

Prevalence of iron deficiency anemia among pregnant women before iron supplementation in Kathmandu university Hospital/Dhulikhel Hospital

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Abstract: *Objective:* To determine the prevalence of iron deficiency anemia among pregnant women before iron supplementation in Kathmandu university Hospital/ Dhulikhel Hospital. *Study area and population:* Fifty three pregnant women who have not started iron supplement and attending OPD of Dhulikhel Hospital were selected for this study. *Method and Material:* A cluster sampling procedure was applied for this prospective and cross-sectional study. Pregnant women without any ongoing infection were selected. Sociodemographic factors, knowledge, attitude and practices of pregnant women towards iron deficiency anemia were obtained by questionnaires and blood samples were drawn. Hemoglobin, ferritin, Total serum Iron and TIBC were measured. Descriptive statistics was used for data presentation. *Results:* Among 53 participants overall prevalence of anemia with hemoglobin less than 11 gm/dl was 37.74%. The prevalence of IDA among pregnant women was 24.52% and the prevalence of IDA among anemic pregnant women was 65%. The percentage of anemic pregnant women with ferritin <15ng/ml was 70.00%, elevated TIBC > 400µg/dl was 65% and total serum iron < 60µg/dl was 65%. *Conclusion:* The 65% prevalence of IDA among anemic pregnant women in the present study suggest that there is high chance of being iron deficient in case of the anemic pregnant women who have not taken iron supplements.

Keywords: Anemia, Iron Deficiency, Pregnancy, Dhulikhel Hospital

1. Introduction

Micronutrient deficiency may affect growth, cognition and reproductive performance. Of the many micronutrients that are considered lacking in the diets of pregnant women, iron is the most extensively investigated. This is because anemia, attributable to iron deficiency is a major problem in developing countries (WHO, 1992).¹Iron deficiency anemia (IDA) is a well documented nutritional deficiency during pregnancy in both developed and developing countries.² IDA is common among women in their reproductive years in particular if the women are poor,

pregnant, and members of an ethnic minority. IDA is the hematologic complication of pregnancy and is associated with increased rates of premature birth, low birth weight and prenatal mortality. IDA is known to be an important factor in maternal death, the poor cognitive development of children and decreased work capacity of the mother.³

IDA in pregnancy is considered one of the major risk factors contributing to maternal deaths in developing countries; hemorrhage, eclampsia and infections being the three major causes of maternal deaths in Nepal. Risk factors

including parasite infestation, season, food habits, gestational age, parity, early age at the time of marriage and geographic location for IDA among pregnant women is believed to be more common in the population of Kavrepalanchowk. Dhulikhel Hospital is one of the community based hospital in the district of Kavrepalanchowk and covers a population of 1.9 million. The research on the prevalence of iron deficiency anemia among pregnant women plays an important role to make policy and programmatic decisions to prevent upcoming consequences for both mother and developing fetus.

In order to reduce infant and maternal mortality it is necessary to observe the prevalence of iron deficiency anemia among pregnant women. Thus, the aim of present study, in a random sample of pregnant women from Kathmandu University Hospital/Dhulikhel Hospital, Kavre, Nepal, was to determine the prevalence of IDA among pregnant women before iron supplementation.

2. Methods

The study was a prospective, cross sectional study conducted in Kathmandu University Hospital/Dhulikhel Hospital for the duration of 7 weeks. Study subjects included 53 pregnant women attending the Gynecology Department.

Blood samples were collected from all participants by the laboratory technician. The procedure was followed as per operating instruction provided by Department of Clinical Biochemistry, Kathmandu University Hospital/Dhulikhel Hospital.

2.1. Study Variables

Dependent variable: Hemoglobin, serum total iron, ferritin, total iron binding capacity.

Independent variable: Sociodemographic factors and socioeconomic factors

Inclusion Criteria:

- Pregnant women to whom iron supplement was not started
- Not suffering from any mental illness, malignant and chronic diseases

2.2. Exclusion Criteria

- Pregnant women who suffered from speech and hearing disorders
- Pregnant women who were undergoing treatment for iron deficiency anemia
- Pregnant women who were critically ill

Methodology: Hemoglobin and ferritin were assessed by the procedure followed as per operating instructions provided by Department of Clinical biochemistry, Kathmandu university hospital/Dhulikhel hospital. Cyanmeth hemoglobin method was used for the quantitative determination of Hemoglobin. Enzyme linked Immunosorbent assay (ELISA) was used for the

quantitative determination of ferritin.

Total iron and total iron binding capacity was assessed by procedure followed as per operating instruction provided by Department of clinical biochemistry, Kathmandu university hospital/Dhulikhel hospital. The modification of Persijn method was used for the quantitative determination of iron and total iron binding capacity.

3. Results

The total sample size of the study was 53 pregnant women.

Table 1 shows the results from the questionnaire used for collecting information from pregnant women. It was observed that the majority of patients were homemakers (60.38%) and a majority of them displayed parity (viable gestational age) more than once (56.60%) (Table 1).

Table 2 shows the overall statistics of the various parameters observed in pregnant women of the present study.

3.1. Incidence of Anemia in Pregnant Women of the Present Study

Table 3 shows the frequency and percentage of the hemoglobin in the present study. The mean hemoglobin was 11.49 gm/dl with standard deviation of 0.86. 62.26% of pregnant women had normal hemoglobin level in the present study. 37.74% of pregnant women were diagnosed as anemic.

3.2. Iron Deficiency Assessment in Anemic Pregnant Women in the Present Study

Ferritin: Table 4 shows the ferritin levels observed in the present study. Among 20 anemic pregnant women, only 30% of the pregnant women had serum ferritin in normal levels whereas 70% of the pregnant women had serum ferritin less than 15ng/ml.

Total Serum Iron levels: Among 20 anemic pregnant women only 35% of the pregnant women had serum total iron in normal levels whereas 65% of the women had serum total iron values less than 60 µg/dl.

Total iron binding capacity (TIBC): Among 20 anemic pregnant women, only 35% of the pregnant women had TIBC in normal levels whereas 65% of the pregnant women had TIBC more than 400µg/dl. Table 5 shows the serum iron and TIBC levels in anemic pregnant women of the present study.

Therefore the prevalence of IDA among pregnant women in 53 samples was 24.53%. The prevalence of IDA among anemic pregnant women in 20 samples was 65 % (Figures 1a and b).

Prevalence of IDA among Anemic 20 samples

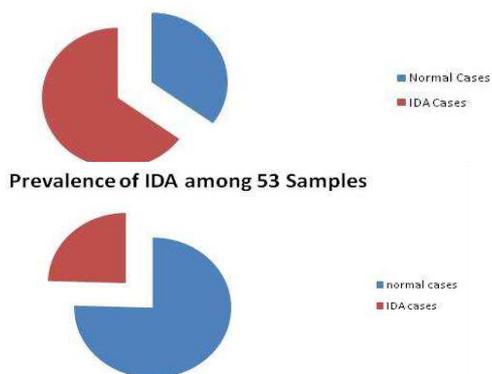


Figure 1a and b. Pie chart showing the prevalence of IDA among the women of the present study

Table 1. Results obtained from questionnaire

| Variable | Percentage (%) |
|---------------------|----------------|
| Education | |
| Primary education | 16.98 |
| Secondary and above | 83.01 |
| Profession | |
| Housewife | 60.38 |
| Shop | 7.55 |
| Agriculture | 5.66 |
| Teacher | 5.66 |
| Stitch | 3.77 |
| Student | 5.66 |
| Hotel | 5.66 |
| Sub health post | 3.77 |
| Social work | 1.89 |
| Parity | |
| once | 43.396 |
| more than once | 56.60 |
| Duration | |
| 1 month | 26.42 |
| 2 month | 39.62 |
| 3 month | 13.20 |
| 4 month | 16.98 |
| 5 month | 1.88 |
| 7 month | 1.88 |

Table 2. Statistics for hemoglobin, serum ferritin, total iron, and TIBC levels.

| Statistics | Ferritin Level (ng/ml) | Total Iron level (μg/dl) | Total Iron Binding Capacity (μg/dl) | Hemoglobin (gm/dl) |
|-----------------|------------------------|--------------------------|-------------------------------------|--------------------|
| Number of cases | 53 | 53 | 53 | 53 |
| Mean | 33 | 85.07 | 345.67 | 11.49 |
| Median | 20 | 83 | 351 | 11.5 |
| Mode | 14 | 59 | 402 | 12 |
| Std. Deviation | 28.97 | 23.01 | 57.15 | 0.86 |
| Range | 156 | 87 | 285 | 3.9 |
| Minimum | 6 | 55 | 205 | 10 |
| Maximum | 162 | 142 | 490 | 13.9 |

a. Multiple modes exist. The smallest value is shown

Table 3. Hemoglobin levels observed in pregnant anemic women of the present study

| Hemoglobin level(gm/dl) | Frequency | Percent |
|-------------------------|-----------|---------|
| Normal(11-16) | 33 | 62.26% |
| more than 16 | 0 | 0.00% |
| Less than 11 | 20 | 37.74% |
| Total | 53 | 100.00% |

Table 4. Ferritin levels as observed in the present study in anemic pregnant women

| Ferritin(ng/ml) | Frequency | Percent |
|-----------------|-----------|---------|
| normal(15-180) | 6 | 30.00% |
| more than 180 | 0 | 0.00% |
| Less than 15 | 14 | 70.00% |
| Total | 20 | 100.00% |

Table 5. Total Serum Iron and TIBC levels observed in anemic pregnant women of the present study

| Total iron (μg/dl) | Frequency | Percent |
|--------------------|-----------|---------|
| Normal(60-150) | 7 | 35.00% |
| more than 180 | 0 | 0.00% |
| Less than 60 | 13 | 65.00% |
| Total | 20 | 100.00% |
| TIBC(μg/dl) | | |
| Normal(250-400) | 7 | 35.00% |
| More than 400 | 13 | 65.00% |
| Less than 15 | 0 | 0.00% |
| Total | 20 | 100.00% |

Table 6. Prevalence of IDA in pregnant women of the present study

| | Frequency | Percent |
|---|-----------|---------|
| Prevalence of IDA among 53 samples | 13 | 24.52% |
| Prevalence of IDA among 20 anemic samples | 13 | 65% |

4. Discussion

Anemia, attributable to iron deficiency is a major problem in developing countries (WHO, 1992). It is estimated that 52% of pregnant women in developing countries have anemia, whereas this proportion is 23% in developed countries (WHO, 2001). In case of Nepal, there are very few studies on the prevalence of IDA among pregnant women before iron supplementation in comparison to other studies like anemia among pregnant women. Therefore, it becomes imperative to give immediate attention to pregnant women to address them for iron supplementation.

The difficulty in establishing a precise diagnosis of the iron status of pregnant women represents a complicating

factor in the understanding of the relationship between maternal and fetal iron levels. The physiological changes that occur during pregnancy (increased plasma volume and erythropoiesis) have a significant impact on hematological and biochemical parameters available for the assessment of iron status. Hemoglobin concentration is the most used parameter to detect anemia in public health care services due to its low cost and available reference standards. Therefore, a combination of several parameters has been proposed in order to improve the diagnosis of iron deficiency (Cook and Finch, 1979)

The 37.74% prevalence of anemia during pregnancy in the present study was lower than the study conducted by Marahata et al. (2007) (42.6%) and Shah et al. (2001) (66%). This may be due to the different methods of the estimation of hemoglobin.

In the present study hemoglobin was estimated by Cyanmeth hemoglobin method. This method for estimating hemoglobin is standard and accurate compared to other available methods. The other responsible factors may be environmental condition and different population background such as income, education, food habits and socio demographic factors. In India, another developing country, 88% of pregnant women were found to be anemic (World Health Organization, UNICEF and UNO, 1998). In the present study, the prevalence of anemia was lower than that of India.

Though the prevalence of IDA in the present study was obviously lower than the prevalence from South-Asian countries (Agarwal et al., 1987; WHO, 1998; Kapil et al., 1999; Bondevik et al., 2000; Dreyfuss et al., 2000) it was higher than found in developing countries. The prevalence of IDA found in other developing countries have been found to be 25-35% (Karimi et al., 2002).

This may be due to different diagnostic criteria. In the present study IDA was diagnosed by four biochemical parameters such as hemoglobin, serum ferritin, serum total iron, and TIBC.

In the present study with respect to anemic pregnant women, the percentage of ferritin <15ng/ml was present in 70%, elevated TIBC > 400µg/dl was present in 65% and total serum iron < 60µg/dl was present in 65% of anemic women.

S-ferritin measurement early in pregnancy is a reliable parameter for judging whether iron supplementation is necessary. Even if S-ferritin is influenced by the plasma dilution, a concentration below 15 microgram/l indicates iron deficiency in all stages of pregnancy (Haram et al., 1997). Serum iron measures the amount of iron in the blood. A normal serum iron is 60 - 170 µg/dl. Iron then binds to a protein with the same structure, fetal transferrin and is transported through the bloodstream to fetal tissues. In general, iron-related hematological and biological parameters are markedly higher in umbilical cord than maternal blood (Oski et al., 1984). Lower levels may indicate iron-deficiency anemia or anemia of chronic disease, while higher levels may indicate hemolytic anemia

or vitamin B12 deficiency. Total iron binding capacity (TIBC) measures the level of transferrin in the blood. Transferrin is a protein that carries iron in the blood. TIBC calculates how much or how little the transferrin in the body is carrying iron. A higher than normal TIBC is a sign of iron-deficiency anemia.

The 65% prevalence of IDA among anemic pregnant women in the present study suggest that there is high chance of being iron deficient in case of the anemic pregnant women who have not taken iron supplements.

5. Conclusion

On the basis of present study findings, it can be concluded that prevalence of anemia was substantially lower than the national figure for pregnant women. Also the 65% prevalence of IDA among anemic pregnant women in the present study suggest that there is high chance of being iron deficient in case of the anemic pregnant women who have not taken iron supplements. A larger sample size is needed to confirm the results. But the results of the present study could aid in the development of an iron deficiency anemia program among pregnant women in the district of Kavrepalanchowk that emphasizes on iron supplementation, parasite control and improved diet.

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