

## ESTIMATION OF FERRITIN IN VEGETARIAN AND NON-VEGETARIAN FEMALE MEDICAL COLLEGE STUDENTS

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Received: 07 January 2022, Revised and Accepted: 16 February 2022

### ABSTRACT

**Objective:** Iron stores in the body exist primarily in the form of ferritin. Iron deficiency anemia is the state where iron level is below normal, low transferrin saturation and ferritin as well as high iron binding capacity. National Family Health Survey-3 shows the prevalence of anemia in 56.2% of women of 15–49 year, 79.2% among children aged 6–35 months, 57.9% in pregnant women.

**Methods:** 50 (apparently healthy female students of the medical college) were included in the study. Ferritin level was estimated by Advia Centaur XP Immunoassay System.

**Results:** About 50% of non-vegetarian and about 79% of vegetarian were anemic. Ferritin level among non-vegetarians was significantly higher than vegetarians.

**Discussion:** Although vegetarian lifestyle has great advantages, vegetarians do have a high risk of a deficiency of some nutrients, including iron. The most readily absorbed type of iron is heme iron which comes from meat, poultry, and fish. Furthermore, plant foods contain several iron-absorption inhibitors. Getting enough iron from non-heme iron sources can be a challenge. Iron requirements for vegetarians are about 1.8 times higher, compared to non-vegetarians.

**Conclusion:** This form of malnutrition is most common and one of the leading causes of disease among girls and women in developing countries. Knowing about ferritin level will help understand iron status and thus avoiding the disease.

**Keywords:** Iron, Ferritin, Haemoglobin, Hem, Anemia, Vegetarian, Non-vegetarian.

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### INTRODUCTION

Among women, serum ferritin values remain relatively low until menopause and then rise. Body ferritin levels, in contrast to hemoglobin, are not affected by residential elevation above sea level or smoking behavior [1]. Iron deficiency anemia is the state where iron content of the body is below normal, low transferrin saturation and ferritin as well as high iron binding capacity. According to the WHO iron deficiency anemia affects 1.3 billion people worldwide among which 43% are preschool children, 51% are pregnant women and 37% are school age children [1]. It primarily affects women. Recent estimates of iron deficiency anemia show that 52% of Indian women aged 15–49 years are anemic. National Family Health Survey-3 shows the prevalence of anemia in 56.2% of women of 15–49 year, 79.2% among children aged 6–35 months, 57.9% in pregnant women. Its estimated prevalence in South-East Asia is 50–70% [1,2].

Women are vulnerable part of society due to poor intake and absorption, increased requirements, menstrual loss, and adolescent pregnancies. Iron deficiency anemia is the most common form of malnutrition in the world and is the eighth leading cause of disease in girls and women in developing countries. Iron stores in the body exist primarily in the form of ferritin. The ferritin molecule is an intracellular hollow protein shell composed of 24 subunits surrounding an iron core that may contain as many as 4000–4500 iron atoms. In the body, small amounts of ferritin are secreted into the plasma. The concentration of this plasma (or serum) ferritin is positively correlated with the size of the total body iron stores in the absence of inflammation. A low serum ferritin value reflects depleted iron stores, but not necessarily the severity of the depletion as it progresses [1]. Normal ferritin concentrations vary by age and sex. Concentrations are high at birth, rise during the first 2 months of life, and then fall throughout later infancy. At about 1 year of age, concentrations begin to rise again and continue to increase

into adulthood. Beginning in adolescence, however, males have higher values than females; a trend that persists into late adulthood [3].

### METHODS

The study was conducted in the Department of Biochemistry, MMMCH. Total Fifty (50) apparently healthy female students studying in the medical college, were included in the study. Among them, 25 were vegetarian and 25 non-vegetarians. The participants are staying alone away from their home.

A detailed history regarding the present or past illness was taken. Informed consent was taken from the participants included in the study.

### Inclusion criteria

- 25 vegetarian subjects
- 25 non-vegetarian subjects.

### Exclusion criteria

- Anaemic Individuals
- Individual taking iron pills
- Any genetic disorders such as thalassemia, sickle cell anemia, and G6PD deficiency
- Any inflammation.

Blood samples were collected in morning hours from antecubital vein in dry disposable syringe under aseptic conditions and transferred to a sterile and dry vial for biochemical analysis.

The following tests were performed:

- Serum/Plasma ferritin level by Advia Centaur XP Immunoassay System
- Haemoglobin (Hb).

**Statistical analysis**

Statistical analyses were carried out. Descriptive statistics was calculated for different characteristics of the subjects to compare the statistical differences between continuous variables (depending on the nature of data collected).

**RESULTS**

According to the WHO criteria, about 50% of non-vegetarian and about 79% of vegetarian were anemic. Two subjects among non-vegetarians and one among vegetarians had ferritin level below normal range (10–120 ng/ml) [4]. No participants had ferritin level above normal range.

Ferritin level among non-vegetarians was significantly higher than vegetarians haemoglobin although level was slightly higher among

**Table 1: Ferritin and Haemoglobin values among Vegetarians and Non-vegetarians**

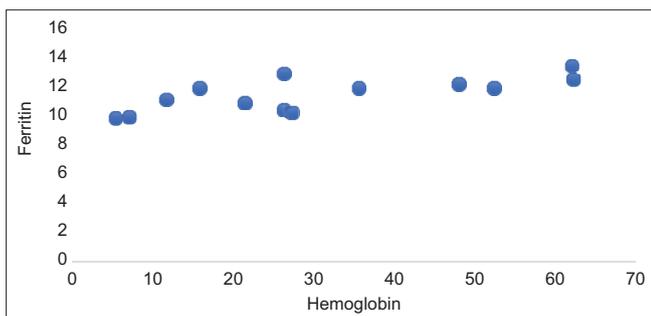
	Ferritin	Hb	R	Relation	Significance P
Vegetarian	18.91±9.3	11.21±0.36	0.538	Positive	0.047* significance
Nonvegetarian	31.6±17.92	11.47±1.17	0.722	Positive	0.003* significance

\*Significant at p<0.05. Hb: Hemoglobin

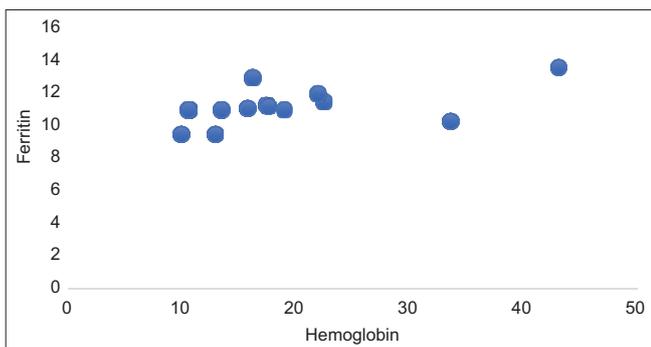
**Table 2: Ferritin and Haemoglobin values among Vegetarians and Non-vegetarians**

	Ferritin	Hb
Vegetarian	18.91±9.3	11.21±0.36
Nonvegetarian	31.6±17.92	11.47±1.17
t	-2.073	-0.591
p	0.0481*	0.559

\*Significant at p<0.05. Hb: Hemoglobin



**Fig. 1: Relation between ferritin and haemoglobin among non-vegetarians**



**Fig. 2: Relation between ferritin and haemoglobin among Vegetarians**

non-vegetarians than vegetarians, but no statistically significant difference was observed (Tables 1 and 2). The strong positive statistically significance relation of ferritin and Hb was observed among non-vegetarians and this relation among vegetarians in not so strong (Tables 1 and 2). The relation between ferritin and haemoglobin among vegetarians and non-vegetarians is also shown in the Figs. 1 and 2.

**DISCUSSION**

Even though vegetarian lifestyle is associated with several advantages, such as lower risk factors and disease prevalence of some chronic health conditions in adults, vegetarians do have a high risk of a deficiency of some nutrients, including iron. Iron deficiency is of importance because iron plays a significant role in human growth and development. Its main role in the body is to participate in oxygen transport as a component of hem in erythrocytes. The most readily absorbed type of iron is hem iron which comes from meat, poultry, and fish. Therefore, since these foods are not consumed by vegetarians, they consume the less-absorbable non-hem iron. Furthermore, plant foods contain several iron-absorption inhibitors. They include phenolic compounds, oxalates, and phytates. Food especially rich in the above-listed iron absorption inhibitors include grains, especially whole grains, beans and nuts, many vegetables including spinach and parsley, but also spices and condiments such as oregano, cinnamon, tea, coffee, red wine, and cocoa. Getting sufficient iron from non-hem iron sources can be a challenge. This is especially true considering that the iron requirements for vegetarians are about 1.8 times higher, compared to non-vegetarians [5-7]. Similar findings have been reported in various localities [2,7-10].

**CONCLUSION**

Women are susceptible to iron deficiency anaemia due to poor intake & absorption, increased requirements, menstrual loss & adolescent pregnancies. This form of malnutrition is most common and one of the leading causes of disease among girls and women in developing countries. The lifestyle of students might also induce iron deficiency since they stay away from their home and many of them stay in hostel. Therefore, knowing about ferritin level will help understand iron status and thus avoiding the disease. The present study would be helpful improving diet pattern. The study would have been even more valuable and had it been a greater number of participants. It is also hoped that the current study will raise awareness anemia and ferritin and concerned diet. Therefore, it is suggested to carry the research in wider population for better result.

**ETHICS APPROVAL**

The study was approved by Institutional Ethics Committee.

**AUTHOR CONTRIBUTIONS**

All the authors have equally contributed for the study.

**CONFLICT OF INTEREST**

The authors declare that no conflict of interest has been reported.

**FUNDING SOURCE**

No external funding.

**REFERENCES**

1. World Health Organization. Serum Ferritin Concentrations for the Assessment of Iron Status and Iron Deficiency in Populations. Vitamin and Mineral Nutrition Information System. Geneva: World Health Organization; 2011.
2. Modi S, Sukhwant B. Study of iron status in female medical students. Indian J Basic Appl Med Res 2013;6:518-26.
3. Domellöf M, Dewey KG, Lönnerdal B, Cohen RJ, Hernell O. The diagnostic criteria for iron deficiency in infants should be re-evaluated. J Nutr 2002;132:3680-6.
4. World Health Organization. Worldwide Prevalence of Anaemia 1993-

2005. Geneva: World Health Organization; 2008. Available from: [http://whqlibdoc.who.int/publications/2008/9789241596657\\_end.pdf](http://whqlibdoc.who.int/publications/2008/9789241596657_end.pdf)
5. Osei-Boadi K, Lartey A, Marquis GS, Colecraft EK. Dietary intakes and iron status of vegetarian and nonvegetarian children in selected communities in Accra and Cape Coast, Ghana. *Afr J Food Agric Nutr Dev* 2012;12:5822-42.
  6. Pawlak R, Bell K. K. Iron status of vegetarian children: A review of literature. *Ann Nutr Metab* 2017;70:88-99.
  7. Hawk SN, Englehardt KG, Small C. Risks of iron deficiency among vegetarian college women. *Health* 2012;4:113-9.
  8. Pawlak R, Berger J, Hines I. Iron status of vegetarian adults: A review of literature. *Am J Lifestyle Med* 2018;12:486-98.
  9. Waldmann A, Koschizke JW, Leitzmann C, Hahn A. Dietary iron intake and iron status of German female vegans: Results of the German vegan study. *Ann Nutr Metab* 2004;48:103-8.
  10. Gallego-Narbón A, Zapatera B, Vaquero MP. Physiological and dietary determinants of iron status in Spanish vegetarians. *Nutrients* 2019;11:1734.