

Anaemia in Pregnancy-is it a Persisting Public Health Problem in Porto Novo-Cape Verde?

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Abstract: Almost half of the pregnant mothers globally presents haematological values indicative of anaemia and knowing the current situation in Porto Novo province is necessary to highlight antenatal health providers towards early detection and prompt management of anaemia in pregnancy. To study the prevalence of anaemia, types and causes of anaemia in pregnant mothers of Porto Novo province. A total of 160 blood samples were collected into EDTA tubes between 1-January to 31-March 2011, at the Antenatal Clinic of Hospital of Porto Novo during the first visit of the pregnant women to the reproductive section and Using Sysmex KX-21-N by Sysmex corporation, Japan. The haematological parameters of Haemoglobin (Hb), Haematocrit (HCT), Mean Cell Volume (MCV) and Red Cell Distribution Width in Coefficient Variation (RDW-CV) were determined in all the samples, the stages of each pregnancy were noted. The reference values for the pregnant women used in this study were as follows: Hb:11.0g dL⁻¹, Hct:35-49%, MCV:80-100fL, RDW-CV:11.5-14.5%. Out of the 160 pregnant women blood samples analyzed, 62 (38.8%) were anaemic and the majority 71% were mildly anaemic cases whereas 29% were moderately anaemic and no severe anaemic cases recorded. Iron deficiency anaemia was 8.1% whereas 91.9% showed mixed anaemia indicating Normocytic-Normochromic, anaemia were higher (53.2%) in pregnant women in the second trimester. The administration of iron with folic acid (folicferro), vitamin B12 and food aid program should be re-inforced for all the pregnant women.

Key words: Anaemia, pregnancy, prevalence, public health, Porto Novo, Cape Verde

INTRODUCTION

Anaemia is a global public health problem affecting both developing and developed countries with major consequences for human health as well as social and economic development. It occurs at all stages of life cycle but is more prevalent in pregnant women and young children. It occurs when the concentration of haemoglobin falls below what is normal for a person's age, gender and environment, resulting in the oxygen carrying capacity of the blood being reduced.

Anaemia is often classified as mild degree (Hb 9.0-11.0 g dL⁻¹), moderate (Hb 7.0-9.0 g dL⁻¹), severe (Hb 4.0-7.0 g dL⁻¹) and very severe Hb <4.0 g dL⁻¹. It can also be classified based on the Haematocrit (PCV%). A common etiological classification of anaemia identifies 3 major causative groups of anaemia, nutritional, marrow disease and haemolytic disease. Nutritional anaemias are by far the most common type of anaemia worldwide and mainly includes iron, folate and vitamin B12 deficiencies.

The World Health Organization (WHO) estimated that in developing countries, prevalence rates in pregnant women are commonly in the range of 40-60%. Around half of those with anemia are suffering from iron deficiency

anaemia that is having deficient body iron stores but without frank anaemia, the latter are therefore considered to be at risk of iron deficiency anaemia. Folate deficiencies and other causes account for the major proportion of the remaining anaemia.

Anaemia can affect psychological and physical behavior. Even very mild forms influence the sense of well being, lessen resistance to fatigue, aggravate other disorders and affect work capacity. For pregnant women anaemia can result in severe morbidity and mortality and reduces the resistance to blood loss with the result that death may result from the blood loss associated with delivery. The so called physiological anaemia occurs when there is disproportionate increase of plasma volume during pregnancy, leading to apparent reduction of red blood cells, haemoglobin and haematocrit value.

During pregnancy, growth of the fetus and of the placenta and the larger amount of circulating blood in the expectant mother, lead to an increase in the demand for nutrients especially iron and folic acid. The majority of women in the developing countries start pregnancy with depleted body stores of these nutrients and this means that their extra requirement is even higher than usual.

The total iron needed during the whole of pregnancy is estimated at about 1000 mg. The daily requirements for

iron as well as folate are 6 times greater for a woman in the last trimester of pregnancy than for a non pregnant woman. This need cannot be met by diet alone but is derived from at least partly from maternal reserves. In a well nourished woman about half the total requirement of iron may come from iron stores. When these reserves are already low due to malnutrition and or frequent pregnancies, anaemia results. It has been estimated that even when food intake is adequate, it may take 2 years to replenish body iron stores after a pregnancy.

The early stages of anaemia in pregnancy are often symptomless. However, as the Hb concentration falls, oxygen supply to vital organs declines and the expectant mother begins to complain of general weakness, tiredness and headaches. Pallor of the skin and of the mucous membrane as well as the nail beds and tongue may not become noticeable until Hb drops to about 7.0 g dL^{-1} . With a further fall in Hb concentration to 4.0 g dL^{-1} , most tissues of the body become starved of oxygen and the effect is most marked on the heart muscles which may fail altogether. Death from anaemia is the result of heart failure, shock or infection that has taken advantage of impaired resistance to disease in the patient.

While less severe anaemia may not be a direct cause of maternal death, it can contribute towards death from other causes particularly haemorrhage. Anaemic mothers do not tolerate blood loss to the same degree as healthy women. During childbirth, a healthy mother may tolerate a blood loss of up to 1 L. However, in an anaemic mother, the story is different, a loss of as little as 150 mL can be fatal. Anaemic mothers are poor anaesthetic and operative risks because anaemia lowers resistance to infection and wounds may fail to heal promptly after surgery or may break down altogether.

The WHO has estimated that the prevalence of anaemia in developed and developing countries in pregnant women is 14% in developed countries and 51% in developing countries. For example in India, anaemia was estimated at 65-75%.

Ezzati *et al.* (2002) reported that half of the global maternal deaths due to anaemia occur in South Asian countries; India contributes to about 80% of the maternal deaths due to anaemia in the region of South Asian. It is obvious that Indians' contribution both to the prevalence of anaemia in pregnancy and maternal deaths due to anaemia is higher than warranted by the size of its population.

Kalaivani (2009) said that factors responsible for high prevalence of anaemia in India have shown to be iron deficiency as the major cause of anaemia followed by folate deficiency and in recent years, B12 deficiency has also been highlighted. Particularly in India the prevalence

is high because of low dietary intake, poor iron and folic acid intake, poor bioavailability of iron in phytate and fibre rich Indian diet and chronic blood loss due to infection such as malaria and hookworm infestation.

Awan *et al.* (2004) reported 96% of pregnant population of Multan area in Pakistan were anaemic. Microcytic hypochromic anaemia resulting from iron deficiency is the most frequent form of anaemia 76% Sifakis followed by folate deficiency 20% reported Seshadri (2001) and combined iron and folate deficiency 20% stated Chenoufi *et al.* (2001) on finding of 200 cases and he concluded by saying that several factors are implicated on high prevalence of anaemia in the pregnant population. Poor dietary status reflected by low socio-economic status makes micronutrient deficiency both clinical and subclinical, relatively more common.

Breast feeding (88%) is also an important stress on the nutritional status of the mother. All these factors deplete the micronutrient stores of the mother, to the extent that she becomes anaemic even in the first trimester in the next pregnancy and this brings a more severe outcome for both the mother and the child reported by Bondevik *et al.* (2001).

Yuan Xing on Tibet pregnant population concluded that an average of 63% of Tibet mothers were anaemic and that the gestational age, ethnicity, residence and low income of Tibetans amounted significantly to the Hb level and the occurrence of anaemia in pregnant Tibetans.

Ma *et al.* (2004) reported 41.58% in pregnant people of Qingdao province of China were anaemic and the subjects with iron deficiency anaemia had much higher rates of vitamin C, folate and B12 deficiencies than those in the non anaemic subjects and especially in the deficient rates of ascorbic acid and folate in the anaemia group. Moreover, they observed that the decreasing trends of Hb concentrations were accompanied by the decreases of serum levels of vitamin A, ascorbic acid, folate and B12 and concluded that multiple vitamin deficiencies may be associated with anaemia in pregnant mothers in the last trimester.

However, the research of Karaoglu *et al.* (2010) on pregnant women of East Anatolian province of Turkey, registered a percentage of 27.1% of anaemic pregnant women having four or more children and being in the third trimester. Their finding also was associated with PICA (Soil eating habits of pregnant women). Most of the anaemia recorded were normocytic-normochromic indicating mixed anaemia. In Turkey, for pregnant women, anaemia was a moderate public health problem, co-existing of iron, folate and B12 deficiencies was observed.

However, anaemia and iron deficiency in the mother are not associated with significant degree of anaemia in the children during neonatal period. Nevertheless, iron

stores in these neonates are compromised, iron content in the breast milk of anaemic mother is also compromised and because of these factors, substantial proportion of infants become anaemic by 6 months, Kilbride *et al.* (1999) on the study of anaemia among pregnant Jordan population. Thus maternal iron deficiency and anaemia render the offspring vulnerable for developing iron deficiency and anaemia right from infancy.

The research of Jahan and Hossain (1998) said that anaemia of 59% were recorded among pregnant mothers in Bangladesh although, despite high prevalence registered, severe cases were absent and iron deficiency increased at lower Hb level. Dreyfuss *et al.* (2000) reported 73% of pregnant Nepalese were anaemic with 7% being severe anaemic cases while Atukorala *et al.* (1994) studied Sri Lanka pregnant women and recorded 65%.

Marahatta (2007) reported the prevalence of anaemia of 42.6% in pregnant women of Kathmandu Nepal and the birthweight, Apgar score at the time of birth, occurrence of preterm delivery and Intra Uterine Fetal Death (IUFD) were more common in anaemic group than in non-anaemic group. Maternal anaemia in pregnancy continued to be considered a risk factor for poor pregnancy outcome and can result in complications that threaten the life of both mother and fetus. However, current knowledge indicates that iron deficiency in pregnancy is a risk factor for preterm delivery followed by low birthweight and possible inferior neonatal health. Although, the extent to which maternal anaemia affects maternal and neonatal health is still uncertain. Some studies have demonstrated a strong association between low haemoglobin before delivery and adverse outcomes while others have not found a significant association.

Thomsen *et al.* (1993) stressed that during pregnancy, the needs of the growing fetus and placenta as well as the increasing maternal blood volume and red cell mass, impose such a demand on maternal iron stores that iron supplementation at daily doses between 18 and 100 mg from 16 weeks gestation onwards could not completely prevent the depletion of maternal iron stores at term.

Kurki *et al.* (1992) conducted a research to understand how anaemia predisposes to preterm labour either directly or indirectly due to increase risk of infection, direct effect is due to hypoxia induced by anaemia which induces synthesis of Corticotrophin Releasing Hormone (CRH) associated with stress predispose to preterm labour and even pregnancy induced hypertension.

Goldenberg *et al.* (1996) reported that increase level of CRH in mother stimulates increase production of

cortisol in fetus which in turn inhibits the longitudinal growth of the fetus. Another indirect mechanism is iron deficiency leads to oxidative damage to erythrocytes in the fetoplacental unit which stimulates production of CRH both *in vivo* and *in vitro*.

Roy and Chakravorty (1992) said that association of anaemia with adverse maternal outcome such as puerperal sepsis, antepartum haemorrhage, postpartum haemorrhage and maternal mortality is no longer debatable and that is why early diagnosis and treatment of anaemia is of utmost importance in pregnant women.

According to Olukoya and Abidoye (1996) on Lagos antenatal screening in Nigeria argued that Hookworm infestation, malaria and HIV infections have contributed immensely with severe anaemic cases seen among pregnant Nigerians in Lagos province.

The experience of Desalegn (1993) on Ethiopian pregnant mothers confirmed the prevalence of 41.9% and the rates were 56.8% for rural areas and 35.9% in the urban areas of Ethiopia. However, the rate of anaemia were higher among illiterate pregnant Ethiopians and those who did not practice family planning of any sort and in the third trimester with increased parity concluded Desalegn and co-workers.

The technical knowledge of Msolla and Kinabo (1997) on Tanzania pregnant women revealed that 95% of Tanzania pregnant subjects were anaemic and all these women were suffering from iron, folate and vitamin B12 deficiencies. This suggests that all subjects had a combination of microcytic and megaloblastic anaemia. The results shown that there were a positive correlation between Hb concentration and weight of the infants at birth. This observation suggests also that anaemia had a significant influence on the birth weight of the infant. Furthermore, this could be an indication of poor food security in general and major causes of anaemia were identified as being poor dietary intake of iron rich foods and probably poor utilization due to diseases like malaria. All the women tested on Tanzania study had basic knowledge on anaemia but despite these knowledge and awareness, the women were still anaemic.

Marti-Carvajal *et al.* (2002) tested 630 blood samples of pregnant mothers of Valencia area in Venezuela and reported 34.44% of mothers with anaemia. This research was contrasted with that of Meda *et al.* (1999) on Burkina Faso in West Africa were pregnant mothers presented 66% of anaemia and also Singh *et al.* (1998) stated 81% of pregnant mothers in Singapore presented with anaemia. Ogbuide *et al.* (1994) argued that anaemia during pregnancy is an indicator of the precarious nutritional

status of any nation and it remains as a world wide public health problem and therefore recommends a regular review of factors which may contribute to the prevalence of the maternal anaemia. Independently of its impact on fetal health, maternal anaemia increases the risk of maternal morbidity. Therefore, it is very important to prevent and to treat maternal anemia.

The research of Adebisi and Strayhorn (2005) reported anaemia in pregnancy among United States based on race and the blacks revealed 20.4 per 1000 while the whites showed 10.6 per 1000. Teenage pregnant women had the highest prevalence in all races while mothers aged 35 and 39 had the lowest prevalence. However, the higher the mother's attained level of formal education, the lower the observed prevalence of anaemia. Omoniyi also stated that increased in parity, unmarried status, multiple pregnancy and non-metropolitan residence were all associated with the higher incidence of anaemia among pregnant women but the risk factors for anaemia in pregnancy were similar in both whites and blacks though lack of formal education had stronger impact in blacks than whites. They concluded by saying that black race were significantly associated with higher risk of anaemia in pregnancy than whites therefore, race is an important determining risk factor of anaemia in pregnancy.

Looker *et al.* (1997) reported 2-5% of the United States of American pregnant teenagers with iron deficiency anaemia while Fujimori performed testing of pregnant adolescents in Sao Paulo, Brazil and showed prevalence of anaemia to be 14.2%, nevertheless, iron deficiency were high with 48.4%. The technical method of Kiwanuka *et al.* (1999) on Ugandan pregnant women registered 84.4% of anaemic mothers and once again, multiparity, poor socio-economical and educational status remains the principal reasons for a high prevalence of anaemia among pregnant women in Uganda.

The research of Dim and Onah (2007) on pregnant mothers in Enugu Southern Nigeria proved that 40.4% of the pregnant women were anaemic, the majority of these anaemic patients were mildly anaemic and there was no case of severe anaemia and those pregnant mothers in third trimester expressed significant anaemia than those in the second trimester.

Furthermore, anaemia is the end result of severe nutrient deficiency of one or more haematopoietic factors usually iron, less frequently folate or vitamin B12. Researchers know that haemoglobin concentration by which anaemia is diagnosed is relatively insensitive index of milder degrees of nutrient depletion so that by the time a woman becomes anaemic she is already suffering from

a marked degree of nutrient deficiency and because a low Hb content of the blood is more easily detected than the underlying deficiencies, it has come to be used as an index of haematopoietic nutritional status.

MATERIALS AND METHODS

A total of 160 blood samples were collected into EDTA tubes between 1 January to 31 March, 2011 at the Antenatal Clinic of Hospital of Porto Novo during the first visit of the pregnant women to the reproductive section and Using Sysmex KX-21-N by Sysmex corporation, Japan. The haematological parameters of Haemoglobin (Hb), Haematocrit (HCT), Mean Cell Volume (MCV) and Red Cell Distribution Width in coefficient variation (RDW-CV) were determined in all the samples, the stages of each pregnancy were noted. The reference values for the pregnant women used in this study were as follows: Hb:11.0 g dL⁻¹, Hct:35-49%, MCV:80-100FL, RDW-CV:11.5-14.5%.

RESULTS AND DISCUSSION

A total of 160 pregnant women samples were analyzed between 1 January to 31 March, 2011 age range 15-45 years old, 62 (38.8%) of pregnant women were anaemic (Hb≤11.0 g dL⁻¹), p≤0.05. The majority (71%) of these anaemic pregnant women were mildly anaemic whereas 29% were moderately anaemic. There was no case of severe anaemia reported and the prevalence of anaemia were higher in pregnant women at the second trimester (53.2%) and at the age range of 20-35 (66.13%).

In this study population of Porto Novo, the prevalence of maternal anaemia was 38.8%. The mean of Hb in the anaemic population was 10.1 g dL⁻¹, Hct 35%, MCV 87.5FL and RDW-CV 13.5%. Iron deficiency anaemia was 8.1% whereas 91.9% were of mixed anaemia showing Normocytic-Normochromic anaemia. The majority of the anaemia observed were mildly (71%) anaemic cases whereas 29% were moderately anaemic. According to this study, anaemia was mostly recorded at the age range of 20-35 years old and those at the second trimester showed 53.2% more than those recorded at the third trimester that expressed 40.35% (Table 1 and 2).

However, the prevalence of anaemia (38.8%) observed in this study was very significant and consistent with data observed elsewhere in developing countries. This research was in line to the estimation of WHO on the prevalence of anaemic cases in developing countries which is between 40-60%. This study was also closer to that of Marti-Carvajal *et al.* (2002) that recorded the prevalence of anaemia of 34.44% among pregnant

Table 1: Presents relationship between degree of anaemia and age of pregnant women

Age (years)	Number (n)	Percentage of age	Mild degree	Moderate degree
15-19	37	23.1	10	6
20-35	109	68.1	29	12
≥36	14	8.8	5	0

Table 2: Presents distribution of anaemia and non-anaemia in different trimesters of pregnancy

Trimesters	Anaemia-n (%)	Non-anaemia-n (%)	Total-n
First	4 (6.5)	26 (26.53)	30
Second	33 (53.2)	22 (22.45)	55
Third	25 (40.3)	50 (51.02)	75

Table 3: Presents prevalence of anaemia by age of the pregnant women

Age (years)	Anaemia-n (%)	Non-anaemia-n (%)	Total-n
15-19	16 (25.81)	21 (21.43)	37
20-35	41 (66.13)	68 (69.39)	109
≥36	5 (8.06)	9 (9.18)	14

Venezuela women, it is not very far to that of Dim and Onah (2007) who reported 40.4% of anaemia among pregnant Enugu women in South Eastern Nigeria.

Although, the burden of this problem is higher in some other countries, for example Meda *et al.* (1999) observed 66% of anaemia in pregnant Burkina Faso women whereas Singh reported 81% of anaemia among Singapore pregnant women of these, this study was totally in contrast.

In Porto Novo-Cape Verde, anaemia in pregnancy could result from multiple causes including nutritional, iron deficiency, folate/vitamin B12 but pica has not been identified as a risk factor for anaemia in pregnancy as the case maybe in some countries. The HIV status of all the pregnant women tested in this research were all seronegative and the Human immunodeficiency virus infection in this locality is considerably low. Iron deficiency therefore, is believed to be the most common cause of anaemia in pregnancy, therefore anaemia in a normal pregnant women of Porto Novo is usually attributed to iron deficiency and successful treatment is often achieved with iron and folic acid supplementation without further investigations. The physiological hemodilution mostly observed in pregnancy could explain for the increased prevalence of mild anaemia (71%) recorded in this study (Table 3).

The prevalence of anaemia (38.8%) obtained in this research also could be attributed to precarious nutritional status of these pregnant women since most of them were domestic wives with little or no official income and the researchers strongly believe that anaemia in pregnancy could be drastically reduced if these domestic, unemployed wives could have access to food aid programs, food rich in iron, calcium, proteins and vitamins because iron supplementation alone has many disadvantages such as poor compliance with treatment,

adverse gastrointestinal effects and low absorption. The prevalence of anaemia among pregnant Porto Novo women as showed in this study is indeed very high and is a persisting mild public health problem.

CONCLUSION

Continuing of daily iron supplementation program with folate and vitamin B12 in the beginning of pregnancy and food aid programs towards unemployed domestic pregnant women is advocated to reduce this problem. Although, in Cape Verde, since 1978 till now, iron supplementation is freely given to all pregnant women, this should be re-enforced. Qualified nutritionists should be integrated in the management of anaemic pregnant women. During pregnancy, efforts should be made towards early diagnosis and treatment of all anaemic pregnant women before delivery. Medical officers incharge of treatment should endeavor to do further investigation on anaemic pregnant women to identify the etiology whenever possible.

APPENDIXES

Management of anaemia in pregnancy: A pregnant Capeverdean woman of Porto Novo, requires about 2-4.8 mg of iron every day and to have it from the dietary sources, she must consume 20-48 mg of dietary iron. This is practically impossible here in Porto Novo province because of average vegetarian diet like local Covi- a green vegetable commonly used in Cape Verde does not contain >10-15 mg of iron and the phytate content of most Cape Verdean food further reduces iron absorption.

Prophylaxis: It is advisable to build up iron store before a woman marries and becomes pregnant and this could be achieved by the following:

- Routine screening for anaemia for adolescent girls from school days
- Encouraging iron rich foods
- Fortification of widely consumed food with iron
- Providing iron supplementation to schools
- Annual screening for anaemia

Iron rich foods: This includes; cereals, jaggery, beet root, green leaf vegetables-covi, meat, liver, egg, fish, legumes, dry beans and iron reached white breads etc.

Oral iron therapy: Oral iron is safe in expensive and effective way to administer iron. In routine cases, it should be a method of choice. Parenteral route of iron therapy should only be considered when oral route is not possible due to any reason. If all pregnant mothers

receive routine iron and folic acid, it is obvious and of course possible to prevent nutritional anaemia in pregnant women.

Iron salt selection: There are many iron preparations available in the pharmacy and a doctor is often confused as to which iron preparation should be used by the patient. Ferrous sulphate is the least expensive and best absorbed form of iron. It also allows more elemental iron absorbed per gram administered. If for some reasons this is not tolerated then ferrous gluconate, fumarate are the next choice for iron therapy.

However, the iron salt should be selected based on compliance of the patient, tolerance, side effects, clinical situation of the patient and availability of a particular salt.

Oral iron therapy must be continued for 3-6 months after haemoglobin has come to normal values because this helps to build up iron stores.

Timing of oral iron intake in relation to food: It is convincible that if iron is taken with food, there is some reduction in side effect related to gastrointestinal tract. And the addition of vitamin C in medicine or in the diet enhances iron absorption. If haemoglobin values did not rise after oral therapy is given then further investigation is needed. Some reasons could be:

- Incorrect diagnosis
- Mal-absorption syndrome
- Presence of chronic infection
- Loss of iron from the body
- Lack of patient compliance
- Ineffective release of iron from a particular preparation

Parenteral iron: The indication for parenteral iron therapy includes:

- Cannot tolerate side effects of oral iron
- Suffers from inflammatory bowel disease
- Patient does not comply
- Patient near term

The defaulting rate with oral iron therapy in pregnant women is fairly high because of gastrointestinal side effects like nausea, vomiting, diarrhea and abdominal pain. Sometimes pregnant women present with severe anaemia after 30-32 weeks of pregnancy and in those cases, time is an important factor to improve haemoglobin values. In such circumstances, parenteral iron therapy is indicated. Parenteral iron could be given by intramuscular or

intravenous route. Iron-sorbitol- citric acid complex 75 mg is used for intramuscular route only. The main disadvantages of intramuscular iron is the pain and staining of the skin, myalgia, arthralgia and injection induced abscess.

Intravenous route should be reserved for those who do not want to receive frequent intramuscular injections. Iron could be given to the pregnant women at one shot as Total Dose Infusion (TDI). Utmost care is needed for TDI therapy via intravenous route because of severe anaphylactic reactions that may follow it.

Tdi reaction: They are as follows:

- Immediate vascular collapse
- Tachycardia
- Dyspnoea
- Cyanosis vomiting
- Pyrexia etc.,

Therefore, total dose of iron therapy by intravenous route should only be given in a hospital setting where facilities and trained medical doctors are available to manage severe reaction after iron dextran.

Calculating TDI: Total dose of infusion of iron is calculated as: $(15 - \text{patient's Hb g dL}^{-1}) \times \text{body weight in kg} \times 3 = \text{mg}$.

Contraindication of parenteral iron therapy: This includes; Nephritis, cardio-respiratory disease and allergy.

Severe anaemia in late pregnancy (after 32 weeks): These patients should ideally be managed in a hospital setting. They may or may not present with heart failure. Although, they need urgent admission and bed rest. Packed red cells are preferred choice for severe anaemia in later part of pregnancy and this should be followed by diuretics. Once, the pregnant woman is stabilized, total dose infusion of iron dextran could be considered.

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