Research Article

Prevalence of iron deficiency and iron deficiency anaemia among nursing students of Bilaspur Chhattisgarh

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Abstract

Background and Aim: The most widespread nutritional problem is iron deficiency affecting over two billion people. It is particularly common disorder among infants, preschool children, young women and older people but it can occur at ages and in any region. A high demand for iron during rapid growth, pregnancy and lactation, accompanied by dietary deficiency in children and young women, can lead to iron deficiency anaemia. **Materials and Methods**: The present study carried out at Department of Biochemistry, Chhattisgarh Institute of Medical Sciences, Bilaspur (CG). A total 112 female students participated in this cross sectional study was age between 18-25 years. Complete blood cell count and Serum iron, Ferritin, total iron binding capacity were used to assess the status of iron deficiency and iron deficiency anaemia. **Results**: We found significant (P<0.001) decrease level of Serum Iron and Ferritin and significant (P<0.001) increased level of TIBC in ID as well as IDA as compared to Normal. In this study, the prevalence rates of ID and IDA in female university students aged 18–25 years were 55.35% and 10.7%, respectively. **Conclusion**: The results of this study indicate that iron supplementation is required for the target group. Finally, nutrition education and intervention program should address ID with a focus on both the dietary quantity and the quality of the micronutrient composition. All of these interventions must be monitored for effectiveness.

Key words: Iron Deficiency Anemia, Iron Deficiency, Nursing Students

Introduction

Iron deficiency (ID) is the most prevalent nutritional disorder in the world [1] and Iron deficiency is the most frequent cause of anemia [2-4]. It is estimated that around 2.15 billion individuals suffer from iron deficiency anemia [5]. It is particularly common disorder among infants, pre-school children's, young women and older people but it can occur at ages and in any region. A high demand for iron during rapid growth, pregnancy and lactation, accompanied by dietary deficiencies and menstrual blood loss, are the most common causes of iron deficiency in children and young women. Iron deficiency is considered one of the ten global risk factors in terms of its disease burden [6].

Anaemia is associated with low work capacity, a poor pregnancy outcome as well as lasting effects on learning and cognitive functions, attention behaviour, health and growth [7, 8]. The prevalence of ID and Iron deficiency anaemia IDA is higher in less developed countries as compared to developed countries. Although the diagnosis of ID is relative simple, it may go unnoticed for a long time due to its non specific clinical sign. The most common sign of ID includes paleness, anorexia, apathy, irritability, reduced attention span and psychomotor deficiencies. Adolescence is a critical stage in the life cycle, when the health of female is affected due to growth spurt, beginning of menstruation, poor intake of iron due to poor dietary habits and gender bias. Iron deficiency Anemia affects over 60% of the adolescent girls in India. Anemia in adolescent girls has far- reaching implication. The anaemic adolescent girls grow into adult women have low pregnancy weight babies [9]. In a recent review of

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the prevalence of iron deficiency anemia in the United States, 9% of toddlers and up to 11% of adolescent girls were iron deficient [10]. Although nutritional deficiencies of folate and vitamin B12, infectious diseases, such as the human immunodeficiency virus, hookworm, malaria and other chronic diseases, may account for anemia, according to the literature, more than 50% of cases of anemia in young children and pregnant women in developing countries are related to iron deficiencies [11-12]. In the World Health Organization (WHO)/World Bank rankings, IDA is the third leading cause of disability-adjusted life years lost for females aged 15–44 years [12-13]. It is the only nutrient deficiency which is also significantly prevalent in virtually all industrialized nations. In addition, there are no current global figures for iron deficiency, but using anemia as an indirect indicator it can be estimated that most female preschool children and pregnant women in non-industrialized countries, and at least 30 to 40% in industrialized countries, are iron deficient [14].

Since female adolescents and adults are among the population groups who are most affected by it, the present study was conducted to determine the prevalence of ID and IDA among apparently healthy female nursing students.

Materials and Methods

A total 112 healthy female students age between 18-25 years were selected for the study. Three students having history of sickle cell anaemia were excluded from the study. The study was carried out with due approval of the institutional human ethical committee, written informed consent was obtained from all subjects before the study. Iron deficiency (ID) was defined as ferritin <15 ng/ml with hemoglobin ≥12.0 g/dl an iron deficiency anemia (IDA) as ferritin <15 ng/ml with hemoglobin <12 g/dl [15]. A detailed physical examination was conducted on all participants. Height and weight of students were measured and body mass index (BMI) was calculated as body weight in kilograms divided by square of height in meters {body weight (Kg)/height (m^2)}. Five ml of blood samples were obtained from each participant. Blood sample was used for haematological and biochemical tests. Complete hemogram was analysed by mythic 18 cell counter make Orphee SA, France, the Serum iron and Total iron binding capacity (TIBC) levels were measured calorimetrically by commercially available kit (Coral Diagnostic India) by and estimation of serum Ferritin was done by Radioimmunoassay Assay. (Kit Make DPC, Diagnostic USA).

Statistical Analysis: The statistical analysis was performed using the Statistical Package for Social Science version 16 (SPSS Inc, Chicago, IL USA). The student's t test for continuous variable was used to compare the difference between the groups. A p- value of 0.05 was considered to be statistically significan

Result

A total 112 students were included in this study. Their ages ranged between 18 to 25 yrs, with a mean age of 19.8 yrs. Subjects were divided into three groups as group first Normal, group second ID (Iron deficiency) and Group third IDA (Iron deficiency anemia). The criteria for the division was Hb ≥ 12.0 g /dl and serum Ferritin ≥ 15.0 ng/ml (group 1), Group 2 Hb ≥12.0 g/dl and Ferritin < 15.0 ng/ml and Group 3 Hb ≤ 12.0 g/dl and Ferritin <15.0 ng/ml . There were thirty eight, sixty two and 12 subjects in group 1, 2 & 3 respectively.

Table 1:- Haematological and iron indices as mean and standard deviation (SD) of all the participants (n=112)

Parameters	Mean	SD
TRBC (millions/cumm)	4.77	.71
Hct (%)	37.93	5.71
Hb (g/dl)	12.26	1.34
MCV(fl)	79.07	11.73
MCH(pg)	24.98	6.76
MCHC (%)	31.09	6.35
Ferritin (ng/ml)	24.55	17.23
Serum Iron (µg/dl)	69.95	21.22
TIBC(µg/dl)	398.90	64.81
BMI (kg/m^2)	19.92	2.52

The above table shows the mean and (SD) of TRBC (millions/cumm) =4.77 (0.71),Hct(%)= 37.97(5.71),Hb(g/dl) =12.26(1.34),MCV(fl) =79.07(11.73), MCH(pg)=24.98(6.76), MCHC(%)=31.09(6.35), Ferritin(ng/ml)=24.55(17.23), Serum Iron(µg/dl)=69.95(21.22) and TIBC(µg/dl)= 398.90(64.81)
Data of table no 1 shows the iron status of all the participants (Mean ± SD). The prevalence of ID and IDA in this study was 55 %, & 11% respectively as shown in the pie chart 1.

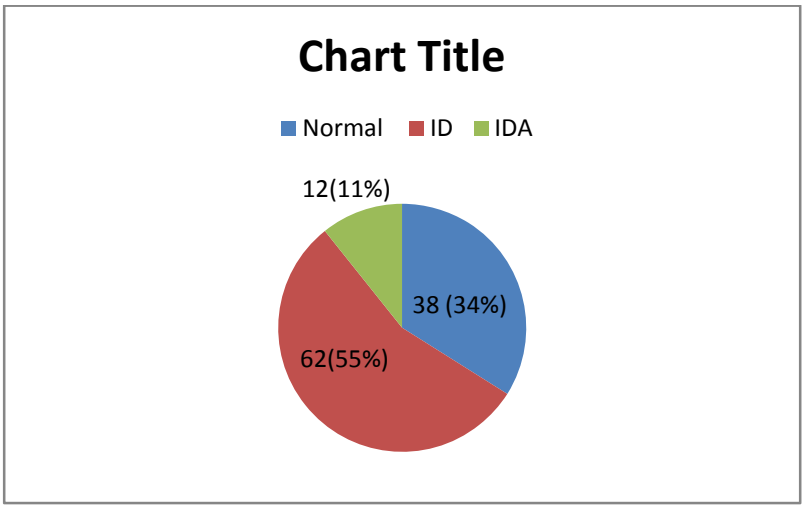
Table 2: comparative result haematological and iron indices as mean and standard deviation (SD) of three groups i.e. Normal , ID and IDA

Parameters	Group 1 (n = 38)	Group 2 (n = 62)	Group 3 (n = 12)
TRBC(millions/cumm)	5.12 ± .58	4.56 ± .71	4.72 ± .69
Hct(%)	42.36 ± 4.95	36.49 ± 3.78	31.38 ±6.48*
Hb (g/dl)	12.70 ± .60	12.11 ± .53	08.65 ± 1.65
MCV(fl)	82.71 ± 7.10	79.39 ± 12.43	65.92 ± 4.03
MCH(pg)	26.57 ± 9.05	25.19 ± 4.64	18.88 ± 4.03
MCHC (%)	30.29 ± 3.03	31.09 ± 8.84	28.62 ±2.24
Ferritin (ng/ml)	37.65 ± 26.54	19.81± 3.34	8.81 ± 2.67*
Serum Iron(µg/ml)	80.25 ±15.29	48.55 ±.14	26.58 ± 6.96*
TIBC (µg/dl)	340.26 ± 43.81	441.55 ±43.57	462.42 ±77.27*
BMI (kg/m^2)	19.78± 2.43	19.66± 2.51	18.93± 2.64^{NS}

TRBC: Total Red blood cell count, Hb: Haemoglobin, HCT: hematocrit, MCV: mean Corpuscular Volume, MCH: mean corpuscular haemoglobin, MCHC: mean corpuscular haemoglobin concentrate, TIBC: total iron binding capacity, BMI: body mass index (* highly significant at p < 0.001, NS: not significant).

Table no 2 shows significant (P<0.001) decrease level of Serum Iron and Ferritin and significant (P<0.001) increased level of TIBC in ID as well as IDA as compared to Normal. We did not found any significant differences in BMI between ID, IDA as compared to normal.

The table data shows significant (P<0.001) decrease level of Serum Iron and Ferritin and significant (P<0.001) increased level of TIBC in ID as well as IDA as compared to Normal.



Pie chart 1 - The Prevalance of Iron deficiecny and Iron Deficiency Anemia among all participants.

Discussion

Iron deficiency anemia is the most common nutritional deficiency worldwide. The negative consequences of IDA on the cognitive and physical development of children and on the work productivity of adults are of major concern [16]. ID usually develops in a sequential manner over a period of negative iron balance, such as periods of blood loss and / or prolonged iron –deficient diets, accelerated growth in children and adolescents as well as during pregnancy and lactation [17-18]. These staged include the iron –depletion phase, iron-deficient erythropoisis and IDA. IDA affects 43% of pre school children all over the world, especially in developing countries, where its prevalence rate is four times higher than in industrial countries [19]. Iron deficiency usually develops slowly and insidiously. Many patients have no specific complaints; others have vague symptoms of tiring easily, headache, irritability, or depression [20]. Probably the single most important clinical clue to anemia is the symptom of chronic fatigue [21]. In one study in India 20% of female college students were found to be anemic, Latent iron deficiency /ID (low serum Ferritin, <15.0 ng/ml, with normal Hb, 12.0 g/dl or more) was found amongst 19 (27.5%) subjects [22]**.** In this study the prevalence of ID 55% was higher than that of IDA 11%. Subjects with ID are likely to develop IDA over a period of time and should receive iron therapy to correct their ID and prevent the development of IDA. Although 15.0 ng/ml of Ferritin level is taken as cut off level for diagnosis of ID, there are reports to suggest that even at higher levels of ferritin, there is evidence of iron deficient erythropoisis [23-25]**.** The results of this study indicate that iron supplementation is required for the target group. Further research is recommended to identify the specific risk factors for ID and IDA. Finally, nutrition education and intervention program should address ID with a focus on both the dietary quantity and the quality of the micronutrient composition. All of these interventions must be monitored for effectiveness.

Conclusion

The result of the study indicates that iron supplementation is required for the target group. As the nursing students resided in hostel their hostel food should also be evaluated to find out if there is any shortfall in their dietary iron .The dietary habits of the students should also be studied to find out their intake of inhibitors and enhancer of iron absorbance just before and after meal to fully eradicate IDA and ID among them.

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