

Evaluation of Iron Deficiency in Women of Reproductive Age: A Prospective Analysis

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ABSTRACT

Background: Anaemia due to iron deficiency is the most common nutritional disorder worldwide. The present study was conducted among reproductive-age women to assess iron deficiency in women.

Materials and Methods: The present study was a prospective, observational study conducted among reproductive-age women (n =280), aged between 18 and 45 years to assess iron deficiency in women. Data collected on the patient questionnaire included age, laboratory values (e.g., Hb, ferritin). Iron deficiency was defined as serum ferritin <15 µg/l. The SPSS (version 25; SPSS Inc., Chicago) was used for statistical testing; and p-value < 0.05 was considered the statistical significance.

Results: In the present study total women included in the study were 280 in which maximum women were in the age group 18-26yrs i.e. 44.64%. In this study iron deficiency was present in 32.85% women. The means of the CBC parameters for the women with iron deficiency were as follows: RBC count was 3.08×10^{12} /L, HGB 9.42g/dL, HCT 36.87% and MCV 77.23fL. The mean of the MCH was 24.56pg and MCHC 31.65g/dL. The mean of the WBC was 7.12×10^9 /L. The mean value of platelet was 303×10^9 /L. In the same way, the mean of the MPV was 11.54 fL. The means of the CBC parameters for the women without iron deficiency were as follows: RBC

count was 4.34×10^{12} /L, HGB 12.56g/dL, HCT 37.45% and MCV 79.45fL. The mean of the MCH was 28.54pg and MCHC 32.76g/dL. The mean of the WBC was 6.48×10^9 /L. The mean value of platelet was 276×10^9 /L. In the same way, the mean of the MPV was 12.32 fL.

Conclusion: The present study concluded that iron deficiency was present in 32.85% women. RBC count, Hb, HCT, MCV, MCH, MCHC, MPV was less in women with iron deficiency. WBC and platelet were more in women with iron deficiency.

Keywords: Iron Deficiency, Nutritional Disorder, Anemia.


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INTRODUCTION

Despite iron being one of the most abundant elements in the earth's crust, iron deficiency is the most common nutritional problem worldwide and presents significant public health challenges. Iron deficiency (ID) and iron deficiency anemia (IDA) disproportionately affect women and children. WHO estimates that over 2.10⁹ people, about a third of the population of the world, are anemic, predominantly due to iron deficiency.¹ Iron deficiency anemia is diminished red blood cell production due to low iron stores in the body.² It is the most common nutritional disorder worldwide and accounts for approximately one-half of anemia cases.^{3,4} Iron deficiency anemia can result from inadequate iron intake, decreased iron absorption, increased iron demand, and increased iron loss.⁵ Iron deficiency anaemia (IDA) occurs in 2–5% of adult men and post-menopausal women in the developed

world.^{6,7} Premenopausal women are vulnerable to ID partly because of iron lost in menstrual blood but also because they often have a low dietary iron intake and may follow restrictive dietary practices to lose weight. Dietary iron recommendations are 18 mg/d for women of reproductive age compared to 8 mg/d for men.⁸ ID in women is associated with psychological effects and decreased dopamine production, affecting perception, motivation, memory, addiction and motor control. Iron supplementation in intervention studies frequently results in improved cognitive function and iron supplementation in pregnancy has been demonstrated to have effects on the offspring's cognition. In adult ID, iron therapy restores brain function.⁹ The present study was conducted among reproductive-age women to assess iron deficiency in women.

MATERIALS AND METHODS

The present study was a prospective, observational study conducted among reproductive-age women (n =280), aged between 18 and 45 years to assess iron deficiency in women. The subjects who were pregnant, had any sign of chronic diseases, had a surgery or blood loss from an accident, and who took iron tablets within 3 months preceding the data collection were excluded from the study. At study inclusion, each patient who agreed to participate in the study received a questionnaire consisting of one section to be completed by the clinician and a second section to be completed by the patient (self-assessment). Data collected on the patient questionnaire included age, laboratory values (e.g., Hb, ferritin). Iron deficiency was defined as serum ferritin <15 µg/l. Complete blood count (CBC) including haemoglobin (Hb) concentration was determined. The World Health Organization defines anemia as blood hemoglobin values

of less than 7.7 mmol/l (13 g/dl) in men and 7.4 mmol/l (12 g/dl) in women. The severity of anemia is based on the patient's hemoglobin/hematocrit level. The mean corpuscular volume is the measure of the average red blood cell volume and mean corpuscular hemoglobin concentration is the measure of the concentration of hemoglobin in a given volume of packed red blood cells. The normal reference ranges for mean corpuscular volume is 80–100 fL and mean corpuscular hemoglobin concentration is 320–360 g/l. It is not uncommon for the platelet count to be greater than 450,000/µl in the presence of iron deficiency anemia.¹⁰ Serum ferritin (SF) concentration, as a measure of iron status, was determined by the chemiluminescent microparticle immunoassay (CMIA). The SPSS (version 25; SPSS Inc., Chicago) was used for statistical testing; and p-value < 0.05 was considered the statistical significance.

Table 1: Distribution according to age group

Age group	N(%)
18-26yrs	125(44.64%)
27-35yrs	90(32.14%)
36-45yrs	65(23.21%)
Total	280(100%)

Table 2: Prevalence of iron deficiency in women

Prevalence of iron deficiency in women	N(%)
Present	92(32.85%)
Absent	188(67.14%)
Total	280(%)

Table 3: Comparison of the means, standard deviations, of the blood count parameters for women with iron deficiency and women with normal iron levels

Hematological parameters	Women with iron deficiency Mean ± SD	Women with normal iron levels Mean ± SD	P value
RBCx10 ¹² /L	3.08±0.34	4.34±0.58	<0.001
HGB (g/dL)	9.42±1.84	12.56±1.45	
HCT (%)	36.87±2.73	37.45±1.27	
MCV (fL)	77.23±4.78	79.45±4.31	
MCH (pg)	24.56±2.65	28.54±0.43	
MCHC (g/dL)	31.65±2.34	32.76±0.58	
WBCx10 ⁹ /L	7.12±1.21	6.48±1.76	
PLTx10 ⁹ /L	303±67.8	276±65.13	
MPV (fL)	11.54±1.21	12.32±2.31	

RESULTS

In the present study total women included in the study were 280 in which maximum women were in the age group 18-26yrs i.e. 44.64%. In this study iron deficiency was present in 32.85% women. The means of the CBC parameters for the women with iron deficiency were as follows: RBC count was 3.08 × 10¹²/L, HGB 9.42g/dL, HCT 36.87% and MCV 77.23fL. The mean of the MCH was 24.56pg and MCHC 31.65g/dL. The mean of the WBC was

7.12 × 10⁹/L. The mean value of platelet was 303 × 10⁹/L. In the same way, the mean of the MPV was 11.54 fL. The means of the CBC parameters for the women without iron deficiency were as follows: RBC count was 4.34 × 10¹²/L, HGB 12.56g/dL, HCT 37.45% and MCV 79.45fL. The mean of the MCH was 28.54pg and MCHC 32.76g/dL. The mean of the WBC was 6.48 × 10⁹/L. The mean value of platelet was 276 × 10⁹/L. In the same way, the mean of the MPV was 12.32 fL.

DISCUSSION

ID is associated with a range of clinical outcomes including depression, reduced endurance and work performance, and compromised intellectual and cognitive functions.¹¹

In the present study total women included in the study were 280 in which maximum women were in the age group 18-26yrs i.e. 44.64%. In this study iron deficiency was present in 32.85% women. The means of the CBC parameters for the women with iron deficiency were as follows: RBC count was $3.08 \times 10^{12}/L$, HGB 9.42g/dL, HCT 36.87% and MCV 77.23fL. The mean of the MCH was 24.56pg and MCHC 31.65g/dL. The mean of the WBC was $7.12 \times 10^9/L$. The mean value of platelet was $303 \times 10^9/L$. In the same way, the mean of the MPV was 11.54 fL. The means of the CBC parameters for the women without iron deficiency were as follows: RBC count was $4.34 \times 10^{12}/L$, HGB 12.56g/dL, HCT 37.45% and MCV 79.45fL. The mean of the MCH was 28.54pg and MCHC 32.76g/dL. The mean of the WBC was $6.48 \times 10^9/L$. The mean value of platelet was $276 \times 10^9/L$. In the same way, the mean of the MPV was 12.32 fL.

A study conducted in central Thailand reported 21% of anaemia among women of reproductive age studying in a university.¹²

Causes of anaemia are multiple and complex, but iron deficiency (ID) is considered to be the major cause of anaemia, especially among women of reproductive age due to limited intake of iron-rich foods along with poor bioavailability, and increased requirement associated with menstruation.¹³⁻¹⁶ While iron supplementation is widely practiced to control anaemia, especially among women of reproductive age, the current evidence suggests that there has been a limited impact of iron supplementation, under the programmatic condition, on reducing the anaemia in most of the developing countries.¹⁷

The most effective way of promoting iron absorption is to consume iron with ascorbic acid-rich sources and avoid the consumption of polyphenols and other inhibitors in a meal which provides a significant source of iron. The use of dietary patterns rather than identifying single or limited combinations of nutrients or foods is a newly emerging method to investigate dietary intake and iron status. This novel approach, which uses factor analysis and logistic regression, has demonstrated that dietary patterns characterized by either a low intake of meat and vegetables or a high intake of milk and yoghurt were associated with an increased risk of suboptimal iron status.¹⁸

CONCLUSION

The present study concluded that iron deficiency was present in 32.85% women. RBC count, Hb, HCT, MCV, MCH, MCHC, MPV was less in women with iron deficiency. WBC and platelet were more in women with iron deficiency.

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