Prevalence of Iron Deficiency and Megaloblastic Anaemia at Booking in a Secondary Health Facility in North Eastern Nigeria

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SUMMARY

***Objective*:** To determine the prevalence of iron deficiency and megaloblastic anaemia at booking in the Specialist Hospital Gombe.

Patients and methods: This was a cross sectional study of 461 women attending the antenatal clinic for their booking visit. The capillary technique was used for the estimation of the packed cell volume (PCV) while the morphologic type of anaemia was determined by the blood film appearance. The age, parity social class and gestational age at booking were obtained and analyzed.

Results: Among the 461 women studied, 239 were anaemic thus making the prevalence of anaemia at booking to be 51.8%. Most, 67.4% were mildly anaemic, 30.5% were moderately anaemic while 2.1% were severely anaemic. Three hundred and sixteen, (68.5%) of the women booked in the second trimester while only 3.0% booked in the first trimester. The majority of the women, 293 (63.5%) were in lower social class. Of the 239 anaemic women, 155 (64.9%) had features of pure iron deficiency anaemia while only 1(0.4%) had features of pure megaloblastic anaemia. Eighty three (34.7%) had dimorphic blood picture while 238 (99.6%) in total had features of iron deficiency anaemia. Although not anaemic by PCV, the blood film of 26(5.6%) showed features of pure iron deficiency.

Conclusion: The contribution of iron deficiency to anaemia in pregnancy is exceedingly high. This further supports the continued use of iron supplements for all pregnant women preferably at no cost in the short run and economic empowerment of the women folk in the long run.

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INTRODUCTION

The word anaemia connotes a decrease in the oxygen carrying capacity of the blood and is best characterized by a reduction in the haemoglobin concentration , which may be relative or absolute.[1] Relative anaemia is that which occur in pregnancy. Absolute anaemia involves a true decrease in red cell mass, is of haematological importance and involves increased red cell destruction as in SCD and malaria, increased corpuscular loss as in haemorrhage, or decreased erythrocyte production as in severe nutritional deficiency or chronic disease. A form of classification of types involves morphologic criteria evident in the anaemic process. Red blood cell indices have also been used to emphasize the importance of direct observation of the erythrocyte. This classification emphasizes cellular size (microcytic, macrocytic, or normocytic) and staining of the erythrocyte (hypochromia, hyperchromia, or normochromia) and may be helpful in differentiating types of anaemia.[1, 2, 3]

Anaemia due to folate deficiency, chronic infection, and iron deficiency yield different red blood cell indices in their pure form; if combined however, a mixed pattern results. In sub-Saharan Africa anaemia in pregnancy is generally accepted as resulting from nutritional deficiencies, particularly iron deficiency.[4-9] Folate deficiency has also been described [9] and recent studies suggest that deficiencies of other vitamins can also contribute to anaemia in pregnancy.[9, 10] Anaemia in pregnancy is a risk factor for infant iron deficiency anaemia[7] and if uncorrected, can be associated with adverse behavioural and cognitive development.[7, 11, 12]

The various factors required for erythropoiesis are protein (erythropoietin), mineral (iron), trace elements (zinc, cobalt and copper), vitamins (folic acid, vitamin B12, vitamin C, vitamin B6) and hormones (androgens and thyroxine).[8,12] There is an increased demand for these factors during pregnancy especially iron. Iron deficiency is by far the most common nutritional anaemia, often worsened by blood loss due to hookworm infestation in many tropical countries and accounts for 75% of all anaemia diagnosed during pregnancy[8,12-14] It is worthy of note that iron depletion without signs of anaemia is also a very common entity in pregnancy.[3] The basic compartment of iron distribution include haemoglobin iron, storage iron, myoglobin iron, labile pool iron, other tissue iron and transport iron. Pregnancy normally decreases the amount of iron but not the percentage distribution to each compartment; however, socioeconomic status, nutritional status and concurrent disease process can modify the dispersion of iron to each compartment.[14, 15]

The pregnancy demand for iron is approximately 1000mg.[2, 8, 13, 16] This requirement is hardly met with tropical diet rich in phytates and the high rate of intestinal disorders which interfere with absorption. Iron is principally absorbed in the duodenum and proximal jejenum. The iron presented to the gastrointestinal tract (GIT) is usually in one of three forms: the ferrous form (from elemental iron), haemoglobin (from animal protein source) and the trivalent or ferric form (from vegetable complexes).The ferrous salts are best, since they need no conversion to be absorbed; the ferric iron in vegetable protein complexes must be reduced to the divalent state before it can pass into the mucosal cell. Haemoglobin iron is readily absorbed after being hydrolysed in the gut lumen into haem and globin. The globin, although degraded by intestinal enzymes into small peptides, remains an integral factor in absorption, since it continues to stabilize the haem in the ferrous state.[14, 15, 16] Iron nutritional status depends on long term iron balance and is favoured by ingestion of an adequate amount of iron in the diet or through iron supplementation.[12,13] The balance is adversely affected by the loss of iron through intestinal mucosal turnover and excretion, skin desquamation, menstruation and lactation. The average amount of iron excreted by the adult is 0.9mg/day; additional 0.5mg/day may be lost in areas of high temperature and humidity like ours. The pathologic cause of iron loss are mainly from excessive menstrual flow, worm infestation (hookworm and schistosomiasis), bleeding from the GIT from ulceration, haemorrhoids, diarrhoea and other occult blood losses. The conservation of iron in humans is strict, with only 0.1% of the total amount of body iron lost each day. This amount is easily replaced in the non pregnant adult if the dietary source is adequate. Pregnancy however has a mar ked effect on iron homeostasis because even in iron sufficient states, large amounts of iron must be borrowed from iron stores to meet the demands of pregnancy. In our environment, the average daily dietary iron intake of the great majority of our expectant mothers is around 9mg, whereas the normal daily requirement for the pregnant woman is 20mg.[12] This puts the majority of our women at risk of iron deficiency anaemia if supplemental iron is not given during pregnancy.

It is becoming increasingly clear that vitamin A plays an important role in iron metabolism and that vitamin A supplement, particularly in women with low or borderline serum retinol concentration, may improve mobilization of iron stores.[13] Vitamin A deficiency is thought to be common in developing countries[6, 8] but its role and that of Vitamin B12 in the causation of anaemia in pregnancy requires further clarification. The WHO recommended universal oral iron supplementation for pregnant women(60mg of elemental iron and 250ug of folic acid once or twice daily) for 6 months in countries with prevalence of anaemia of less than 40% and for an additional 3 months postpartum in countries where the prevalence is more than 40%.[11] Studies have shown improved maternal and perinatal outcome by routine iron supplementation during pregnancy.[12,17-20] Because of the poor compliance of oral haematinics, studies were carried out which revealed that weekly or twice weekly iron supplementation also give equally good results with better patient compliance.[21,22,23]

The use of two injections of iron dextran (250mg each) given intramuscularly at 4-weekly interval in tandem with Tetanus toxoid (T.T) injection have also been recommended for better compliance.[22] Because of the belief, though erroneous of the majority of our women that injections are better and stronger than tablets, this option is a worthwhile one in the interim. Besides, compliance is assured. The cost of the injection, the discomfort associated with the injection and the occasional anaphylactic reactions are factors that could militate against its widespread use. The aim of this study is to determine the prevalence of iron deficiency and megaloblastic anaemia at booking in a secondary health care facility in Gombe.

PATIENTS AND METHODS

The patients studied comprised 461 women attending the antenatal clinic of the Specialist Hospital Gombe for their booking visit. The hospital serves both as a secondary referral centre and as a primary facility and serves the entire population of Gombe and its environs. Booking clinics are held every Tuesdays. Screening for anaemia was carried out every week over eight weeks (7th March 2006 to 25th April 2006). Ethical permission for the study was obtained from the management of the specialist hospital. Patients with known chronic illness, known sickle cell disease patients and those already on haematinics were excluded from the study.

All the women were offered screening and no one refused to undergo the screening. At the initial interview, the socioeconomic level of the patient was assessed on the basis of husbands and patients occupation. In this study, Warner's six social classes [24] were employed and the characteristics of each class according to Edward's occupational index. Age and parity were recorded and trimester estimated by examination of the fundal height. Ultrasound scan was not available for dating. These information were recorded on a questionnaire designed for the study.

After verbal consent had been given, 3mls of blood was then withdrawn from the antecubital vein, using plastic disposable syringe and placed in a specimen bottle containing ethylene diamine tetra-acetic acid (EDTA) anticoagulant for determination of PCV and red blood cell morphology. The capillary technique was used for the estimation of the PCV. After centrifugation with the microhaematocrit centrifuge for 5minutes at 3000rpm, the PCV was measured using a Hewkley micro-haematocrit reader. For the purpose of this study, anaemia in pregnancy was defined as haematocrit of less than 30%.[14,24-26] The severity of anaemia was classified as follows: mild(PCV 27%-29%, moderate (PCV 19%-26%) and severe (PCV below 19%.). [25-27] For the blood film, a small drop of blood was placed in the centre of the slide about 1-2cm from one end. A smooth slide was used as spreader at an angle of 45^0 to the slide. The film was air dried and then flooded with Leishman's stain. After 2 minutes water was added and the film was stained for 5-7 minutes. It was then washed in a stream of buffered water until it had acquired a pinkish tinge. After the back of the slide was wiped clean, it was set upright, dried and then examined. Microcytic hypochromic morphology was considered consistent with iron deficiency while a macrocytic blood picture was considered megaloblastic anaemia[1, 2, 3, 11]. The combination of the two is termed dimorphic anaemia. Data were entered and analysis was done using EPI.INFO version 6.0.

RESULTS

Of the 461 women aged 15 -40years studied at the time of their first antenatal clinic attendance, 239 (51.8%) were anaemic using a cut –off point of haematocrit of less than 30%.When the WHO cut-off value of haematocrit of < 33% is used, 427 (92.6%) of the women were anaemic.

Table 1 details some socio demographic characteristics of the anaemic women and the gestational age at booking. The majority 162(67.8%) of the women were between the ages of 20-29yrs. The mean age was 24.9+ 5.69. Most, 280(60.7%) were multiparae. The mean parity was 2.89 +2.53.The majority, 158 (66.1%) were in lower social class. Four hundred and forty seven (97.0%) booked in the second and third trimester of pregnancy. Table 2 shows the distribution of patients according to severity of anaemia. The majority of the patients, 67.4% were mildly anaemic, 30.5% were moderately anaemic while 2.1% were severely anaemic. It is revealed in Table 3 that of the 239 anaemic women, 155 (64.9%) had features of iron deficiency alone while only 1(0.4%) had features of megaloblastic anaemia alone. Eighty three (34.7%) had dimorphic blood picture while 238 (99.6%) in total had features of iron deficiency. Although not anaemic by PCV, the blood film of 26(5.6%) showed features of iron deficiency.

Table 1: Some Socio Demographic Characteristics and Gestational Age at booking among the Anaemia Group

Characteristics	Total no. of pts	No. anaemic	(% anaemic)
Age (years)			
15-19	81	35	(43.2)
20-24	45	88	(60.7)
25-29	124	74	(59.7)
30-34	71	29	(40.8)
35-39	33	11	(33.3)
40	7	2	(28.6)
Total	**461**	**239**	**(51.8)**
Parity			
0	78	42	53.8
1-4	280	138	49.3
>5	103	59	57.3
Total	**461**	**239**	**(51.8)**
Social Class			
1	13	6	(46.2)
2	6	4	(66.7)
3	28	11	(39.3)
4	121	60	(49.6)
5	84	45	(53.6)
6	209	113	(54.1)
Total	**461**	**239**	**(51.8)**
GA at booking			
1st trimester	14	8	1.7
2nd trimester	316	156	33.8
3rd trimester	131	75	16.3
Total	**461**	**239**	**(51.8)**

GA Gestational age

Table 2: Distribution of Patients with Anaemia in Pregnancy According to Severity

Severity of anaemia	Haematocrit (percentage)	Frequency	Percentage of Anaemic patients	Percentage of all patients
Mild	27-29	161	67.4	34.9
Moderate	19-26	73	30.5	15.8
Severe	<19	5	2.1	1.1
Total		**239**	**100**	**51.8**

Table 3: Distribution of Anaemic Patients according to Blood Film Appearance

Blood film	Frequency	Percentage
Microcytic-Hypochromic	155	64.9%
Macrocytic	1	0.4%
Dimorphic	83	34.7%
Total	**239**	**100%**

***** Other red blood cell indices common to all are not represented.

DISCUSSION

The prevalence of anaemia (PCV<30%) at booking in Gombe was found to be 51.8%.This falls within the range 35%-75% from previous reports.[6, 8, 17, 25] It is however higher than 29.1% reported from Sagamu, 8.8% from Enugu and 29.79% from Lagos [25,27, 28] The high incidence in this study is probably related to the low socioeconomic status of the women with attendant poor nutrition. The incidence of severe anaemia of 2.1% is similar to 1.1% reported from Enugu but higher than 0.7% reported from Sagamu.[25, 28] Higher values have also been reported .[11, 17, 30, 31]

In developing countries anaemia during pregnancy is most often believed to result from nutritional deficiencies, especially iron.[4-6,8,11,12,13,14,28, 32] The gold standard for identifying iron deficiency anaemia has been the examination of a suitably stained bone marrow aspirate for storage iron as haemosiderin.[11,33] This method is invasive, and therefore not suitable for large scale screening. Serum ferritin has been shown to be a good measurement of storage iron, but the cost, non availability and the fact that it is elevated in the presence of inflammation which is not uncommon in our environment makes the test less appealing.[18] Iron deficiency causes hypochromia and microcytosis of the red blood cells, which can be readily recognized on a stained blood film. In areas where laboratory facilities are limited like ours, the most useful and simplest diagnostic tool for iron and folate deficiency is the examination of a thin blood film, as long as there is a trained technician and a microscope.[11] This is what is used on routine basis to diagnose nutritional anaemias in our centre and most parts of the developing world.

Iron deficiency was found to complicate 99.6% of all cases of anaemia found in this study. This is similar to the 96.77% and 90% reported by Okafor et al and Ogunbode respectively but higher than the 64% reported by Dorothy et al.[12, 32] Although Okafor et al used bone marrow aspirate for their study and Dorothy et al [32] used serum ferritin, the findings of 64.5% of our patients with features suggestive of pure iron deficiency is similar to 60.4% and 64% reported from their series respectively. Similar finding has also been reported.[6] The low socio-economic class could explain the high percentage of iron deficiency anaemia in this study. The dimorphic anaemia in our study of 34.7% was also comparable to the 32.2% but the megaloblastic changes alone of 0.4% was lower than the 3.23% reported from the same study in Benin.[34]

Iron needs exhibit a marked increase during the second and third trimester of pregnancy and that was when 97% of our patients booked for antenatal care. During this period the daily need increase to an average of 5.6mg per day.[33] This amount of absorbed iron needs cannot be met from diet even if iron fortification is in place.[33] Folate deficiency in pregnancy could coexist with iron deficiency particularly among lower socio-economic groups consuming mostly cereal based diet as seen in this study. This is aggravated by prolonged cooking and reheating of liquid food preparations.[26,33]

In conclusion, it is recommended that the socioeconomic situation of the womenfolk should be improved. This no doubt will improve nutrition and hopefully prevent iron deficiency anaemia. Early booking should also be encouraged.

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