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Contemporary Obstetrics and Gynecology for Developing Countries

Second Edition

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Anaemia in Pregnancy

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Olayinka Ogunbode and Olatoye Ogunbode

29.1 Introduction and Definition

Anaemia occurs globally and is a major public health problem in women of reproductive age, especially in developing countries. It is a major direct and indirect cause of maternal mortality and is associated with high foetal wastage [1, 2]. Despite various interventions over the past four decades, it continues to acquire greater magnitude as a result of impoverishment of the population, arising from conflicts, wars, and global economic recession [3]. Although iron deficiency is considered as the commonest cause, anaemia in the tropics may also result from non-nutritional causes such as malaria, acute and chronic infection, acute and chronic inflammation and haemoglobinopathies. Human immunodeficiency virus (HIV) infections have also contributed significantly to the increased prevalence of anaemia [4].

Anaemia can be defined as diminution below normal of the total circulating red blood cells or haemoglobin (HB) mass for an individual's age, sex and population. The normal haemoglobin range between 12 and 14 g/dl, with men having higher haemoglobin levels than women. In the non-pregnant woman, haemoglobin of 12 g/dl or below is suggestive of anaemia; however, in recognition of the physiological changes affecting haemopoiesis during pregnancy, a lower level of haemoglobin (11 g/dl) is customarily accepted for the definition of anaemia.

Globally, 56 million pregnant women are estimated to be anaemic by the World Health Organization with the developing countries contributing over 80% [5–7]. In Africa, the prevalence is estimated to be 35–75% accounting for 2–12% of direct maternal deaths [8]. In Nigeria, the prevalence is between 17% and 88% [6, 9, 10].

In general, deficiency anaemias are prevalent in developing countries as a result of poverty and its accompanied under-nutrition [11]; however, this can be masked by anaemia caused by red cell haemolysis from infective conditions such as malaria (Table 29.1). In West Africa where malaria is endemic, haemolytic anaemia is common in contrast to East Africa, where iron deficiency is the commonest form [12]. Thus, the order in which the major causes of anaemia exist is strongly determined by the environmental parasitic profile [13]. In Nigeria the main causes are malaria infection, folic acid and iron deficiency, antepartum and post-partum haemorrhage.

With the World Health Organization definition of anaemia in pregnancy (level of haemoglobin 11 g/dl or less), one-third of antenatal patients would be classified as anaemic [13]. In practice, many hospitals in Nigeria use a lower level of haemoglobin (10 g/dl or less) as indicating anaemia, based on the work of Lawson which showed that no serious maternal or foetal harm occurs until haemoglobin value was below 10 g/dl [14]. In developing countries, it is, however, advisable to apply the WHO definition for diagnosing anaemia for the benefit of standardization and meaningful comparison whenever data are being presented or discussed globally. Additionally, unless we start to adopt the World Health Organization's definition, there will not be adequate awareness of the magnitude of the problem of anaemia in our community. Only then will there be prompt and adequate efforts to improve the haematological status of our expectant women.

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Table 29.1 Environmental influence on order of frequency of different types of anaemia

A. General cause of anaemia in the developing countries is malnutriton. Therefore, deficiency anaemias top the list.

Iron deficiency	–	very high
Folic acid deficiency	–	very high
Vit. B_{12} deficiency	–	rare

B. When endemic infections are prevalent (e.g. malaria), anaemia associated with infections tends to overshadow the nutritional anaemias. Accordingly, the nutritional anaemias will be less frequently seen. Thus,the pattern of anaemia in Nigeria before 1976 was:

Megaloblastic anaemia (because of red cell haemolysis)	–	very high
Folic acid deficiency	–	high
Iron deficiency	–	low.
Vit. B_{12} deficiency	–	rare

C. With infections substantially controlled (a situation that now exists in Nigeria, 1985), severe anaemias become rare and the deficiency anaemias attain nearly the same frequency as megalobastic anaemia which is still caused by malaria infection.

Megaloblastic anaemia Folic acid deficiency Iron deficiency	}	common in nearly equal frequency
Vit. B_{12} deficiency	–	rare

Fig. 29.1 Peripheral blood film showing target cells visible in the upper half of the film

29.2 Environmental Factors and Pattern of Anaemia

Malaria infection was and perhaps is still the most important factor responsible for causing anaemia in Nigeria and in other areas where the parasite is endemic. The incidence and severity of malaria are increased in pregnancy due to the decreased immunity and increased parasitaemia. However, severe anaemias, which used to account for about 15% of all anaemias are now considerably less common, present in only about 4% of patients currently seen with anaemia [3]. The main reason for this significant reduction is the various initiatives over the past years such as the Safe Motherhood Initiative (SMI), Roll Back Malaria (RBM) and Millennium Development Goals (MDG). This can be attributed to improved prevention of malaria infection through the distribution of free insecticide-treated nets (ITN) to pregnant women and the increased use of intermittent preventive treatment of malaria using sulphadoxine-pyrimethamine (IPTp-SP) combination of anti-malarial medication [15].

The second factor is the prompt diagnosis and treatment of malaria infection. The average Nigerian now knows that malaria infection must be considered whenever a febrile illness develops. Anti-malarial drugs are therefore first administered and medical attention sought only when significant improvement does not occur after a few days. Furthermore, the practice of primary health care in the past decade has ensured that anti-malarial drugs are the commonly prescribed drugs in rural areas. There is thus an increased global prophylactic use of anti-malarials and this has led to a reduction in patients who have the potential of developing acute malarial infection. With adequate control of severe malarial infection, the underlying deficiencies of folic acid and iron have become apparent in the now predominantly mild-to-moderate degrees of anaemia (packed cell volume (PCV), 19–33%).

Studies have shown that iron deficiency amongst pregnant Nigeria women is of dietary origin [16]. Although staple foods in Nigeria are rich in iron (the available daily range in a balanced diet being 26–40 mg), many of our patients who belong to the low socio-economic group are unable to afford a diet that provides adequate iron. In fact, the average daily iron consumption of many of these patients is less than 10 mg. The situation, therefore, is that mild-to-moderate anaemia is now more commonly seen. Iron deficiency is nearly as common as folic acid deficiency, as some degree of iron deficiency is present in at least 90% expectant women seen with dimorphic anaemia. The implication of the forego-

ing is that iron supplement has become as desirable as antimalarials and folic acid in the management of anaemia in pregnancy.

Nigeria because of its large population has the highest number of HIV-positive pregnant women in Africa and the prevalence of anaemia has been documented to be higher amongst this group of women. This may be attributed to the disease or medications given for the treatment of the condition [4, 17].

29.3 Physiological and Other Considerations

Blood volume is usually increased during pregnancy. The increase in the plasma component of about 50% is much is higher than in the red cells of about 30% and the haemoglobin is consequently reduced to a varying extent, occasionally resulting in anaemia. This phenomenon is termed physiological anaemia and occurs in varying proportions. The increased blood volume can also pose a positive danger. For example, in the cardiac patient, the increased circulatory volume could lead to heart failure and because of the reduced oxygen-carrying capacity of diluted blood, the foetus, in severe anaemia, may be insufficiently oxygenated.

There is also an increased demand for haemopoietic factors, the best known of which is iron. The pregnancy demand of iron is approximately 900 mg, of which about 500–600 mg go to the uterus and its contents. Between 150 and 200 mg of iron is lost from a normal delivery and a similar amount is required for lactation. In addition to the above requirements, about 500 mg of iron is needed for the increased maternal haemoglobin mass; this iron is returned to the store after delivery. On the credit side some iron, about 250 mg, is saved as a result of amenorrhoea throughout pregnancy. This still leaves a total likely ultimate iron deficit of about 600–700 mg. Thus, pregnancy creates a state of negative iron balance.

It may take 6–12 months after delivery to recover from the iron deficit of pregnancy from a good diet. Therefore, anaemia is relatively more common in grandmultiparous women, particularly those in whom pregnancies succeed each other rapidly. In environments where the diet is poor in iron or where poverty does not permit adequate dietary iron intake, it will take a much longer period to regain the iron loss resulting from pregnancy. To meet the iron needs of pregnancy, a woman requires about 2.5–6 mg of elemental iron daily with much of this requirement in the second and third trimester.

A common cause of anaemia in pregnancy is inadequate absorption of iron. This may be an important factor in developing countries where malabsorption syndromes are prevalent. Even in patients with normal absorptive capacity, certain factors predispose to deficiency anaemia. The first is inadequate dietary iron. In the developing countries, the average daily dietary iron intake of the great majority of expectant women in around 9 mg, whereas the normal daily requirement for pregnant women is about 20 mg. Of the total amount of iron in food, only a fraction (10–15%) is available for absorption [18, 19]. Natural foods such as liver, meat, egg and certain fruits are good sources of iron, but they are generally outside the reach of an average person in developing countries.

Phytic acid, present in brown bread, which also contains iron, tends to interfere with iron absorption by combining with iron to form insoluble salts. Intestinal disorders such as chronic diarrhoea also adversely affect iron absorption. By contrast, iron absorption is favourably enhanced by the presence of hydrochloric acid in the stomach. As is well known the ferrous salts are more readily absorbed than the ferric salts, hence the dietary value of fresh vegetables and fruits that are rich in vitamin C.

A lot has been said of iron but other substances are also necessary for the formation of red cells by an active bone marrow. These include folic acid and vitamin B12 (the haemopoietic principle) in the synthesis of nucleic acid and subsequently nucleoprotein. Folate requirement is increased in pregnancy and since the storage of folate in the body is small, this need cannot be met without a supplemented diet. Malaria infection also adds to the increased requirement.

Women, whether in the rich or poor communities of the world, are potentially prone to varying degrees of anaemia during pregnancy. Three of the reasons evident from the physiological considerations are:

1. *Physiologic Haemodilution*: This occurs particularly in the second trimester of pregnancy. The increase in plasma volume outstrips the increase in red cell volume and therefore anaemia tends to result.
2. *Increase Demands of Blood-Forming Substances*: There are increased demands by the developing foetus, the placenta and the increase in the body weight of the expectant woman.
3. *Failure to take Haematinics*: This predisposes to anaemia in pregnancy through inadequate intake of haematinics either from foods or by medication. The cause of inadequate intake of haematinics is often ascribed to nausea and vomiting which are common features of early pregnancy. This phenomenon is a more common feature of early pregnancy. This phenomenon is more common in the primigravida but there would appear to be some hereditary elements in its frequency. For example, it is known to be more common in women whose mothers had suffered from this complication of pregnancy.

29.4 Main Types of Anaemia

In order to give a panoramic view of the causes of anaemia, it is sometimes good to present the main groups with examples, as follows:

1. *Deficiency Anaemias*: The main examples are folic acid and iron deficiency, more rarely vitamin B12 deficiency may occur. Other micro or macronutrients needed for the production of haemoglobin may also be contributory factors.
2. *Haemolytic Anaemias*: There are two main categories in this group:
   (a) *Hereditary Cause of Red Cell Haemolysis*: Examples include abnormal haemoglobins [haemoglobin sickle cell (HbSC), HbSS, thalassaemia), red cell membrane defects (spherocytosis) and enzyme disorders [glucose-6-phosphate dehydrogenase (G6PD) deficiency].
   (b) *Acquired Causes of Red Cell Haemolysis*: In the developing countries, at least equally important examples are malaria, severe chest infection, urinary tract infection and septicaemia from any cause.
3. *Haemorrhagic Anaemias*: Blood loss can occur in two forms. Frank blood loss is seen in patients with threatened abortion, antepartum or postpartum haemorrhage. On the other hand, the blood loss could be from heavy hookworm infestation.
4. *Anaemias of Bone Marrow Pathology*: In this situation, every other factor is present normally, but there is failure of adequate formation of new red blood cells. Factors that can be responsible are bone marrow destruction (aplastic), infiltration (e.g. leukemias, metastases from malignancies) and chronic medical disorders (e.g. kidneys, liver, bowels) also contribute to this group of anaemias.

29.5 Management of Anaemia in Pregnancy

The principles underlying the management of anaemia in pregnancy are as follows:

(a) *Identification and Treatment of the Cause*: From a good history, clinical examination and investigations.
(b) *Correction of Anaemia*: By the most appropriate method (depending on the severity of the anaemia and how much time one has on hand – in other words, the gestational age of the pregnancy at the time of diagnosis). It must be remembered that the objective is to correct the anaemia before the onset of labour or term.

29.6 Diagnosis

To reach a diagnosis the history must be detailed, the clinical examination must be thorough and appropriate investigations must be carried out to confirm the diagnosis. The history must include age, ethnicity, occupation, use of social or recreational drugs, medications, dietary habits and known familial diseases. Others include the obstetrics, gynaecology and medical and travel history. Investigations can also be used to monitor response to definitive treatment.

The classical symptoms of tiredness, weakness and dizziness are present in only a small percentage of patients with anaemia. In fact, it is common for patients with haemoglobin of less than 6.8 g/dl (PCV, 18%) to walk into the clinic without any complaint. Many patients with anaemia (over 80% of them) are picked up from the routine estimation of the haematocrit level during visits to the antenatal clinic. This fact underscores the importance of routine haemoglobin estimation in pregnant women at each visit to the antenatal clinic. In severe cases, however, the classical symptoms may exist with dyspnoea and generalized oedema.

29.7 Clinical Examination

The clinical examination must be systematic. From a careful general examination, one may suspect a likely cause of the anaemia. For example, patients with abnormal haemoglobins are generally slender in stature, with long and thin limbs. Another feature is the prominence of the forehead (bossing). An important sign often missed in these patients is scarification marks at the joints particularly the elbow and knee joints representing traditional treatment for bone pains. Sometimes scarification marks may be seen in the splenic area.

The central sign of anaemia is pallor and the areas to examine for pallor are the tongue and the mucous membranes (conjunctivae, the tongue and the buccal mucosa). Anaemia can also be detected by examining the palms of the hand and the fingernail beds. The nails may show the existence of koilonichia, which is a feature of severe iron deficiency. Jaundice should be excluded, as its presence suggests a haemolytic cause. The other aspects of general examination of the patient should be carried out such as examining for lymphadenopathy, oedema, etc. after the general features, the systems should be examined for the purpose of further evaluation of the anaemia.

The respiratory system is examined for gross pathology such as tuberculosis or chronic chest infection and a particular search must be made for basal crepitation, which are present in patients with anaemia complicated by heart failure.

The next system is the cardiovascular system. In many patients with anaemia, there is some degree of cardiac

hypertrophy probably caused by the increase in workload on the heart in its efforts to adequately oxygenate the body tissues. It is therefore not unusual for the apex beat to be slightly displaced laterally from the mid-clavicular line. In patients with moderate-to-severe anaemia, a pan-systolic murmur (ejection or haemic murmur) may be heard. With adequate treatment of the anaemia the murmur normally disappears.

On the abdomen, a general examination is made but particular attention should be paid to the spleen. Splenic enlargement coexisting with anaemia suggests a haemolytic aetiology. It should be emphasized that splenic size is both of diagnostic and prognostic importance. The size of the spleen in patients with haemolytic anaemia varies inversely with the control of underlying haemolytic process. While it is recognized that in tropical countries splenic enlargement may be present in the non-anaemic patient as in the tropical splenomegaly syndrome its existence in an anaemic patient should raise the suspicion of red cell haemolysis until proven otherwise.

29.8 Investigations

Investigations vary from simple side room test to sophisticated laboratory procedure. The packed cell volume (PCV) using capillary blood is most usually done; however, a full blood count (FBC) is preferable because it estimates the Hb concentration and other indices such as the total and differential white cell counts, mean corpuscular volume (MCV), mean corpuscular haemoglobin (MCH), mean corpuscular haemoglobin concentration (MCHC) and platelets count. Peripheral blood film is useful in identifying the type of anaemia as microcytic, hypochromic, macrocytic, megaloblastic or dimorphic varieties.

In the diagnosis of iron deficiency anaemia, the iron status is usually assessed by the measurement of haemoglobin (HB), serum iron (SI), total iron-binding capacity (TBC), transferrin saturation (TS) pr T1 percentage, serum ferritin and erythrocyte protoporphyrin. Values diagnostic of iron deficiency are as follows:

Serum iron: mean 102 ± 42 µg/dl	– Low in iron deficiency
Total iron binding capacity: mean 444 ± 94 µg/dl	– High in iron deficiency
Serum transferrin below 12 µg/l (normal 14.2–120 µg/l)	

It should be noted that these indices (measurements) of iron deficiency anaemia can be affected by both inflammation and iron deficiency. For example, both iron deficiency and inflammation are associated with a decrease in HB, SI and with an increase in erythrocyte protoporphyrin.

Thus, transferrin saturation is affected by inflammation and infection because they decrease serum iron levels. Increase in serum iron caused by iron supplements haemolytic diseases and liver diseases such as hepatitis B virus infection will also lead to higher transferrin saturation.

Inflammation due to subclinical malaria or other parasites had been associated with a rise in the level of serum ferritin. Therefore, in Africa, serum ferritin is not a reliable indicator of iron status unless inflammation is also taken into consideration.

Malaria parasite can be easily identified by microscopic examination of the thin and thick films of the peripheral blood sample. Newer rapid diagnostics kits are also available for easy diagnosis of malaria especially in areas with shortage of laboratory scientists.

Stool microscopy may help in detecting occult blood and ova of parasites (hookworm) while urine microscopy, culture and sensitivity is useful in identifying infections of the urinary system. Coombs' test will help in detecting autoimmune causes.

With the increased embracement of voluntary counselling and confidential testing (VCCT) for HIV infection and prevention of mother-to-child transmission (PMTCT) of HIV services, many pregnant women are now aware of their HIV status. Rapid testing kits for HIV are available for testing women with unknown status.

29.9 Clinical Approach to the Management of Anaemia in Pregnancy

When the diagnosis of anaemia in pregnancy is made, particularly in the asymptomatic patient, questions relevant to the establishment of a possible cause should be asked – such as a history of any febrile illness preceding the event (malaria), dietary status, blood loss, recurrent bone pains in childhood (common in patients with abnormal haemoglobins).

Questions should also be directed to relevant systems such as the chest or urinary tract. After this, the appropriate investigations should be carried out.

(i) For patients with mild-to-moderate degrees of anaemia, the following investigations are suggested:
- Mild anaemia, Hb 9–11 g/dl (PCV, 27–33%)
- Moderate anaemia, Hb 6.6–9 g/dl (PCV, 19–26%)
  (a) Estimation of the PCV to confirm the severity of the anaemia
  (b) Full blood count and differentials
  (c) Blood films – a *thick film* for malaria parasites; a *thin film* for red cell morphology
  (d) Haemoglobin electrophoresis
  (e) Urinalysis including culture and sensitivity
  (f) Liver function tests
  (g) Stool for hookworm ova

(h) Blood grouping and Rhesus factor in preparation for possible blood transfusion
(i) Where relevant and where facilities exist, serum iron, total iron-binding capacity, serum folate and serum ferritin

(ii) For patients with severe anaemia, Hb 6.8 g/dl or less (PCV, 18% or less), the following additional investigations are required:
(a) Chest radiography to exclude chronic chest infection, for example, tuberculosis
(b) Bone marrow biopsy for a clearer cause/type of existing anaemia (because the peripheral blood picture is always several weeks behind the bone marrow state)

From the history, a careful clinical examination and the above investigations, it should be possible to arrive at a diagnosis in the majority of patients with anaemia.

29.10 Treatment

All anaemic patients in areas where malaria is endemic should receive anti-malarials. If malaria parasitaemia is found, a full course of anti-malarials should be given. The specific anti-malarial depends on the trimester of pregnancy. Although Quinine is safe throughout all trimesters, artemisinin-based combination therapy (artemether/lumefantrine) is the recommended first-line treatment for uncomplicated malaria in the second and third trimester. The oral route is preferred except in situations where there is severe vomiting.

Any other identifiable cause should be treated (e.g. urinary tract infection, hookworm infestation, dietary deficiencies such as iron, folic acid and very rarely vitamin B_{12}).

29.10.1 Correction of Anaemia

1. Oral haematinics.
2. Parenteral haematinics.
3. Blood transfusion (usually packed red cells). A potent diuretic, for example, frusemide 40 g, given intramuscularly or by the intravenous routine may occasionally be administered along with the blood transfusion.
4. Exchange blood transfusion.

29.10.2 Choice of Method for Correcting Anaemia

General guidelines are given because each case must be assessed individually, the objective being to correct the anaemia before term or before onset of labour, whichever is earlier.

29.10.3 Mild Anaemia

For patients with mild anaemia, oral haematinics such as fersolate 200 mg or other equivalent iron preparations plus folic acid 5 mg daily is administered. The former practice of increased dosage of haematinics, for example, ferrous sulphate 200 mg thrice daily, was found from recent studies to be of no significant advantage [12]. However, if a mildly anaemic patient is seen late in pregnancy from the Week 37 onwards, blood transfusion with packed cells should be given, 500 ml transfused slowly over a period of 8 hours at a time and given only to those at serious carefully considered risks.

29.10.4 Moderate Anaemia

The same principle for the management of mild anaemia should operate, but because of the higher risks in these patients resort to blood transfusion would be earlier, from about the Week 32 of pregnancy.

29.10.5 Severe Anaemia

Irrespective of the gestational age of the pregnancy, caution should be exercised in the use of blood transfusion to correct the anaemia. In patients with severe anaemia alone and deserving transfusion, a slow blood transfusion in the form of packed cells is appropriate and this can be repeated every third day until the haematocrit gestation of the pregnancy. A haematocrit level of 28% is acceptable before the Week 34 of pregnancy. After the Week 36, the objective should be to correct the anaemia to a PCV minimum level of 33%.

For patients with imminent heart failure, usually patients with haematocrit level of 15% or less, or patients with established heart failure (irrespective of the haematocrit level), a potent diuretic should be added to each 500 ml of packed cells. Again, transfusion is repeated on alternate days as often as desirable. One important point about transfusion in severe anaemia is that blood transfusion should be slowly administered – 500 ml being given over a period of approximately 4 hours, but faster and less than 4 hours when the anaemia is due to acute blood loss.

In addition, in the majority of cases a broad-spectrum antibiotic (amoxicillin/clavulanic acid, 1 g, 12 hourly for 1 week) should be given to patients with severe anaemia, as prophylaxis against infection. In patients with severe anaemia, the body resistance to infection is very low and this explains the justification for antibiotic prophylaxis. In a few of them, an infection would have already been in existence. In such situation, efforts must be made to identify the site and type of infection. Appropriate antibiotics should be commenced as soon as possible.

29.11 Exchange Blood Transfusion

This is the most rapid method of correcting anaemia but it is also the most expensive and laborious. Its advantage over packed cell transfusion is only marginal and greatest within the first 12 hours following transfusion. Therefore, it is a method now rarely used. The only indication for exchange blood transfusion in anaemia in pregnancy is when correction of the anaemia must be made very quickly, a situation which exists in a patient with *severe anaemia in early labour.*

29.12 Parenteral Iron Therapy

This approach is relevant because of the prevailing circumstances in many developing countries. First, for economic, socio-cultural, educational reasons and because of the high endemicity of parasitic infections, the prevalence of anaemias including iron deficiency remains high. Second, most antenatal patients cannot be relied upon to take drugs strictly according to prescriptions once outside medical supervision. Third, many women book late in pregnancy resulting in a short time for the correction of anaemia by oral medications. Another compounding factor is the lack of blood bank facilities due to unpreparedness of the public to donate blood to match the high demand.

The overall situation thus favours parenteral iron therapy provided the clinical picture is that of iron deficiency, there is no previous history of hypersensitivity to parenteral iron and there is ability to monitor the infusion as for blood transfusion. Although with time, the haemoglobin response to oral and parenteral therapy should be the same, experience from controlled clinical studies has shown that parenteral therapy is often more effective principally because of poor compliance by patients on oral therapy. There is also the psychological satisfaction among our patients that a good treatment is that which includes injection. This has led to a very high acceptance rate for parenteral therapy.

The appropriateness of the widespread use of parenteral iron in our practice has been reinforced by evidence of satisfactory haematological responses to treatment of a large number of patients with anaemias associated with iron deficiency. The routes of administration are:

(a) *Intravenous iron preparation*: The simplest is imferon total dose infusion (TDI). The dose required is related to the body weight of the patient and the haematocrit level (deficit from normal values) as shown in Table 29.2. The procedure for TDI is as shown in Table 29.3.

(b) *Intramuscular iron*: The common preparations are iron dextran (imferon), iron polysorbitol gluconic acid complex (ferastral) and iron sorbitol (jectofer). Most experience is limited to imferon and ferastral. The advantage of ferastral is that it can be given in a higher dose. The manufacturers advocate the administration of 10 ml, in two divided doses. However, from experience, it is more acceptable and much less painful to give not more than 4 ml imferon and 5 ml ferastral at a time. A serious disadvantage of intramuscular iron is the staining of the overlying skin, which is more obvious in fair-skinned people. It is possible to reduce the incidence of staining by a skilful technique such as the Z-technique which involves pulling the tissues laterally while the needle is being inserted so

Table 29.2 Dosage of imferon

Patient's	Weight	Observed haemoglobin						
Kg	lb.	3.0G 20%	4.4G 30%	5.9G 40%	7.4G 50%	8.9G 60%	10.4G 70%	11.8G 80%
		Total dose of imferon in ml						
5	10	5	5	4	3	3	2	2
9	20	10	9	8	6	5	4	3
14	30	14	13	11	9	8	6	4
18	40	19	17	15	12	10	7	5
23	50	24	21	18	15	12	9	6
27	60	29	25	22	18	15	11	8
32	70	34	30	25	21	17	13	9
36	80	38	34	29	24	19	15	10
41	90	42	38	32	27	22	16	11
45	100	48	42	36	30	24	18	12
50	110	53	46	39	33	26	20	14
55	120	58	51	43	36	29	22	15
59	130	62	53	47	39	31	23	16
64	140	67	59	50	42	34	25	17
68	150	72	63	54	45	36	27	18
73	160	77	68	57	48	38	29	20
77	170	82	72	61	51	41	31	21
82	180	86	76	64	54	43	32	22
86	190	91	80	68	57	45	34	23
91	200	96	84	72	60	48	36	24

1 m. Imferon 1 = 50 mg Fe

This formula makes an allowance for the replenishment of body iron stores. In pregnancy, add 10 ml (500 mg Fe) to the calculated dose

Table 29.3 Procedure of administration of imferon total dose infusion (TDI)

1. Determine the patient's total requirements from the dosage table including the additional requirements for pregnancy, if applicable
2. Add the total calculated volume of imferon aseptically to one pint of sterile normal saline or 5% dextrose solution in the absence of normal saline
3. A test dose should be given at a rate not exceeding five drops per minute for 10 minutes under strict medical supervision. If this test dose is well tolerated, the rate of infusion may be increased to 45–6 drops per minute
4. If there are any signs of intolerance (urticarial rash, loin pains, chest pain, respiratory discomfort or any significant change from the pre-infusion general feeling, acute hypersensitivity) to the test dose, the infusion should be stopped at once

Symptoms frequently subside on ceasing the infusion but treatment for shock may be necessary in patients with severe reaction

One contraindication to the use of iron dextran apart from a history of hypersensitivity is overwhelming sepsis

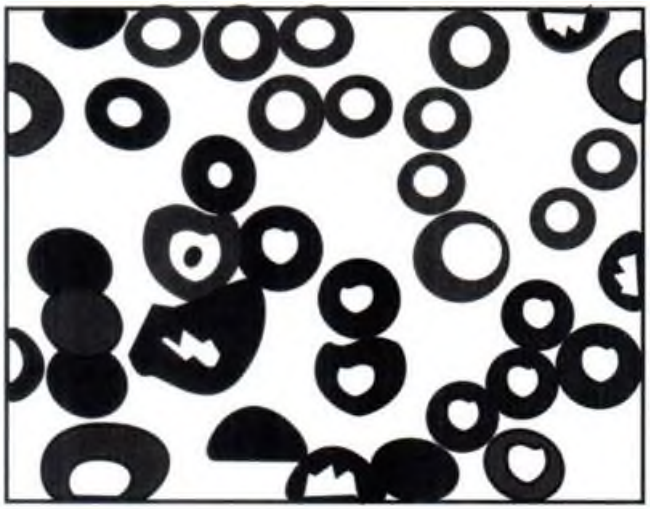

Fig. 29.2 Peripheral blood films a patient with anaemia in pregnancy. Note the polymorphic appearance of the red cells, microcytic, macrocytic, normocytic cells, with varying degrees of hypochromia

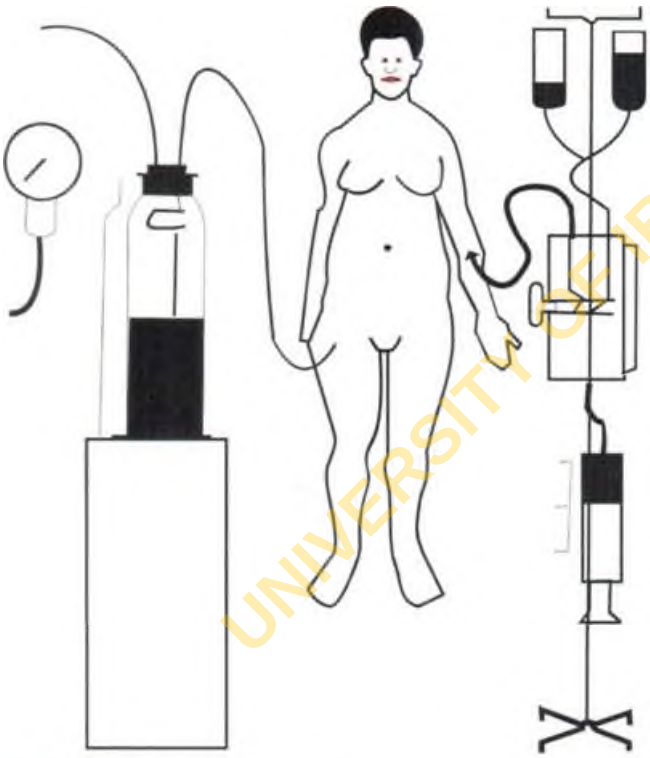

Fig. 29.3 Exchange blood transfusion

that the needle track and therefore the track of the leakage is zig-zagged.

In summary, the choice of parenteral iron would depend on the practitioner who has to take into account the facilities available to him for a safe therapy. A constraint to imferon infusion in the developing countries is inadequate medical manpower for supervision during the infusion. This constraint is not a serious one since if many of those patients are not given parenteral iron, they would have to be given blood which would require equal supervision by medical or paramedical personnel. On the other hand, with the single-handed practitioner or in most parts of the rural areas, the intramuscular therapy would seem to be more applicable. The advantages of parenteral iron therapy are listed in Table 29.4.

Table 29.4 Advantages of imferon (TDI) in the developing countries

1. Certainty of dosage and administration
2. Avoidance of repeated injections
3. Economy in time for the patient and hospital staff
4. Saving of blood, particularly in obstetrics and elective surgery
5. Reliable haematological response when time is short before delivery or surgery

A rare complication of correction of anaemia is iron overload. First, it results from the treatment of refractory anaemia with multiple blood transfusions and also due to an abnormal increased absorption, when iron is given orally. It rarely follows massive or repeated parenteral iron administration because of the predominantly reticulo-endothelial localization of parenterally injected iron complexes. Second, following TDI infusion, for days and even weeks after a large injection, plasma iron concentrations may remain high, but virtually all of the iron remains attached to dextran. From the plasma it is gradually taken up by the reticulo-endothelial system and only when needed, iron is split off and transported by transferrin to the marrow for haemoglobin synthesis.

The advocation of a liberal use of imferon to conserve the relatively little available blood for use in case of severe anaemias or dire emergencies should be seen as an interim measure dictated by prevailing circumstance. The long-term improvement in problems associated with anaemia will come from an improved socio-economic state of the population.

Furthermore, through education, the following will emerge:

(a) The development of an awareness to utilize maximally existing medical facilities, inadequate as they are
(b) An increased willingness and appreciation of the need to donate blood for obstetric and other emergency use
(c) The encouragement of a higher compliance rate with oral medication
(d) An early report for booking during pregnancy

29.12.1 Malaria Chemoprophylaxis

Some epidemiologists argue that by administering malaria chemoprophylaxis, the natural immune system will be inter-

fered. Removal of the protection after delivery theoretically places the subject under a greater threat of severe malaria infection. Also, the patient is prevented from improving her immune status. Furthermore, some anti-malarials, particularly the 4-aminoquinoline drugs, have been reported to cross the placenta and to cause foetal abnormalities, including loss of vision, ototoxicity and cochleovestibular disturbances.

There is no question that malaria, even in the non-pregnancy state, can lead to severe morbidity and death from cerebral malaria. However, few the deaths may be, if even one death per 100,000 subjects, it is justifiable to protect all those at risk of infection, particularly in an endemic region. Therefore, the potential benefits of chemoprophylaxis outweigh the possible immunological derangement that may follow such practices.

Thus, there is today a general agreement among obstetricians, many epidemiologists and pharmacological scientists on the regular use of malaria chemoprophylaxis during pregnancy and the puerperium. The main factors dictating this practice are as follows:

1. Prevention/reduction of malaria attacks in the pregnant woman in view of the maternal and perinatal morbidity or mortality that may occur following such infection.
2. Protection of the lowered acquired immunity to malaria reckoned to occur during pregnancy particularly in the primigravidae.
3. Malaria is endemic in the tropics; therefore, pregnant as well as non-pregnant women are susceptible to malaria infection.

29.12.2 What Drug(s) to Give as Malaria Chemoprophylaxis?

The approach to malaria prophylaxis varies from one region to the other and sometimes from one practitioner to another in the same centre. The choice of drug is usually dictated by the regional experience of the practitioner with respect to the drug resistance profile of malaria parasites or outcome of research on malaria chemoprophylaxis conducted by or known to the prescriber.

Currently, intermittent preventive treatment of malaria in pregnancy (IPTp) with sulphadoxine/pyrimethamine (SP) is the recommended regimen. This involves the administration of three tablets of sulphadoxine/pyrimethamine (500 mg/25 mg) given twice or thrice during pregnancy at 4 weeks interval and started after quickening which is about the 16–18 week of gestation. Two doses are recommended for low-risk patients while patients with immunosuppression in HIV infection are given three doses. The IPT-Sp is avoided during the first trimester because of risk of teratogenicity and after 34 weeks of gestation because of the risk of hyperbilirubinaemia and kernicterus in the newborn since sulphonamides and bilirubin competes together for binding site on serum albumin, thereby increasing the free circulating levels of bilirubin. However, recent recommendations from WHO allows its continued use at 4 weekly intervals till delivery in malaria endemic area. The previously used weekly administration of pyrimethamine 25 mg (daraprin) has been found to be non-effective and no longer recommended. Other previous practices of the administration of 600 mg base chloroquine to expectant mothers at the first antenatal visit was found to be non-effective and promoted the development of resistance strains of plasmodium species.

Considerable space has been devoted to malaria prevention because of its importance in the causation of anaemia in the tropics and the contemporary issues surrounding the subject.

Other methods of preventing anaemia that must be mentioned are prophylactic haematinics, health education on nutritional supplementation, treatment of hookworm infestations when diagnosed and birth spacing which is assisted by the knowledge and practice of family planning. One preventive method that requires further discussion is haematinic supplementation. All patients now require iron 200 mg daily and folic acid 5 mg. The practice of some health institutions to administer iron 200 mg thrice daily has been found to be of no advantage over the single dose regimen for prophylaxis.

29.13 Adverse Effects of Anaemia in Pregnancy

Anaemia has adverse effects on the expectant woman as well as the foetus. In the mother these include loss of work and home care through weakness by incapacitation and easy fatigue, cardiac failure in severe cases and occasionally, maternal death may be the result of anaemia. Deaths are common in neglected cases and where prompt treatment cannot be given. There is predisposition to infections and aggravation of other complications of pregnancy such as pre-eclampsia. After delivery, some of the patients are prone to postpartum haemorrhage and infections.

In the foetus, abortion, intra-uterine growth restriction (IUGR), intra-uterine death and preterm delivery are recognized complications during pregnancy. Babies that survive delivery are prone to perinatal complications and are also liable to anaemia later in life since their development will be governed by similar environmental factors to which the mothers had been exposed.

29.14 Prevention of Anaemia

The prevalence of anaemia is strongly influenced by the level of education and socio-economic status. It is therefore clear that prevention is difficult in many developing countries, but certain measures, as stated below, will lead to a reduction.

(a) A vigorous campaign for early booking for antenatal care
(b) Dietary advice during the counselling class at antenatal clinics
(c) The administration of anti-malarial and haematinics throughout pregnancy and the puerperium
(d) Through education, early marriage will be reduced and by extension, diminished complications of pregnancy
(e) Health education in secondary schools, with references to pregnancy

29.15 Summary

Anaemia, as elsewhere, is the commonest complication of pregnancy. Its prevalence in the developing countries is high, of the order of 60%. The main causes are dietary deficiencies caused by poverty and environmental endemic parasitic infections. The high frequency of abnormal haemoglobins further aggravates the problems of anaemia in the tropics.

The principles of management are identification of the cause to enable correct treatment and correction of the anaemia by the most appropriate methods. The overall objective is to make sure that the patient is not anaemic by term or onset of labour, whichever occurs earlier.

Attention has been drawn to the place of parenteral iron in the developing countries and the need for measures that will lead to a reduction in the unacceptably high prevalence of the condition in obstetric practice.

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