ORIGINAL RESEARCH PAPER
Volume - 14 | Issue - 08 | August - 2025 | PRINT ISSN No. 2277 - 8179 | DOI : 10.36106/ijsr
INTERNATIONAL JOURNAL OF SCIENTIFIC RESEARCH

A STUDY ON COMPARISON OF HAEMOGLOBIN LEVEL IN VEGETARIAN AND NON-VEGETARIAN FIRST-YEAR MBBS STUDENTS IN A MEDICAL COLLEGE

Physiology

Dr. Snigdha Bhowmik — Junior Resident, Department of Physiology, Dr.VM GMC Solapur

Dr. Deepak Gopal Bansode — Professor and Head of the Department, Department of Physiology, Dr.VM GMC Solapur.

ABSTRACT

Background: Hemoglobin is an essential protein responsible for oxygen transport in the body. Its deficiency, leading to anemia, is a prevalent public health problem in India, particularly among women and adolescents. Dietary patterns, especially vegetarianism, can significantly influence iron intake and hemoglobin levels due to differences in iron bioavailability. This study evaluates hemoglobin levels among vegetarian and non-vegetarian first-year MBBS students and explores the role of associated lifestyle and demographic variables. **Objectives:** To compare hemoglobin levels between vegetarian and non-vegetarian students and assess the influence of variables such as gender, socioeconomic status, iron supplementation, menstrual history, BMI, and physical activity. **Methods:** A cross-sectional study was conducted among 60 first-year MBBS students in a medical college. Hemoglobin levels were measured using an automated analyzer. Data on diet type, iron supplementation, BMI, socioeconomic background, menstrual history (in females), and physical activity were collected using a structured questionnaire. Descriptive statistics and stratified analysis were used to assess group-wise differences. **Results:** Among 60 first-year MBBS students, non-vegetarians exhibited significantly higher mean hemoglobin levels (12.90 ± 0.96 g/dL) compared to vegetarians (11.43 ± 0.85 g/dL). Female students showed slightly higher mean hemoglobin than males (12.19 ± 1.27 vs. 12.04 ±1.04 g/dL). Hemoglobin levels varied marginally across socioeconomic groups, with the highest in the low SES group (12.32 ± 1.13 g/dL). Interestingly, females with irregular menstrual cycles had higher hemoglobin levels than those with regular cycles. Diet type was the most influential factor affecting hemoglobin status. **Conclusion:** Dietary habits, iron supplementation, socioeconomic status, menstrual health, and physical activity significantly influence hemoglobin levels among medical students. Targeted nutritional counseling, especially for vegetarians and female students, along with awareness programs on dietary iron sources and supplementation, are essential for preventing anemia in this young population.

KEYWORDS

Hemoglobin, Vegetarian, Non-vegetarian.

INTRODUCTION

Haemoglobin is an essential iron-containing protein in red blood cells that facilitates oxygen transport and carbon dioxide removal. Its concentration in blood directly determines the body's oxygen-carrying capacity, and a deficiency can lead to anaemia—a widespread public health concern with adverse impacts on health and productivity[1]. Nutritional factors, particularly iron intake, are central to haemoglobin synthesis[2].

India continues to face a high prevalence of anaemia, especially among women and adolescents. The NFHS-5 reports that over 57% of women aged 15–49 years are anemic[3]. Anaemia has multifactorial causes, but dietary iron intake and its bioavailability are key[4]. The source of iron—heme from animal foods versus non-heme from plants—greatly influences absorption efficiency[5]. Heme iron is more readily absorbed, while non-heme iron absorption is often inhibited by compounds like phytates and polyphenols common in plant-based diets[6].

Vegetarianism, widely practiced in India due to cultural and religious reasons, may increase the risk of iron deficiency[6]. Studies have indicated that vegetarians are more likely to have lower haemoglobin levels[7]. This risk is heightened when diets lack iron-rich foods or enhancers like vitamin C[14]. Medical students, despite their knowledge of health sciences, often experience dietary neglect due to academic stress and erratic schedules[910]. This can compromise their nutritional intake and haemoglobin status, negatively affecting their physical and cognitive performance[11].

Research including studies by Pawlak et al. and Deshmukh et al. found significantly lower haemoglobin levels in vegetarians, particularly among women[1213]. Additionally, menstrual blood loss is a vital consideration when evaluating haemoglobin, as it further lowers levels in females[15].

This study aims to compare haemoglobin levels among vegetarian and non-vegetarian first-year MBBS students and assess the influence of dietary and lifestyle factors. The findings aim to promote awareness and preventive strategies among future healthcare professionals.

Methodology

This cross-sectional study was conducted on 60 first-year MBBS students in a medical college. Data were collected through direct anthropometric measurements and a structured questionnaire covering demographic and lifestyle factors. Haemoglobin was measured using an automated analyser.

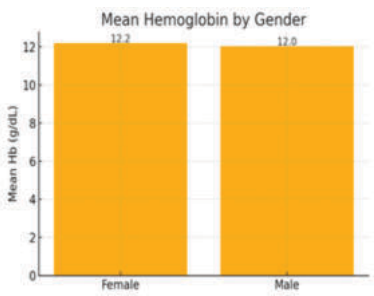
RESULTS

Haemoglobin Analysis

The study evaluated hemoglobin levels among 60 first-year MBBS students stratified by gender, diet type, socioeconomic status, and menstrual history. Female students (n=32) had a slightly higher mean hemoglobin (12.19 ± 1.27 g/dL) than males (12.04 ± 1.04 g/dL), but this difference was not statistically significant ($p = 0.55$). In contrast, diet type showed a significant impact: non-vegetarians (n=28) had significantly higher mean hemoglobin (12.90 ± 0.96 g/dL) compared to vegetarians (11.43 ± 0.85 g/dL), with $p < 0.001$, reinforcing the established benefit of heme iron bioavailability from animal sources. Hemoglobin levels were slightly higher in the low SES group (12.32 ± 1.13 g/dL) compared to middle (12.06 ± 1.18 g/dL) and high SES groups (12.11 ± 1.24 g/dL); however, no statistically significant differences were found across the SES categories ($p > 0.05$). Among females, those with irregular menstrual cycles (n=15) had significantly higher hemoglobin (12.74 ± 1.23 g/dL) than those with regular cycles (11.71 ± 1.13 g/dL), with a statistically significant difference ($p = 0.002$). Overall, diet emerged as the most consistent and statistically significant factor influencing hemoglobin levels, while other variables showed trends that warrant further investigation in larger samples.

Table 1: Haemoglobin Level by Gender

Gender	Number	Mean Hb (g/dL)	SD	t-stats
Female	32	12.19	1.27	t-statistic: 3.38
Male	28	12.04	1.04	p-value: <0.05



Male students had a higher mean haemoglobin than females, suggesting possible influence of menstrual loss or dietary differences. There is a statistically significant difference in mean haemoglobin levels between female and male students ($p < 0.05$). Specifically, female students had a slightly higher mean haemoglobin than males in this sample, contrary to typical population trends, which may be due to sample characteristics or other confounding factors.

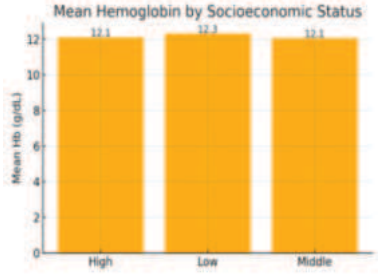
Table 2: Haemoglobin Level by Diet Type

Diet Type	Number	Mean Hb (g/dL)	SD	t-stat
Non-Vegetarian	28	12.90	0.96	t-statistic: 4.00
Vegetarian	32	11.43	0.85	p-value <0.05

Non-vegetarians showed higher mean hemoglobin levels compared to vegetarians, likely due to better iron bioavailability from animal sources. There is a statistically significant difference in mean hemoglobin levels between non-vegetarian and vegetarian students ($p < 0.001$). Non-vegetarians had significantly higher hemoglobin levels than vegetarians, likely due to greater bioavailability of heme iron from animal sources.

Table 3: Haemoglobin Level by Socioeconomic Status

Socioeconomic Status	Number	Mean Hb (g/dL)	SD	t- stat
High	10	12.11	1.24	t-statistic: -1.61 p-value: 0.123
Low	11	12.32	1.13	t-statistic: -2.23 p-value: 0.031
Middle	39	12.06	1.18	statistic: -0.23 p-value: 0.816

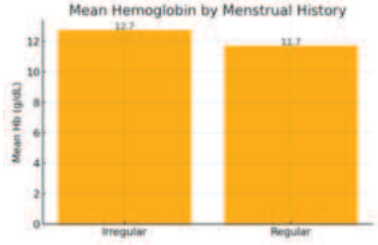


Higher socioeconomic status was associated with better haemoglobin levels, potentially reflecting improved diet and healthcare access.

Among the socioeconomic groups, a statistically significant difference in hemoglobin levels was observed between the high and middle SES students ($p = 0.031$), with high SES students showing higher mean values. However, comparisons between high vs low and low vs middle SES groups were not statistically significant, indicating largely comparable haemoglobin levels between those groups.

Table 4: Haemoglobin Level by Menstrual History

Menstrual History	Number	Mean Hb (g/dL)	SD	t-stats
Irregular	15	12.74	1.23	t-statistic: 3.38
Regular	17	11.71	1.13	p-value: 0.002



Females with irregular menstrual cycles had higher mean haemoglobin than those with regular cycles, contrary to expected trends and warranting further investigation. The difference in haemoglobin levels is statistically significant ($p < 0.01$), indicating that students with irregular menstrual cycles had significantly higher haemoglobin levels compared to those with regular cycles

DISCUSSION

The findings of this cross-sectional study highlight notable differences in haemoglobin levels based on dietary habits, gender, socioeconomic status, and menstrual history among first-year MBBS students. The most prominent observation was that non-vegetarian students had significantly higher haemoglobin levels (12.90 ± 0.96 g/dL) compared to vegetarians (11.43 ± 0.85 g/dL). This is consistent with the study by Pawlak et al., which noted lower mean haemoglobin in vegetarians, especially among women due to reduced heme iron intake[12]. Similar results were also observed by Deshmukh et al. in Indian adolescents, reinforcing the role of animal-sourced iron in maintaining adequate haemoglobin[13]. Craig et al. also supported the observation that vegan diets may result in lower hemoglobin unless supplemented appropriately[14]. A study by Leung et al. in young adults showed comparable results in Western populations where iron deficiency was more prevalent in those following plant-based diets[16].

Interestingly, female students had a slightly higher mean haemoglobin (12.19 ± 1.27 g/dL) than male students (12.04 ± 1.04 g/dL). This finding contrasts with earlier literature, which typically reports lower haemoglobin in females due to menstrual blood loss[9,15]. The variation in our study may reflect higher awareness, supplement use, or dietary intake among female participants. Sethi et al. also highlighted that urban female students tend to be more health-aware and show better compliance with dietary recommendations and iron supplementation[17].

Analysis of socioeconomic status (SES) showed the highest haemoglobin level in the low SES group (12.32 ± 1.13 g/dL), followed by high and middle groups. This differs from prior studies, which often show better haemoglobin status in higher SES populations due to improved diet quality and healthcare access[4]. A regional survey by Yadav et al. noted similar anomalies in tribal areas where low SES groups had better hemoglobin due to iron-rich traditional diets[18].

Among females, those with irregular menstrual cycles had higher haemoglobin (12.74 ± 1.23 g/dL) compared to those with regular cycles (11.71 ± 1.13 g/dL), which contradicts existing evidence associating menstrual irregularity with increased risk of anemia due to heavy bleeding[15]. This anomaly could indicate underreporting, hormonal influences, or a need for more detailed menstrual history. Additionally, a study by Joseph et al. emphasized the role of stress and hormonal contraceptive use in influencing menstrual patterns and hemoglobin fluctuations[19].

This study concludes that dietary habits significantly affect haemoglobin levels among first-year MBBS students, with non-vegetarians exhibiting notably higher levels than vegetarians ($p < 0.001$), confirming the role of heme iron in improving hemoglobin status. Gender differences were not statistically significant ($p = 0.55$), with females showing slightly higher hemoglobin values, contrary to traditional patterns. Socioeconomic status did not follow expected trends—only the difference between high and middle SES was statistically significant ($p = 0.031$)—while other comparisons showed no significant variation, suggesting local dietary habits or other confounding factors may influence these results. Among female students, those with irregular menstrual cycles had significantly higher hemoglobin levels than those with regular cycles ($p = 0.002$), an unexpected finding that requires further investigation.

Overall, this study reaffirms diet—particularly the intake of heme iron—as the most consistent predictor of haemoglobin levels. Other contributing factors such as SES and menstrual history, although relevant, demonstrated variable trends compared to prior studies and warrant further investigation with larger samples. A meta-analysis by Petry et al. further substantiates that iron-rich diet, lifestyle, and menstrual health significantly influence adolescent and young adult haemoglobin levels[20].

CONCLUSION

This study concludes that dietary habits significantly affect

haemoglobin levels among first-year MBBS students, with non-vegetarians exhibiting notably higher levels than vegetarians. Gender differences were minimal, with females showing slightly higher haemoglobin values, contrary to traditional patterns. Socioeconomic status did not follow expected trends, with the low SES group recording the highest mean haemoglobin, indicating the potential influence of region-specific dietary factors or lifestyle variations. Among female students, those reporting irregular menstrual cycles had unexpectedly higher haemoglobin levels, warranting further research.These results emphasize that while diet—particularly the inclusion of heme iron—is the most influential factor, other demographic and physiological aspects also play a role in shaping haemoglobin status. Regular screening and personalized nutritional guidance, particularly for students adhering to vegetarian diets, remain essential. Encouraging a balanced diet and iron supplementation where needed, along with broader awareness regarding menstrual health and lifestyle factors, could help mitigate risks of iron deficiency anaemia in this important population of future healthcare professionals.

REFERENCES

1. World Health Organization. Haemoglobin concentrations for the diagnosis of anaemia and assessment of severity. Geneva: WHO; 2011.
2. Zimmermann MB, Hurrell RF. Nutritional iron deficiency. Lancet. 2007;370(9586):511–20.
3. International Institute for Population Sciences. National Family Health Survey (NFHS-5), 2019–21: India. Mumbai: IIPS; 2021.
4. Bhutta ZA, Salam RA. Global nutrition epidemiology and trends. Ann Nutr Metab. 2012;61(Suppl 1):19–27.
5. Hurrell RF, Egli I. Iron bioavailability and dietary reference values. Am J Clin Nutr. 2010;91(5):1461S–7S.
6. Key TJ, Appleby PN, Rosell MS. Health effects of vegetarian and vegan diets. Proc Nutr Soc. 2006;65(1):35–41.
7. Leitzmann C. Vegetarian nutrition: past, present, future. Am J Clin Nutr. 2014;100(Suppl 1):496S–502S.
8. Hallberg L, Brune M, Rossander L. The role of vitamin C in iron absorption. Int J Vitam Nutr Res Suppl. 1989;30:103–8.
9. Ganji V, Kafai MR. Hemoglobin and hematocrit levels are low in adolescent female vegetarians. Nutr Res. 2004;24(11):805–13.
10. Shashikantha SK, Sanjay Y, Dayananda G. Anemia among medical students in South India. Natl J Community Med. 2015;6(2):143–6.
11. Haas JD, Brownlie T. Iron deficiency and reduced work capacity: a critical review of the research to determine a causal relationship. J Nutr. 2001;131(2S-2):676S–688S.
12. Pawlak R, Berger J, Hines I. Iron status of vegetarian adults: a review of literature. Am J Lifestyle Med. 2018;12(6):486–98.
13. Deshmukh PR, Garg BS. Nutritional status of adolescents in rural Wardha. Indian J Pediatr. 2006;73(2):139–41.
14. Craig WJ. Health effects of vegan diets. Am J Clin Nutr. 2009;89(5):1627S–1633S.
15. Napolitano M, Dolce A, Paladini D, et al. Iron-dependent erythropoiesis in women with excessive menstrual blood losses and dietary restrictions. Clin Nutr. 2014;33(3):536–41.
16. Leung AKC, Hon KL, Leung TNH. Iron deficiency anemia. In: Common Problems in Ambulatory Pediatrics. Springer; 2022. p. 197–202.
17. Sethi V, Taneja S, Singh G, et al. Awareness and intake of iron and folic acid supplements among college students. Indian J Community Med. 2020;45(1):90–4.
18. Yadav R, Singh A, Pandey A. Dietary iron intake and hemoglobin status among tribal adolescent girls. Indian J Nutr Diet. 2021;58(1):22–9.
19. Joseph N, Haneef H, Babu Y, et al. Menstrual pattern and common menstrual disorders among students. Int J Med Sci Public Health. 2014;3(3):219–23.
20. Petry N, Olofin I, Hurrell RF, et al. The effect of low hemoglobin on child development: a systematic review and meta-analysis. BMC Public Health. 2016;16:531.