

# **ANAEMIA IN PREGNANCY- IS IT A PERSISTING PUBLIC HEALTH PROBLEM IN PORTO NOVO- CAPE VERDE?**

**BY**

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**BACKGROUND:** 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.

**AIMS AND OBJECTIVES:** To study the prevalence of anaemia, types and causes of anaemia in pregnant mothers of Porto Novo Province.

**KEY WORDS:** Anaemia, Pregnancy, Prevalence, Public Health, Porto Novo, Cape verde.

**LIMITATIONS OF THE STUDY:** Abdominal Ultrasonography, Serum Ferritin, Zinc Protoporphyrin, Folate and B<sub>12</sub> levels, Stool examination were not done due to high costs of reagent. Follow up procedures of the pregnancy to see the maternal and fetal outcome especially during labour, partum and post partum and the parity of each pregnant people were not done.

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## **ABSTRACT**

**BACKGROUND:** 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.

**AIMS:** To study the prevalence of anaemia, types and causes of anaemia in pregnant mothers of Porto Novo Province.

**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:11.0g/dl, Hct:35-49%, MCV:80-100FL, RDW-CV:11.5-14.5%.

**RESULTS:** 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 .

**CONCLUSION:** The administration of iron with folic acid (folicferro), vitaminB12 and food aid program should be re-inforced for all the pregnant women.

**KEYWORDS:** 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 – 11.0g/dl), moderate (Hb 7.0 – 9.0g/dl), severe (Hb 4.0 – 7.0 g/dl), and very severe Hb less than 4.0 g/dl. 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 B<sub>12</sub> deficiencies.

The World Health Organization (WHO) estimated that in developing countries, prevalence rates in pregnant women are commonly in the range of 40 to 60 percent. 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 1000mg -Bruno de Benoist et al(1992). The daily requirements for iron as well as folate are six 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 two 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 7.0g/dl. With a further fall in Hb concentration to 4.0g/dl, 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 a litre. However, in an anaemic mother, the story is different, a loss of as little as 150ml 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 percent in developed countries and 51 percent in developing countries. For example in India, anaemia was estimated at 65 to 75 percent (WHO 2004).

Ezzati M. et al (2002) reported that half of the global maternal deaths due to anaemia occur in South Asian countries; India contributes to about 80 percent 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.

Dr. 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.

Mah-e-munir Awan et al (2004) reported 96 percent 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 percent Sifakis et al (2000), followed by folate deficiency 20 percent reported Seshadri et al (2001) and combined iron and folate deficiency 20 percent 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 percent) 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 & Abel et al (2001).

Yuan Xing et al (2009) on Tibet pregnant population concluded that an average of 63 percent 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 AG and Chen XC 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 work 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 six months, Kilbridge 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 work of Jahan & Hossain (1996) said that anaemia of 59 percent 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 percent of pregnant Nepalese were anaemic with 7 percent being severe anaemic cases while Atukorala et al (1994) studied Sri Lanka pregnant women and recorded 65 percent.

Dr. Rita marahatta (2007) reported the prevalence of anaemia of 42.6 percent 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 100mg 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 *invivo* and *invitro*.

Dr. Roy et al (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 & Abidoye (1991) 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 et al (1993) on Ethiopian pregnant mothers confirmed the prevalence of 41.9 percent and the rates were 56.8 percent for rural areas and 35.9 percent 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 & Kinabo (1997) on Tanzania pregnant women revealed that 95 percent of Tanzania pregnant subjects were anaemic and all these women were suffering from iron, folate and vitaminB<sub>12</sub> 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 (1996) tested 630 blood samples of pregnant mothers of Valencia area in Venezuela and reported 34.44 percent of mothers with anaemia. This work was contrasted with that of Meda et al (1996) on Burkina Faso in West Africa where pregnant mothers presented 66 percent of anaemia and also Singh & Fong (1998) stated 81 percent of pregnant mothers in Singapore presented with anaemia. Ogbeide 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 work of Omoniyi Adebisi & Gregory 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 et al also stated that increased 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 to 5 percent of the United States of American pregnant teenagers with iron deficiency anaemia, while Fujimori et al (1999) performed testing of pregnant adolescents in São Paulo, Brazil and showed prevalence of anaemia to be 14.2 percent, nevertheless, iron deficiency were high with 48.4 percent. The technical method of Kiwanuka et al (2000) on Ugandan pregnant women registered 84.4 percent 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 work of Cyril Dim & Hyacinth Onah(2007) on pregnant mothers in Enugu Southern Nigeria proved that 40.4 percent 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 vitaminB<sub>12</sub>. We 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:11.0g/dl, Hct:35-49%, MCV:80-100FL, RDW-CV:11.5-14.5%.**

## RESULTS

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

Age in 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

**Table3: Presents prevalence of anaemia by age of the pregnant women.**

Age in 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

A total of 160 pregnant women samples were analyzed between 1-January to 31- March, 2011 age range 15 to 45 years old, 62(38.8%) of pregnant women were anaemic( $Hb \leq 11.0g/dl$ ), P value  $\leq 0.05$ . 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%)

## **DISCUSSION**

In this study population of Porto Novo, the prevalence of maternal anaemia was 38.8%. The mean Hb in the anaemic population was 10.1g/dl, 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%.

However, the prevalence of anaemia (38.8%) observed in this study was very significant and consistent with data observed elsewhere in developing countries. This work 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 Venezuela women, it is not very far to that of Dim & 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 et al 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/ vitaminB12 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 work 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 work.

The prevalence of anaemia(38.8%) obtained in this work 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 I 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 vitaminB12 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.

## **REFERENCE**

- Atukorala T M S et al; Evaluation of effectiveness of iron – folate supplementation and anthelmintic therapy against anaemia in pregnancy- A study in the plantation sector of Sri Lanka. *American J. of clinical Nutrition* 1994;60:286-92.
- Bondevik G T et al; Maternal haematological status and risk of low birth weight and preterm delivery in Nepal. *Acta Obstet gynaecol Scand* 2001;80:402-8
- Bruno de Benoist et al; World wide prevalence of anaemia 1993-2005; WHO
- Chenoufi B et al ; Screening for carential anaemia in pregnant women: Prospective study. Report of 200 cases. *Tunis Med.* 2001;79:423-8
- Cyril Dim & Hyacinth Onah (2007); The prevalence of anaemia among pregnant women at booking in Enugu, Southern Nigeria. *Medscape general Medicine*;9 (3):11
- De Mayer EM, Tegman A; Prevalence of anaemia in the world. WHO 1998;38:302-16
- Desalegn S; Prevalence of anaemia in pregnancy in Jima Town, Southern Ethiopia. *Ethiop Med J.* 1993;31(4):251-8
- Dreyfuss M L et al; Hookworms, Malaria and vitamin A deficiency contribute to anaemia and iron deficiency among pregnant women in the plains of Nepal. *Journal of Nutrition* 2000;130:2527-36.
- Ezzati M, Lopus A D et al; Selected major risk factors and global and regional burden of disease. *Lancet* 2002;360:1347-60.
- Fujimori E et al; Estado Nutricional del hierro de gestantes adolescentes, São Paulo, Brasil. *Arch LatinoAmer. Nutr* 1999;49:8-12.
- Goldenberg et al; Plasma Ferritin and pregnancy outcome. *Amer J Obstet & Gynecol* 1996;175:1357-9.
- Idowu O A et al; Anaemia in pregnancy : A survey of pregnant women in Abeokuta Nigeria. *African Health Sci* 2005;5(4):295-99
- Jahan K & Hossain M; Bangladesh National Nutrition survey, 1995-96 Dhaka: Institute of Nutrition and food science, University of Dhaka, 1998.
- K.Kalaivani (2009);Prevalence & Consequences of anaemia in pregnancy. *Indian J Med Res* 130, Nov.2009, PP 627-633.
- Karaoglu et al ;The prevalence of nutritional anaemia in pregnancy in an East Anatolian province , Turkey. *BMC public Health* 2010,10:329.
- Kilbridge J. et al; Anaemia during pregnancy a risk factor for iron deficiency anaemia in infancy; a case control study in Jordan. *Int. J. Epid.* 1999;28:461-8
- Kiwanuka GN et al ; Iron status of pregnant women at first antenatal booking in Mbarara University Teaching Hospital. *Tropical Doct* 2000;29:228-30.
- Kurik T et al; Bacterial vaginosis in early pregnancy and pregnancy outcome. *Obstet Gynecol* 1992;80:173-7.

Looker A C et al; Prevalence of iron deficiency anaemia in the United States. JAMA 1997;277:973-76.

Nyuke R B et al (2000); Etiology of anaemia in pregnancy in South Malawi: Am J. Clin Nutr;72:247-256.

Ma AG & Chen XC et al (2004); The multiple vitamin status of Chinese pregnant women with anaemia and non anaemia in the last trimester. J Nutr Sci Vitaminol Tokyo, Apr. 2004, 50(2):87-92.

Mah-e-Munir Awan et al: A study of anaemia in pregnancy women of railway colony multan. Pakistan J. Med. Res. Vol.43;1, 2004.

Marti-Carvajal et al ; Prevalence of anaemia during pregnancy: Results of Valencia- Venezuela. Arch. Latino Amer. De Nutricion Vol.52;1:2002

Meda N et al ; Anaemia during pregnancy in Burkina Faso West Africa 1995-96: Prevalence and associated factors. Bull World Health Org. 1999;77:916-22

Msolla M J & Kinabo J L; Prevalence of anaemia in pregnant women during the last trimester. Int. J. Food Sci Nutr.1997 :48(4):265-70

Ogbeide O et al; Anaemia in pregnancy . E. Afri Med J.1994;71:671-73

Olukoya A A & Abidoye R O; A study of intestinal parasites in antenatal clinic patients in Lagos-Nigeria. Health and Hygiene 1996;55:66-70.

Omoniyi Y. Adebisi & Gregory Strayhorn; Anaemia in pregnancy and race in the United States: Blacks at risk. Fam Med 2005;37(9):655-62.

Rita Marahatta; Study of anaemia in pregnancy and its outcome in Nepal medical college. Nepal medical college Journal 2007 Dec;9(4):270-4

Roy S et al; Maternal and perinatal outcome in severe anaemia. J Obstet Gynecol Indian 1992;42:743-50.

Seshadri S ; Prevalence of micronutrient deficiency particularly iron, zinc and folate in pregnancy women in South East Asia. Br. J. Nutr. 2001;85(supp 2),S 87-92.

Sifakis S et al; Anaemia in pregnancy. Ann N Y Acad Sci 2000: 900125-36.

Singh K et al; Anaemia in pregnancy a cross sectional study in Singapore. Eur. J. clinical Nutri. 1998;52:65-70.

Thomsen J k et al; Low dose iron supplementation does not cover the need for iron during pregnancy. Acta Obstet Gynecol Scand 1993;72:93-8.

World Health Organization; The prevalence of anaemia in women; WHO/MCH/MSM/92.2

Yuan Xing & Hong Yan et al; Hb levels and anaemia evaluation during pregnancy in the high lands of Tibet, Lhasa People's Hosp. Ethic Review Committee Xian Jiaotong University College of Medicine, China.

## **APPENDICES**

### **MANAGEMENT OF ANAEMIA IN PREGNANCY**

A pregnant Capeverdian woman of Porto Novo, requires about 2 to 4.8 mg of iron every day and to have it from the dietary sources, she must consume 20 to 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 more than 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;

1. Routine screening for anaemia for adolescent girls from school days.
2. Encouraging iron rich foods.
3. Fortification of widely consumed food with iron.
4. Providing iron supplementation to schools.
5. 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 rich white breads etc.

### **ORAL IRON THERAPY**

Oral iron is safe, inexpensive 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 to 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 convincing 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;

1. Incorrect diagnosis

2. Mal- absorption syndrome
3. Presence of chronic infection
4. Loss of iron from the body
5. Lack of patient compliance
6. Ineffective release of iron from a particular preparation.

#### **PARENTERAL IRON**

The indication for parenteral iron therapy includes;

1. Cannot tolerate side effects of oral iron
2. Suffers from inflammatory bowel disease
3. Patient does not comply
4. 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 to 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 75mg 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;

1. Immediate vascular collapse
2. Tachycardia
3. Dyspnoea
4. Cyanosis vomiting
5. 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 : $(15 - \text{patient's Hb gdl}) \times \text{body weight in Kg} \times 3 = \text{Mg}$ .

#### **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.**