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Original Research Article

# Study of the Prevalence of Anemia among Antenatal Women Visiting a Tertiary Care Hospital : A Report From North-East India

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**Abstract:** Worldwide anemia in pregnant women is a significant problem, especially in developing countries. It is commonly considered a risk factor for poor pregnancy outcome. Researches have documented iron deficiency as the leading cause of anemia in pregnancy. Several health programmes have been initiated to eradicate anemia. Objective of this study was to assess the prevalence of anemia in the pregnant women and compare the iron status of anemic pregnant women with that of non- anemic pregnant women. 53.4% of pregnant women were found to be suffering from different grades of anemia. 27.8% mild and 25.4% moderate anemia. There was a significant difference in the iron and ferritin levels between anemic and non anemic pregnant women. 39.91% of non-anemic pregnant women were iron depleted. 73.03% of the anemic pregnant women as found in the study were suffering from iron deficiency anemia. In 72 cases of anemia iron status was normal thereby implicating other causes of anemia. In conclusion the iron status of the pregnant women have been found to be low resulting in high prevalence of anemia. Continued evaluation of implementation of different health programmes and generation of nutritional awareness is very much required to achieve our goal of eradication of anemia.
**Keywords:** Anemia, ferritin, iron-deficiency, transferrin, total iron binding capacity

## INTRODUCTION

It has long been recognized that anemia is one of the most prevalent nutritional deficiency diseases affecting pregnant women. It is a disorder characterized by blood hemoglobin concentration lower than the defined normal level. According to WHO normal hemoglobin level in pregnant females is taken as 11gm% [1]. The prevalence of anemia varies considerably because of differences in socio-economic conditions, lifestyles including food habits and health seeking behaviours across different cultures. According to the estimates of WHO for the year 2011, 38% of pregnant women have anemia globally [2]. The percentage is high for South Asian countries including India at 40-59.9%[2]. In a study of the Indian Council of Medical Research (ICMR) in 1989 , prevalence of anemia in 4181 pregnant rural women of 11 States was estimated and it was demonstrated that 87.6 per cent women had haemoglobin (Hb)<10.9gm% [3]. ICMR district nutrition survey 1999-2000 also reported prevalence of anemia as 84.2 per cent with 13.1 per cent with severe anemia in pregnancy [4]. Contrary to the above studies, the NFHS-2 (National Family Health Survey, 1998-1999) reported prevalence of anemia as 49.7 per cent in pregnant women [5]. According to the NFHS 3 report, the highest prevalence of anemia in women (more than 60 percent) was found in eight contiguous states along the East Coast of India continuing north through Jharkhand and Bihar into the Northeast. Severe anemia was highest in Assam and Andhra Pradesh [6].

The term anemia is sometimes synonymously used with iron deficiency anemia. Clearly however these two terms do not cover the same reality. There are about 2-5 times more iron deficient than iron –deficient

anemic individuals. Though there are many causes of anemia, iron deficiency is the predominant nutritional deficiency causing anemia. Substantial amounts of iron are deposited in the placenta and fetus during pregnancy. This results in an increased need of about 700-850 mg in body iron over the whole pregnancy. Though iron absorption increases during pregnancy, but pregnant women still do not absorb sufficient additional iron, and the risk of iron deficiency increases. Iron deficiency during pregnancy is associated with multiple adverse outcomes for both mother and infant , including an increased risk of hemorrhage, sepsis, maternal mortality and low birth weight. There are no current global figures for iron deficiency, but taking anemia as an indicator it can be estimated that most pregnant women in non-industrialized countries and 30-40% in industrialized countries are iron deficient [7, 8].

Measurement of hemoglobin, serum ferritin and total iron binding capacity(TIBC) enable iron status to be characterized in detail [9]. In the last two decades the importance of iron deficiency anemia in pregnant females as a public health problem has been increasingly recognized by health authorities and policy makers. To evaluate the success of different programs initiated for its eradication, a continuous evaluation of its prevalence is very much needed. This study has been designed with the following aims :

1. To study the prevalence of anemia among pregnant women visiting a tertiary hospital.
2. To evaluate the body iron status of the anemic pregnant population.

## MATERIALS AND METHODS

This study was designed as a prospective observational study. It was conducted on patients attending the out patient department of Obstetrics & Gynaecology (O&G)department, of Gauhati Medical College & Hospital. Required approval of Institutional Ethical Committee was obtained and the study was conducted for a duration of 1 year 2 months from December 2015 to January 2017.

### Study Subjects

A total of 500 pregnant women was included in the study after obtaining informed consent from them

### Inclusion criteria

- Pregnant women who were attending the antenatal OPD for their 1st antenatal checkup during the study period
- Not on any iron folic acid and vitamin supplementation.

### Exclusion criteria

- Pregnant women on their 2nd, 3rd and subsequent antenatal visits.
- Pregnant women on iron folic acid and/or vitamin supplementation.

### Scheme of study

Pregnant women attending the antenatal OPD for their 1st antenatal checkup was enrolled in the study after taking informed consent. A detailed history was taken in a questionnaire including food habits, religion and socioeconomic status. 5ml of venous blood sample was collected in EDTA and clot vials. Hemoglobin was estimated in the side laboratory of O&G department and the clot vial was sent to Biochemistry section of Central Clinical Laboratory for Iron Profile estimation which included serum iron, Total Iron Binding Capacity(TIBC) and Serum ferritin.

### Hemoglobin estimation

Hemoglobin was estimated by cell counter by Sodium lauryl sulphate method.

### Iron Profile

Iron, dTIBC and ferritin was estimated in vitros 5600 Integrated system . Iron was estimated using ferrous-dye complex method and dTIBC was estimated by measuring the decrease in absorbance of coloured iron-dye complex. Ferritin estimation was done by Enhanced Chemiluminescence using a two step immunometric method.

Criteria for diagnosis of anemia(WHO): Hemoglobin < 11 gm/dl [1].

**Table 1: Level of Hemoglobin for diagnosis of different grades of anemia as per WHO[10]**

| Anemia level | Hemoglobin level(gm/dl) |
|---|---|
| Mild | 10-10.9 |
| Moderate | 7-9.99 |
| Severe | <7 |

**Statistical Analysis**

Values were calculated as mean ± SD. Student's unpaired t-test was used to study serum iron, dTIBC, and ferritin levels in anemic and non-anemic pregnant women using Instat 3 software. The p-value of less than 0.05 was considered as statistically significant.

## RESULTS & OBSERVATION

**Table 2: Percentage distribution of grades of anemia in the study population.**

| Grades of Anemia | Number | Percentage | Hb(mean ± SD) |
|---|---|---|---|
| Mild | 139 | 27.8 | 10.49 ± 0.28 |
| Moderate | 127 | 25.4 | 8.99 ± 0.72 |
| Severe | 1 | .002 | 4.8 |
| Total | 267 | 53.4 | 9.77 ± 0.92 |

**Table 3: Iron profile study in anemic and non-anemic population**

| | Anemic | | Non anemic | | P-value |
|---|---|---|---|---|---|
| | Mean | SD | Mean | SD | |
| Iron | 41.47 | 20.28 | 84.41 | 33.04 | <0.0001 |
| TIBC | 470.89 | 96.68 | 385.69 | 70.46 | <0.0001 |
| Ferritin | 17.23 | 12.34 | 30.81 | 14.28 | <0.0001 |

**Table 4: Categorization of women using haemoglobin and ferritin estimations**

| Categories | Serum Ferritin(ng/ml) | Hemoglobin(gm/dl) | No(%) |
|---|---|---|---|
| Normal, Iron deficiency excluded | >12 | >11 | 140(60.09) |
| Storage, Iron depletion | <12 | >11 | 93(39.91) |
| Iron Deficiency Anemia | <12 | <11 | 195(73.03) |
| Other causes of anemia | >12 | <11 | 72(26.97) |

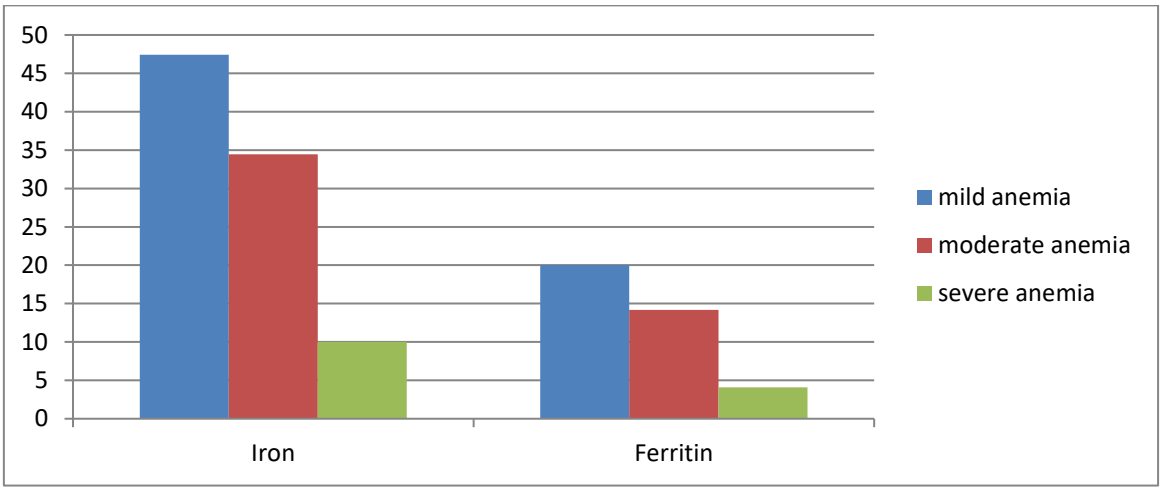


**Fig-1: Iron and ferritin status in different grades of anemia.**

## DISCUSSION

Anemia is one of the most commonly encountered medical disorders affecting the female population. United Nations has declared anemia as a major public health problem that needs to be totally eliminated. The problem is more in developing countries as compared to developed countries, and according to a WHO estimate 56% of women in developing countries are anemic [11]. Again anemia has been found to be more prevalent in rural areas than in urban areas as is evident from the National Family and Health Survey -4 report, 45.7% of pregnant women in urban areas and 52.1% in rural areas were found to be anemic [12]. This is because anemia is attributed to

dietary inadequacy due to low economic status, ignorance about the nutritive value of locally available food, inadequate food habits, illiteracy resulting in ignorance and lack of awareness about prevalence of these preventable medical conditions. During pregnancy anemia becomes a cause for serious concern as it adversely affects the intrauterine development of the foetus. Adverse outcomes for both mother and fetus include an increased risk of hemorrhage, sepsis, maternal mortality, perinatal mortality, and low birth weight.

In the present study the anemic status of pregnant women attending the antenatal OPD of Gauhati Medical College & Hospital for their first antenatal checkup and who were not on iron folic acid supplementation was studied. The percentage of pregnant women found to suffer from anemia was found to be 53.4%. NFHS-4 (2015-16)[12], has reported that in India 50.3% of pregnant women between the ages of 15 to 49 years are anemic. In Assam the percentage is a little lower at 44.8%. Anemia was classified into three categories of mild, moderate and severe based on WHO criteria. 27.8% were suffering from mild anemia, 25.4% from moderate anemia and there was only one case of severe anemia. The percentage of pregnant women who are anemic was found to be higher in a large nationwide study survey conducted across the country and covering 41,112 pregnant women. In this study analysis of data taken from the District level Household Survey under the Reproductive and Child Health Programme, more than half of the pregnant women were found to be mildly anemic and 42.6% were moderately anemic [13]. This study was however carried in 2002-2004 and published in 2010. Another study conducted by Dr. JB Sharma *et al* in Delhi found 96% of pregnant women to be anemic , with 89.8% suffering from mild anemia and 5.3% severe anemia. They however failed to find any significant correlation between dietary habits and anemia, it being equlally high in vegetarians and non-vegetarians [14]. In the present study similar correlation between dietary habits and anemia could not be done as 99% of the studied women were non-vegetarians. Yet another study conducted among the rural population of Andhra Pradesh, which was published in the year 2013, found very high prevalence of anemia at 93.26% with mean hemoglobin 10.37 ± 0.94 gm/dl[15]. Both the above mentioned studies found very high prevalence of anemia but both were conducted a few years back 2003, and 2013. Different government sponsored programmes aimed at eradicating anemia has yielded very good results and has brought down anemia across different age groups. In the state of Assam the percentage of pregnant women with anemia has reduced from 72% according to NFHS 3 report to 44.8% in NFHS 4 survey. The present study included women who had come for their first antenatal checkup , almost all in their 1$^{st}$ trimester, not on iron supplementation. This may have presented a higher percentage of pregnant women with anemia as compared to NFHS 4 report.

For erythropoiesis protein and minerals mainly iron is required along with B complex group of vitamins. Deficiency of iron is the commonest micronutrient deficiency observed in pregnant women and Iron Deficiency Anemia (IDA) is the commonest type of anemia in pregnancy [16]. Iron deficiency in pregnant women is because of increased requirement during pregnancy (about 1000mg are required) [17], which are not met by diet low in iron .The Indian diet is based on cereals and pulses which contain more than 40% of total phosphorous as phytates. Vegetables and plant food contain high proportion of oxalates. Phytates and oxalates interfere with the absorption of food iron.

In the present study iron profile of all the study subjects was determined and a comparative analysis was done between anemic and non anemic subjects. Iron, TIBC and Ferritin was estimated along with hemoglobin to characterize the iron status of the studied individuals in detail. Serum ferritin is the most specific biochemical test that correlates with relative total body iron stores. A low serum ferritin reflects depleted iron stores and hence is a precondition for iron deficiency in the absence of infection. Iron deficiency results in reduction in serum iron levels and an elevation in transferrin (TIBC) levels. A significant difference was found in the serum iron (41.47 vs 84.41), TIBC(470.89 vs 385.69) and ferritin(17.23 vs 30.81) levels when compared between anemic and non anemic pregnant women.

Serum ferritin level below 12 ng/ml is taken to indicate iron deficiency. On categorization of women using hemoglobin and ferritin estimated values [18], it was found that 57.6% of all the women included in the study suffered from iron deficiency. 39.91% of the women without anemia were iron depleted which can be explained by the fact that iron deficiency anemia represents the extreme low end of the spectrum of iron status. 73.03% of the anemic pregnant women as found in the study were suffering from iron deficiency anemia as revealed by their ferritin levels of less than 12 ng/ml. 26.97% of anemic pregnant women had their ferritin levels more than 12ng/ml and they were categorized into category 4 in which the cause of anemia was other

than iron deficiency. The other causes of anemia are diet low in proteins, chronic blood loss due to infections such as malaria and hookworm infestation. North-East is a malaria endemic area and is an important cause of anemia among its population. Also HbE disease is widely prevalent in this part of the country. HbE disease causes mild anemia in the affected people. However further investigation as regards to ascertain other causes of anemia other than iron deficiency were not done. So other causes of anemia could not be ascertained.

## CONCLUSION

In the last two decades, the importance of iron deficiency and anemia as a public health problem has been increasingly recognized by health authorities and policy makers. Anemia in pregnant women is all the more important as it affects the intrauterine development of the foetus. Different programmes have been initiated by the government with an aim to remove anemia. But the findings of this study has shown that, the percentage of pregnant women with anemia is still very high. So there remains much to be done. Most important in removing anemia is generation of nutritional awareness regarding consumption of iron rich diet and making necessary changes in the diet so as to increase the bioavailability of iron present in the diet.

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