestational diabetes remains highly controversial in view of the lack of evidence regarding the various strategies such as glycosuria testing, blood glucose levels and oral glucose challenge or tolerance tests. The situation is made more complex by conflicting recommendations from various respected organisations [28]. Therefore, the approach should be based on clinical acumen and the appropriate use of resources, a good example of the practical limitations of an evidence-based approach. It seems reasonable to screen for diabetes based on risk factors such as older age, obesity, family history and previous history of conditions such as prematurity, foetal macrosomia, congenital anomalies or intrauterine foetal death. Because diabetes has a devastating effect on pregnancy, screening for diabetes at 26–28 weeks' gestation with a 50-g 1-hour glucose challenge test seems prudent.

In Rhesus negative women, a repeat indirect Coomb's test is performed and, if negative, rhesus (D) immune globulin is given to prevent sensitisation to the Rhesus antigen. Repeat haematocrit and HIV screening are done in high-risk women during the period. Common causes of pregnancy-related anaemia consist of deficiencies of iron and folic acid besides infections such as malaria and helminths such as hookworms. Given the widespread prevalence of iron deficiency in developing countries, it is reasonable to recommend oral iron supplementation on a routine basis. As oral iron therapy is associated with minor side effects such as constipation especially in early pregnancy, it is best to await the beginning of the second trimester before initiating daily supplementation with 30 mg of elemental iron in the ferrous form. Patients with anaemia require appropriate therapy and those with folate deficiency which occurs mostly in multiple gestations require daily supplementation with 5 mg of folic acid orally for prevention. This approach regarding supplementation does not replace the value of an appropriate diet even prior to pregnancy. It is even more important for the primary prevention of neural tube defects through an adequate intake of folic acid.

### 10.11 Fourth Visit (36 weeks)

In developing countries, the major causes of morbidity and mortality for the mother, foetus and newborn are haemorrhage, hypertensive disorders, infections, obstructed labour, prematurity and anaemia. Therefore, it is appropriate that

antenatal care addresses the preventive issues associated with these conditions. Third-trimester antenatal care focuses on maternal blood pressure and weight as well as surveillance of foetal wellbeing. Hypertensive disorders account for much of the maternal and perinatal morbidity and mortality in developing countries. Transient hypertension is a clinically benign condition characterised by isolated high blood pressure in late pregnancy; its significance lies in the difficulty in distinguishing it from early pre-eclampsia. Chronic hypertension is a risk factor for intrauterine foetal growth restriction and intrauterine foetal demise, as well as for pre-eclampsia. Management of gestational hypertension at earlier stages of gestation requires balancing the risks of immediate delivery of an immature infant against the risks to both mother and infant of a complication of pre-eclampsia. The management strategy consists of control of maternal blood pressure, ongoing antepartum assessment of foetal wellbeing, and surveillance for superimposed pre-eclampsia. Prompt recognition can prevent adverse outcomes in most cases. Early detection enables treatment to avoid complications such as eclampsia and stroke [26].

The third trimester is the time to discuss the birth plan. A detailed review of labour and delivery prepares the patient for the labour experience. Pain control methods are discussed (or taught in special education classes) as they reduce the need for pain medication by as much as 30%.

### 10.12 Foetal Surveillance

As part of meticulous antenatal care, multiple methods of foetal health surveillance provide enormous means to improve foetal outcomes. Antepartum foetal assessment is used in pregnancies at risk for perinatal morbidity and mortality. Current testing options include the foetal movement count, non-stress test, contraction stress test and biophysical profiles. Vibroacoustic stimulation and umbilical as well as mid-cerebral artery Doppler velocimetry studies are useful adjunctive procedures in women with pregnancy complications. All these modalities have limitations. A strict protocol for antepartum foetal surveillance that is applicable to all patients is not feasible. However, testing based on general principles and guidelines can be followed. Although few practitioners working in specialised centres in developing countries have experience and expertise with these complex tests, knowledge is growing with the increased availability of modern facilities. Current evidence suggests that antepartum assessment by foetal biophysical profile scoring is associated with a significant reduction in the incidence of cerebral palsy in tested high-risk patients compared to untested patients [29]. Nevertheless, the extent of testing needs to be tailored to local resources and available expertise.

Pregnant women and their families usually become more apprehensive as delivery approaches and have several con-



cerns that require sensitive explanation and reassurance. A common concern relates to the health of the foetus as labour approaches, particularly regarding delivery and perinatal infectious complications. Group B streptococcal infection is the most common cause of neonatal sepsis and is responsible for significant neonatal morbidity and mortality. Approximately 25% of women have asymptomatic Group B streptococcal infection at some time during pregnancy, but the neonatal infection rate is only about 2 per 1000 deliveries [30]. Nevertheless, it is important for all pregnant women to be tested for group B streptococcus between 35 and 37 weeks of every pregnancy. To help protect their newborns from infection, pregnant women who test positive for Group B strep in the current pregnancy should receive prophylactic antibiotics intravenously during labour.

Detailed counselling of women during the last weeks of pregnancy includes childbirth preparations (labour, monitoring plans, support, pain relief and questions about episiotomy). It is critically important that skilled birth attendants are available during labour regardless of the type of birthing centre, maternity unit or hospital undertaking the delivery. It is particularly important to plan for the place of birth especially for the 10–20% of women who will need to have an emergency transfer in late pregnancy or during labour to facilities where blood transfusion and procedures such as caesarean section are available. In patients with gestation exceeding 40 weeks, an explanation is provided about the significance of a postdate pregnancy. Of concern to women is uteroplacental insufficiency and increased size of the baby, which can make delivery more difficult. Assessment of the cervix is conducted, and education is provided on foetal surveillance and the methods of induction of labour when needed. While routine induction of labour is not recommended, available evidence shows that it is beneficial after 41 completed weeks in reducing the risk of perinatal death.

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### 10.13 Unbooked Patients (With no Antenatal Care)

A pregnant woman is classified as ‘booked’ or having had appropriate care if she has attended at least four antenatal visits. Unbooked patients presenting for the first time late in the third trimester or in labour are a common occurrence in developing countries. When a patient who has had no antenatal care presents late in pregnancy or in labour, it is essential to rapidly assess the pregnancy risk factors. A focused history, physical examination and laboratory assessment are conducted. The profile that emerges from various studies is that the unbooked mother is young, unmarried, unemployed, has a low income, and has no permanent relationship with the father of the infant. However, she knows about antenatal care and knows that is important

to seek such care [31]. The reasons for not seeking care are usually varied and non-specific. It has been suggested that an important difference between booked and unbooked patients is the personality and attitude toward pregnancy and parenthood. Obstetric complications in unbooked patients include anaemia, hypertensive disorders, preterm labour, preterm rupture of the membranes, antepartum haemorrhage and intrauterine foetal death. In reviewing published work, one can detect a higher obstetric risk profile in booked mothers with poor obstetric history, which probably influenced their decision to seek antenatal care. Unbooked mothers tend to be at lower risk, often presenting ‘unbooked’ because of antenatal complications [31]. Several studies found a statistically significant association between the absence of antenatal care and adverse maternal and foetal outcomes [32]. This emphasises the need for regular antenatal visits and underscores the utilisation of antenatal care services to avoid the complications of pregnancy. The provision of antenatal and emergency obstetric care has played a vital role in reducing maternal, perinatal and infant mortality in developing countries during the past 60 years and must continue to be promoted as an important component of safe maternal health.

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### 10.14 Effectiveness of Different Antenatal Care Models

There is not a lot of evidence to justify a specific antenatal care model among the different ones that are currently used. There is a dearth of objective evidence to enable comparative assessment of the various existing models for antenatal care: focused visits versus the traditional number of visits; midwife-led continuity care versus shared care with the general practitioner or consultant-led care. Midwife-led care for low-risk women is where a midwife team leads the care a woman receives (with general physician back-up when needed) or with specialist back-up [33]. Group ANC is a model that brings together a healthcare provider, usually a midwife, and a group of women in the same stage of pregnancy to receive care. This model is highly utilised in low- and medium-resource countries. Group antenatal care has a couple of obvious benefits: it costs less than one-to-one visits and the women have more hours of care as a group than on their own. Only small studies have been conducted looking at group care, but they have found that mothers knew more about pregnancy, birth and parenting in the group setting. The mothers reported liking the group care and the review found no difference between how the pregnancies developed between the group and individual setting [34, 35].

A meta-analysis of models of antenatal care by Fernandez and colleagues found no significant differences in different models of antenatal care regarding maternal and foetal outcomes in low risk women [36].

### 10.15 Barriers and Enablers to Utilisation of Antenatal Care

Although antenatal care is important for improving the health of the mother and baby, many women do not receive the recommended four visits. Barriers that exist to effective antenatal care include: (1) inadequate infra-structural resources, (2) lack of knowledge of services, (3) ignorance of the importance and value of antenatal services, (4) cultural, religious and traditional practices (including beliefs in traditional healers), (5) lower women's autonomy, in making their own healthcare decisions, (6) poverty and lack of transportation resources and (7) household responsibilities. Aniebue and colleagues [24] found that while most women who utilised fewer focused antenatal visits did so because of its convenience and low cost. On the contrary, 45% feared the new model might be inadequate for their learning, familiarisation with care providers and for early detection of disease. The authors suggested 'an extensive health education campaign, social mobilisation and involvement of relevant stakeholders in the design, execution and monitoring of focused antenatal care from the inception of the programme' [24]. There are additional strategies to assist women to access antenatal care such as new health policies, educating health workers and promote health service reorganisation. Community interventions to help people change pregnant women's behaviour can also play a part. Examples of these interventions are media campaigns reaching many people, enabling communities to take control of their own health, informative-education-communication interventions or financial incentives [37, 38]. These interventions used together are more effective and have the potential to improve the number of women receiving antenatal care and reduce maternal mortality in early infant deaths in developing countries.

### 10.16 Summary

Antenatal care has various facets, ranging from the prevention of morbidity and mortality to the promotion of maternal and foetal wellbeing and their medical and psychosocial implications. Developing and industrialised countries have much in common and can learn from each other in terms of programme development to enhance maternal health. It would not be appropriate for programmes of developed countries to be adopted by developing countries without evaluation of their relevance. Instead, they should be adapted for utilisation after considering local circumstances. As detailed in this chapter, it is easy to agree on certain procedures for antenatal care such as routine assessment of blood pressure for early detection of hypertensive disease of preg-

nancy but difficult to obtain consensus on others, such as an appropriate number of antenatal visits, the extent of prenatal genetic screening, and the need for routine use of ultrasound for the monitoring of foetal growth. Nevertheless, the promotion and availability of an appropriate framework should enhance the improvement of antenatal care delivery.

With the rationalisation of healthcare resources and a paradigm shift towards evidence-based care, communities in developing countries must work together to improve access to reproductive healthcare. We have reviewed an approach to a focused and evidence-based antenatal care that is cost-effective and efficient. However, caution must be exercised in adopting a narrow focus toward evidence-based care that incorporates research evidence from developed countries without due consideration for prevailing local conditions and circumstances. We suggest an expanded, community-based maternal health initiative that includes birth centres, well-woman clinics, teen pregnancy programmes and family planning services. The staff of such programmes must include nurses, certified midwives, social workers, general medical practitioners, and specialist obstetricians and gynaecologists. Pregnant women need the support of caring family members, friends and health professionals. As noted by East and colleagues [39] 'while programmes that offer additional social support during pregnancy are unlikely to have a large impact on the proportion of low birthweight babies or birth before 37 weeks' gestation and little impact on stillbirth or neonatal death, they may be helpful in reducing the likelihood of caesarean birth and antenatal hospital admission'. Through innovative and well-coordinated healthcare delivery by health professionals, it is anticipated that the incidence of pregnancy complications would continue to decrease, and thereby improve maternal health, newborn and infant outcomes in developing countries.

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