International Journal of Current Research and Review
DOI: http://dx.doi.org/10.31782/IJCRR.2020.4549

Research Article

IJCRR
Section: Healthcare
Sci. Journal Impact Factor: 6.1 (2018)
ICV: 90.90 (2018)
Scopus

Status of Vitamins and Minerals in Pregnancy: Still A Point of Concern in Central India

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ABSTRACT

Globally, 1.62 billion people are affected by anemia, of which 56 million are pregnant women. Anaemia is a major public health issue that affects both developing and developed countries with severe implications for both human health and social and economic growth resulting in a loss of billions of dollars annually. During pregnancy, anemia is considered extreme when the concentration of hemoglobin is less than 7.0g / dL, moderate when-hemoglobin falls between7.0–9.9g / dL, and mild at 10.0-11g / dl. The study was conducted on pregnant womens, 230 pregnant women and 40 non pregnant women have taken part in the study. Out of 230 pregnant women, 140 women are having decreased concentration of Hb, Vit-B12, folate, ferritin and transferrin. The present study concludes thatadequate iron and Folic acid intake is necessary for a healthy pregnancy, iron, and Folic acid supplementation should be considered early in these cases at their first meeting with healthcare professionals.

Key Words: Pregnancy, Anemia, Vitamin B12, Folic Acid

INTRODUCTION

Anaemia is a major public health issue that affects both developing and developed countries with serious implications for both human health and social and economic growth resulting in a loss of billions of dollars annually [1–3]. The effect of anemia on maternal and neonatal life during pregnancy varies from varying rates of morbidity to mortality. Extreme anemia is often associated with adverse maternal outcomes and can lead to a substantial proportion of maternal heart failure, hemorrhage, and infection, either directly or indirectly. On the other hand, among anemic women, there were higher levels of placental problems (abnormal placentation and placental abruption)[4].

Extreme anemia was associated with significant maternal and fetal complications during pregnancy, after several studies were elucidated. It raises the risk of premature delivery[5,6], low birth weight[7,8] intrauterine fetal death[6], neonatal death[9], maternal mortality[10], and infant mortality.[11] In normal pregnancy due to haemodilution, mild anaemia with hemoglobin as low as 10 mg/dl is anticipated. However, the incidence of anaemia due to iron deficiency during pregnancy is high, depending on the population studied, between 25 percent and 40 percent [12,13]. An estimated 58.27 million women around the world are anaemic during pregnancy, of which 95.7% live in developing countries[14]

Iron deficiency occurs when stores of body iron are exhausted, as calculated by a serum ferritin level below 12-15 ng / ml[15] Iron deficiency anaemia (IDA) is characterized as low hemoglobin accompanied by iron deficiency. Anemia can exacerbate postpartum haemorrhage sequelae and predispose to puerperal infection — both major causes of maternal mortality in developing countries.[16] In infants, iron deficiency anemia is a risk factor that may be associated with adverse behavioral and cognitive development if uncorrected [17].Increased dietary requirements of pregnancy, insufficient nutrition, and insufficient stores at the start of pregnancy are the main causes of iron deficiency in obstetrics[18].

The most bioavailable dietary iron is heme (ferrous) iron that is found in meat, poultry, and fish. Egg yolks, legumes, nuts, dried fruits, and whole grains contain non-heme (ferric) iron.

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ISSN: 2231-2196 (Print) **ISSN:** 0975-5241 (Online)

Received: 21.05.2020 **Revised:** 14.06.2020 **Accepted:** 27.06.2020 **Published:** 21.07.2020

Nevertheless, non-heme iron is poorly absorbed, and several substances such as dietary calcium and polyphenols that are found in coffee and tea impede iron absorption in general.A large proportion of women in developing countries do not have sufficient iron stores or enough ongoing dietary iron intake to prevent IDA[19], and this is even more pronounced in countries where vegetarian diet and tea consumption are popular as in Southeast Asia[13]. The etiological reasons for pregnancy anemia are numerous, and their relative contributions differ by geographic area and season.[17,20] Other causes include parasitic infestations such as malaria and hookworm; infections such as HIV and hemoglobinopathy.[21,22]The predisposing factors are large-scale multiparity, young age, low socio-economic status, and analphabetism.[17,23] Other factors include inter-pregnancy spacing of < 1 year and late booking, among others.[23,24] These factors prevail among pregnant women, making pregnancy anemia a significant reproductive health problem.[17,23]

Pre-conceptional supplementation of folic acid has been shown to minimize Neural Tube Defects (NTDs) in the fetus.[25] While some countries have adopted initiatives for the fortification of folic acid over time, fetal NTD still affects around 6 in every 10,000 pregnancies.[25,26] Other modifiable risk factors possibly lead to the prevalence of NTD. Vitamin B12 shows close relation of the metabolic to folate. Vitamin B12 deficiency has been shown to be an independent risk factor, almost tripling the risk of NTD.[27,28]

In cell replication, normal erythropoiesis, nucleoprotein and myelin synthesis, normal development, DNA synthesis and one carbon metabolism, vitamin B12 plays a crucial role. Deficiency of vitamin B12 was first reported in 1849 and was known to have a deadly outcome until 1926, when a vitamin B12-rich liver diet slowed down the disease cycle. [29] Also known as cobalamin, castle extrinsic factor, and antipernicious anaemia factor, vitamin B12. It is water-soluble, stable in heat and red and contains 4.35 percent by weight of cobalt[30].Vitamin B12 forms a cobalt-containing group of compounds, called cobalamin. This vitamin involves myelin synthesis, degradation of fatty acids and the synthesis of proteins and DNA.[31]Microorganisms develop all-natural vitamin B12 and is found only in animal-derived foods and vegetables contaminated with vitamin B12 synthesizing bacteria. Vitamin B12 is an animal vitamin source and is common in vegetarians because of low intake and poor absorption in the elderly [32, 33].

Thus, vegetable-based diets can lead to vitamin B12 deficiency. Most of the anemia is associated with iron deficiency in women of childbearing age and during pregnancy.[34]Nevertheless, in populations in developed countries, both low-serum folate and B12 have recently been reported, with particular reference to pregnant and lactating mothers and their infants [35]. There may be a higher incidence of folate and Vitamin B12 deficiency in the populations of developing countries than previously suspected.

AIM AND OBJECTIVE

To study the levels of Hb, ferritin, serum folate and Vitamin B12 in pregnant women's and healthy controls.

To correlate the levels ofHb, ferritin, serum folate, and Vitamin B12 in pregnant women's and healthy controls attending AVBRH Wardha and SMHRC Nagpur.

MATERIAL AND METHODS

The present study was carried out in the Department of Biochemistry and Dept. of OBGYat Datta Meghe Medical College, Shalinitai Meghe Hospital &Research Centre, Nagpur in collaboration with Jawaharlal Nehru Medical College Datta Meghe Institute of Medical Sciences, Sawangi (Meghe) Wardha Maharashtra.

Total **270** subjects were selected for study and divided in to following three groups

Group I: 140 Anaemic pregnant womens

Group II: 90Non-anaemic pregnant women

Group III: 40 Pregnant Women

Sample collection:

Blood sample was collected for the measurement of Hb, serum Folate, Ferritin, Vitamin B12, and transferrin. Serum folate was measured by UV Visible spectroscopy and Ferritin, Transferrin, and Vitamin B12 was measured by Dry chemistry analyzer.

Inclusion criteria:

- Pregnant Women

STATISTICAL ANALYSIS

All approximate findings were as mean ±SD. Mean values were evaluated by unpaired student t-test for significance. Statistical analysis was carried out using the Social Science program Statistical Package (SPSS, 24.0). The categorical measures will be used with frequencies and percentages. Probability values $p < 0.05$ will be considered statistically significant**.**

OBSERVATION AND RESULTS

Table 1: Characteristics of Women

Characteristics	No of Women
Non-Pregnant Female	40
Pregnant Female	230
Parity	
Primigravidae	78
Multigravidae	152
Gestation	
First Trimester	64
Second Trimester	67
Third Trimester	99

Table 2: Biochemical Parameters in pregnant women's and correlation between non pregnant women

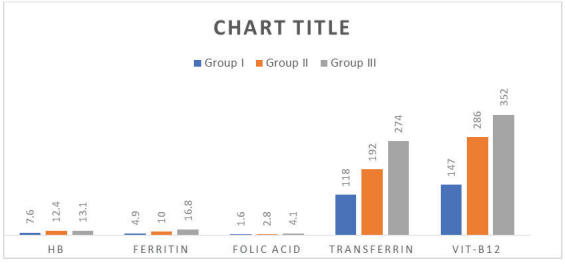
	Group I	Group II	Group III
Hb	7.685±1.007	12.477±1.087	13.125±0.953
Ferritin	4.957±1.03	10.077±4.206	16.8±5.916
Folic Acid	1.628±0.483	2.844±1.47	4.175±0.770
Transferrin	118.88±56.724	192.266±80.50	274.35±48.96
Vitamin B12	147.871±40.45	286.111±150.64	352.075±109.19

Table 3: Biochemical parameters in pregnant and non-pregnant women

Biochemical Parameters	Pregnant women's Mean±SD (n=230)	Non-Pregnant women's Mean±SD (n-40)	t-Value	p-Value
Hb	11.09±2.426	13.125±0.953	5.229	<0.0001
Ferritin	7.517±2.56	16.8±5.916	16.571	<0.0001
Folic Acid	2.236±0.0608	4.175±0.770	37.847	<0.0001
Transferrin	156.073±36.193	274.35±48.96	18.019	<0.0001
Vitamin B12	216.991±69.12	352.075±109.19	10.338	<0.0001

P<0.05

In our study out of 230 Pregnant women, 140 women are having low biochemical parameters, 90 Pregnant Women are having normal biochemical parameters.



Graph 1: Shows correlation of biochemical parameters.

DISCUSSION

Globally, 1.62 billion people (25 percent) are affected by anemia, of which 56 million are pregnant women[6,36,37]. During pregnancy, anemia is considered extreme when the concentration of hemoglobin is less than 7.0g / dL, moderate when-hemoglobin falls between7.0–9.9g / dL, and mild at 10.0-11g /dl[38,39]. Anemia during pregnancy is a major cause of morbidity and mortality in pregnant women in developing countries, and has both maternal and fetal consequences. [40].

It is estimated that anemia causes more than 115,000 maternal deaths and 591,000 perinatal deaths worldwide annually [38]. Diet is also a significant determinant of the iron preconception status in the reproductive age group. Iron deficiency is the nutritional deficiency most often found in pregnant women. It had been postulated to be associated with poor outcomes of the pregnancy and premature delivery. There is a substantial increase in iron requirements during pregnancy due to increased red cell mass and fetoplacental growth.[33,41] The cause of anemia during pregnancy in developing countries is multifactorial and involves a dietary deficiency of iron, folate, and vitamin B12 as well as parasitic diseases such as malaria and hookworm.

During pregnancy, anemia may be caused by multiple factors including blood loss; iron, folate or vitamin B12 shortages; or underlying diseases such as hemoglobinopathies (e.g. thalassemia and sickle cell disease), chronic inflammatory diseases, autoimmune disorders, and malignancies. The relative contribution of each of these factors to pregnancy anemia varies greatly across regional distribution, seasonality, and dietary practice. Anemia has a number of converging contributing factors including dietary, genetic, and infectious disease causes; iron deficiency, however, is the cause of 75 percent of cases of anemia[42,43]. Iron deficiency anemia affects the nation's growth by reducing children's cognitive development and adult productivity[44]. Owing to the physiological increase in red cell mass and additional demands from the fetus, sufficient dietary iron intake and iron supplementation in pregnant women must be ensured as iron stores in the mother decrease during pregnancy.

Pregnant women with anemia are also usually treated with an iron supplement. Given the known possibility of decreasing levels of other micronutrients during pregnancy (including vitamin B6) and causing or aggravating anemia, such supplementation of nutrients is not appreciably common. This study indicates that deficiency of vitamin B6 is one of the common causes of pregnancy nutritional anemia. We performed a prospective analysis of ferritin, vitamin B12, folate in pregnant women's and non-pregnant healthy women and analyzed the clinical characteristics of pregnant women. In our study, 230 pregnant women's have taken part, out of which 140 women's are having low levels of ferritin, folate,

vitamin B12, and transferrin, 90. Pregnant Women's are having normal biochemical parameters.

CONCLUSION

Hemoglobin levels of less than 11g/dl any time during pregnancy are considered abnormal.In our study pregnant women's are having low levels of Hb, transferrin, ferritin, low levels of folate as folate plays a major role in producing new cells, including healthy red blood cells. Folate deficiency can contribute to birth defects, such as spina bifida and low birth weight and low levels of Vitamin B12 which also contributes to birth defects if it remains untreated then it also raise the risk of having a baby with neural tube defects.

For women with low ferritin levels, iron supplementation should be increased to 30 to 120mg per day. Present study concludes that adequate iron and Folic acid intake is necessary for a healthy pregnancy, iron and Folic acid supplementation should be considered early in these cases at their first meeting with healthcare professionals.

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