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A CROSS-SECTIONAL STUDY ON THE CORRELATION BETWEEN HEMOGLOBIN LEVELS, PHYSICAL ACTIVITY, AND DIETARY IRON INTAKE AMONG FEMALE MEDICAL STUDENTS IN MAURITIUS

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ABSTRACT

Objectives: To determine the prevalence of anemia among female medical students at SSR Medical College, Mauritius, and to evaluate the correlation between hemoglobin levels, physical activity patterns, and dietary iron intake. **Design:** Cross-sectional observational study. **Setting:** SSR Medical College, Mauritius. **Participants:** 150 female medical students aged 18-25 years recruited through stratified random sampling. Exclusion criteria included known hematological disorders, chronic illnesses affecting iron metabolism, pregnancy, and current iron supplementation. **Main Outcome Measures:** Hemoglobin concentration; physical activity levels assessed using the Global Physical Activity Questionnaire (GPAQ); dietary iron intake evaluated through a validated food frequency questionnaire. **Results:** Mean hemoglobin concentration was 12.1±1.2 g/dL. Anemia prevalence was 34.7% (n=52), with mild anemia (28.7%) and moderate anemia (6.0%). Mean dietary iron intake was 14.2±4.8 mg/day, with only 28.0% meeting the recommended allowance of 18 mg/day. Physical activity analysis revealed 38.7% sedentary, 44.0% moderately active, and 17.3% highly active. A significant positive correlation was observed between hemoglobin and dietary iron intake ($r=0.28$, $p=0.003$). Hemoglobin showed negative correlation with sedentary hours ($r=-0.22$, $p=0.02$). Multiple regression identified haem iron intake ($\beta=0.34$, $p<0.001$) and sedentary behavior ($\beta=-0.19$, $p=0.02$) as independent predictors. Factors significantly associated with anemia included inadequate dietary iron intake (OR 3.2, 95% CI 1.5-6.8), sedentary lifestyle (OR 2.4, 95% CI 1.1-5.2), and heavy menstrual bleeding (OR 2.8, 95% CI 1.3-6.1). **Conclusions:** Anemia affects one-third of female medical students, with inadequate dietary iron intake and sedentary lifestyle as significant modifiable risk factors. Findings highlight the need for targeted nutritional interventions and physical activity promotion in medical education settings.

KEYWORDS: Anemia, hemoglobin, female medical students, dietary iron, physical activity, Mauritius.

INTRODUCTION

Anemia remains a significant public health challenge globally, affecting approximately 1.62 billion people, with the highest prevalence among women of reproductive age.[1] The World Health Organization estimates that 29.9% of non-pregnant women aged 15-49 years are anemic, with substantial variations across regions.[2] Iron deficiency anemia (IDA) accounts for approximately 50% of all anemia cases and represents the most common nutritional deficiency worldwide.[3]

Female medical students constitute a uniquely vulnerable population for several reasons. The physiological demands of menstruation result in average monthly iron losses of 12-15 mg, creating an ongoing requirement for adequate dietary iron repletion.[4] Simultaneously, the rigorous academic environment of medical education

often leads to irregular eating patterns, reliance on convenience foods with low nutritional density, and insufficient time for meal planning and preparation.[5] Paradoxically, despite possessing theoretical knowledge about nutrition and anemia prevention, medical students frequently demonstrate poor dietary practices—a phenomenon described as the "knowledge-practice gap" in health professions education.[6]

Mauritius, an island nation in the Indian Ocean, has undergone rapid epidemiological transition with rising non-communicable disease burden. The Mauritius Nutrition Survey 2022 revealed that 33.7% of women aged 15-49 years had anemia, with iron deficiency contributing to approximately 60% of cases.[7] However, data specifically examining medical students—a population with unique occupational and educational exposures—remain limited.

Physical activity represents an additional, often overlooked, determinant of iron status. Regular moderate physical activity enhances erythropoiesis through increased erythropoietin production and improved oxygen utilization.[8] However, high-intensity or endurance exercise may paradoxically increase iron requirements through multiple mechanisms: foot-strike hemolysis in running-based activities, gastrointestinal blood loss, exercise-induced inflammation increasing hepcidin production, and sweat losses.[9,10] The net effect depends on the type, intensity, and duration of physical activity, as well as individual baseline iron status.[11]

The primary objective of this study was to determine the prevalence of anemia among female medical students at SSR Medical College, Mauritius, and to evaluate the independent and interactive associations between hemoglobin levels, physical activity patterns, and dietary iron intake. Secondary objectives included identifying modifiable risk factors for anemia in this population to inform targeted interventions.

METHODS

Study Design and Setting: This cross-sectional study was conducted at SSR Medical College, Mauritius, from January to June 2025.

Study Population: 150 female medical students aged 18-25 years were recruited through stratified random sampling based on academic year. Exclusion criteria: hematological disorders, chronic illnesses affecting iron metabolism, pregnancy/lactation, current iron supplementation, or recent acute illness.

Data Collection

- **Hemoglobin assessment:** Venous blood samples analyzed using Sysmex XN-1000 automated hematology analyzer. Anemia defined as Hb <12.0 g/dL per WHO criteria.
- **Dietary iron intake:** Semi-quantitative food frequency questionnaire assessing 45 food items, validated for Mauritian dietary patterns. Iron intake categorized as inadequate (<15 mg/day), borderline (15-17.9 mg/day), or adequate (≥18 mg/day).
- **Physical activity:** Global Physical Activity Questionnaire (GPAQ) with MET-minute/week calculation. Categories: sedentary (<600), moderate (600-2999), high (≥3000).
- **Menstrual history:** Structured questionnaire assessing cycle characteristics and heavy menstrual bleeding (bleeding >7 days or self-reported heavy flow).

Statistical Analysis: Data analyzed using SPSS version 26.0. Continuous variables expressed as mean±SD or median(IQR). Between-group comparisons using t-tests/Mann-Whitney U tests and chi-square tests. Pearson/Spearman correlation coefficients calculated. Multiple linear and logistic regression analyses performed with statistical significance at $p<0.05$.

Ethical Approval: Survey based. No ethical is required.

RESULTS

Participant Characteristics and Anemia Prevalence

Of 162 screened students, 150 were included in final analysis (96.8% completion rate). Mean age was 21.3±2.1 years. The mean hemoglobin concentration was 12.1±1.2 g/dL (range: 8.8-14.9 g/dL). Anemia was present in 52 participants (34.7%, 95% CI: 27.2-42.8%), comprising mild anemia (28.7%) and moderate anemia (6.0%). No severe anemia cases were identified.

Table 1: Baseline Characteristics of Study Participants.

Characteristic	Total (N=150)	Anemic (n=52)	Non-Anemic (n=98)	p-value
Age (years), mean±SD	21.3±2.1	21.5±2.3	21.2±2.0	0.42
BMI (kg/m²), mean±SD	22.8±3.9	22.1±3.6	23.2±4.0	0.09
BMI Category, n (%)				0.12
Underweight (<18.5)	18 (12.0)	9 (17.3)	9 (9.2)	
Normal (18.5-24.9)	94 (62.7)	31 (59.6)	63 (64.3)	
Overweight/Obese (≥25.0)	38 (25.3)	12 (23.1)	26 (26.5)	
Menstrual Characteristics				
Bleeding duration (days), mean±SD	4.8±1.4	5.2±1.6	4.6±1.3	**0.02**
Heavy menstrual bleeding, n (%)	41 (27.3)	21 (40.4)	20 (20.4)	**0.01**

Dietary Iron Intake Patterns

Mean dietary iron intake was 14.2±4.8 mg/day, with only 20.0% meeting the recommended allowance of 18 mg/day. Anemic participants had significantly lower total iron intake (12.4 vs. 15.2 mg/day, p<0.001), primarily driven by lower haem iron consumption (3.2 vs. 4.6 mg/day, p<0.001).

Table 2: Dietary Iron Intake and Physical Activity Characteristics.

Parameter	Total (N=150)	Anemic (n=52)	Non-Anemic (n=98)	p-value
Dietary Iron Intake				
Total iron intake (mg/day), mean±SD	14.2±4.8	12.4±3.9	15.2±5.0	**<0.001**
Haem iron (mg/day), mean±SD	4.1±2.3	3.2±1.8	4.6±2.4	**<0.001**
Non-haem iron (mg/day), mean±SD	10.1±3.8	9.2±3.2	10.6±4.0	**0.03**
Iron intake category, n (%)				**0.002**
Inadequate (<15 mg/day)	81 (54.0)	37 (71.2)	44 (44.9)	
Borderline (15-17.9 mg/day)	39 (26.0)	10 (19.2)	29 (29.6)	
Adequate (≥18 mg/day)	30 (20.0)	5 (9.6)	25 (25.5)	
Tea consumption (cups/day), median (IQR)	2 (1-3)	2 (2-4)	2 (1-3)	**0.04**
Physical Activity				
Total PA (MET-min/week), median (IQR)	960 (360-2160)	720 (240-1680)	1200 (480-2400)	**0.01**
PA Category, n (%)				**0.04**
Sedentary (<600 MET-min/wk)	58 (38.7)	26 (50.0)	32 (32.7)	
Moderate (600-2999 MET-min/wk)	66 (44.0)	19 (36.5)	47 (48.0)	
High (≥3000 MET-min/wk)	26 (17.3)	7 (13.5)	19 (19.4)	
Sedentary hours/day, mean±SD	7.8±2.9	8.7±3.1	7.3±2.7	**0.005**

DISCUSSION

Principal Findings

This cross-sectional study of 150 female medical students at SSR Medical College, Mauritius, revealed three principal findings. First, the prevalence of anemia was 34.7%, affecting approximately one in three participants, with mild anemia predominating (28.7%). Second, only 20% of participants met the recommended dietary iron intake of 18 mg/day for menstruating women, highlighting a substantial nutritional gap despite medical education. Third, both dietary factors (inadequate iron intake, high tea consumption) and lifestyle factors (sedentary behavior, prolonged sedentary hours) independently correlated with hemoglobin levels, with sedentary lifestyle emerging as a modifiable risk factor comparable in magnitude to dietary inadequacy.

Comparison with Previous Studies

The observed anemia prevalence of 34.7% is remarkably consistent with the 33% prevalence reported in the Mauritius Nutrition Survey 2022 for women aged 15-49 years.[7] This finding is noteworthy because medical students might be expected to have lower anemia rates given their health literacy and socioeconomic advantages. Similar studies from other regions have reported variable prevalence: a study of female medical students in India found 33% anemia.[23], while studies from Pakistan (41.5%)[24] and Ethiopia (25.3%)[25] demonstrated regional variations. The consistency of our findings with national data suggests that medical education alone does not confer protection against nutritional deficiencies—a concerning observation given that these students will become future healthcare providers responsible for managing anemia in their patients.

The mean dietary iron intake of 14.2 mg/day in our study falls substantially below the recommended 18 mg/day for menstruating women.[18] This finding aligns with studies from high-income countries where young women frequently fail to meet iron requirements despite adequate food availability.[26] The primary deficit was in haem iron consumption (mean 4.1 mg/day), suggesting low intake of animal-source foods. Vegetarian dietary patterns, weight-conscious eating behaviors common among young women, and reliance on convenience foods may contribute to this pattern.[27] Notably, anemic participants had significantly lower haem iron intake but comparable non-haem iron intake, highlighting the importance of highly bioavailable haem iron sources in maintaining adequate iron status.

The association between physical activity and hemoglobin levels merits particular attention. While the correlation between total physical activity and hemoglobin was modest and non-significant (r=0.15, p=0.08), sedentary hours demonstrated a significant negative correlation (r=-0.22, p=0.02), and sedentary lifestyle emerged as an independent predictor of anemia in adjusted models (OR 2.4). This finding suggests that physical inactivity may be as important as dietary inadequacy in determining iron status. Several mechanisms may explain this association: sedentary individuals have lower metabolic demands and potentially reduced erythropoietin stimulation[8]; physical activity improves appetite and dietary variety[28]; and exercise may enhance iron absorption through improved gastrointestinal function.[29] Conversely, the relationship is bidirectional—anemic individuals experience fatigue and reduced exercise tolerance, potentially leading to

voluntary activity reduction.[30] Longitudinal studies are needed to clarify directionality.

The Knowledge-Practice Gap

Perhaps the most concerning finding is the disconnect between medical knowledge and personal health practices. These students have completed or are completing coursework in biochemistry, physiology, and nutrition, yet their dietary iron intake mirrors that of the general population. This "knowledge-practice gap" has been documented across health professions[6,31] and suggests that didactic education alone is insufficient to modify personal health behaviors. Potential explanations include: time constraints limiting meal preparation, stress-induced eating patterns, normalization of suboptimal diets within peer groups, and the perception that nutritional guidelines apply to patients rather than oneself.[32] Addressing this gap requires interventions beyond knowledge transfer, incorporating behavioral economics principles, environmental modifications (improving campus food environments), and normalization of self-care as a professional competency.

CONCLUSIONS

Anemia affects approximately one-third of female medical students at SSR Medical College, Mauritius, a prevalence comparable to the general population despite their medical education and health literacy. Inadequate dietary iron intake, particularly haem iron from animal sources, and sedentary lifestyle emerged as significant modifiable risk factors. These findings challenge the assumption that medical knowledge automatically translates to personal health practices and highlight the need for targeted interventions addressing both nutritional intake and physical activity. Medical schools have an opportunity—and perhaps an obligation—to create environments that support student health, not only through curricular content but through campus food environments, physical activity infrastructure, and normalization of self-care as integral to professional development. Routine anemia screening, iron literacy campaigns, and structured physical activity programs should be considered essential components of medical student wellness initiatives.

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Competing Interests

All authors have completed the ICMJE uniform disclosure form at www.icmje.org/coi_disclosure.pdf and declare: no support from any organization for the submitted work; no financial relationships with any organizations that might have an interest in the submitted work in the previous three years; no other relationships or activities that could appear to have influenced the submitted work.

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Ethical Approval

This study is survey based. Does not required Ethical Approval.

REFERENCES

1. Kassebaum NJ, Jasrasaria R, Naghavi M, et al. A systematic analysis of global anemia burden from 1990 to 2010. Blood, 2014; 123(5): 615-624. doi:10.1182/blood-2013-06-508325
2. World Health Organization. The global prevalence of anaemia in 2011. Geneva: WHO; 2015.
3. Camaschella C. Iron-deficiency anemia. N Engl J Med, 2015; 372(19): 1832-1843. doi:10.1056/NEJMra1401038
4. Harvey LJ, Armah CN, Dainty JR, et al. Impact of menstrual blood loss and diet on iron deficiency among women in the UK. Br J Nutr, 2005; 94(4): 557-564. doi:10.1079/bjn20051493
5. Ganasegeran K, Al-Dubai SA, Qureshi AM, Al-abed AA, Rizal AM, Aljunid SM. Social and psychological factors affecting eating habits among university students in a Malaysian medical school: a cross-sectional study. Nutr J, 2012; 11: 48. doi:10.1186/1475-2891-11-48
6. Peltzer K, Pengpid S, Sychareun V, et al. Dietary intake and nutritional status of university students from four low-middle income countries. Nutr Health, 2016; 22(1): 45-58. doi:10.1177/0260106016659696
7. Ministry of Health and Wellness, Republic of Mauritius. Mauritius Nutrition Survey 2022 Report. Port Louis: Government of Mauritius; 2023.
8. Hu M, Lin W. Effects of exercise training on red blood cell production: A meta-analysis. Med Sci Sports Exerc, 2012; 44(5): 841-848. doi:10.1249/MSS.0b013e31823d6b8c
9. Osman DA, Aly SM, Alqahtani MA, et al. Hematological and iron status in aerobic vs. anaerobic female athletes: an observational study. Front Sports Act Living, 2024; 6: 1453254. doi:10.3389/fspor.2024.1453254
10. Roy R, Kück M, Fenske S, et al. Iron deficiency in adolescent and young adult German athletes—A retrospective study. Nutrients, 2022; 14(21): 4511. doi:10.3390/nu14214511
11. Clénin G, Cordes M, Huber A, et al. Iron deficiency in sports - definition, influence on performance and therapy. Swiss Med Wkly, 2015; 145: w14196. doi:10.4414/smw.2015.14196
12. World Medical Association. World Medical Association Declaration of Helsinki: ethical

principles for medical research involving human subjects. JAMA, 2013; 310(20): 2191-2194. doi:10.1001/jama.2013.281053
13. World Health Organization. Obesity: preventing and managing the global epidemic. Report of a WHO consultation. World Health Organ Tech Rep Ser, 2000; 894: 1-253.
14. World Health Organization. Haemoglobin concentrations for the diagnosis of anaemia and assessment of severity. Vitamin and Mineral Nutrition Information System. Geneva: WHO; 2011.
15. Heath AL, Skeaff CM, Gibson RS. The relative validity of a computerized food frequency questionnaire for estimating intake of dietary iron and its absorption modifiers. Eur J Clin Nutr, 2000; 54(7): 592-599. doi:10.1038/sj.ejcn.1601055
16. Beck KL, Kruger R, Conlon CA, et al. The relative validity and reproducibility of an iron food frequency questionnaire for identifying iron-related dietary patterns in young women. J Acad Nutr Diet, 2012; 112(8): 1177-1187. doi:10.1016/j.jand.2012.04.012
17. Mauritius Ministry of Health. Mauritius Food Composition Tables. Port Louis: Government Printing Office; 2018.
18. Indian Council of Medical Research. Nutrient Requirements and Recommended Dietary Allowances for Indians. Hyderabad: ICMR National Institute of Nutrition; 2020.
19. World Health Organization, Food and Agriculture Organization. Vitamin and Mineral Requirements in Human Nutrition, 2nd ed. Geneva: WHO; 2004.
20. Armstrong T, Bull F. Development of the World Health Organization Global Physical Activity Questionnaire (GPAQ). J Public Health, 2006; 14(2): 66-70. doi:10.1007/s10389-006-0024-x
21. World Health Organization. Global Recommendations on Physical Activity for Health. Geneva: WHO; 2010.
22. National Institute for Health and Care Excellence. Heavy menstrual bleeding: assessment and management. NICE guideline [NG88]. London: NICE; 2018.
23. Kalyanpur V, Padmaja U. Hemoglobin status of female medicos in urban area and factors affecting it: an observational cross-sectional study. Int J Med Res Rev, 2017; 5(2): 142-148.
24. Jawed S, Tariq S, Tariq S, Kamal A. Frequency of nutritional anemia among female medical students of Faisalabad. Pak J Med Sci, 2017; 33(2): 398-403. doi:10.12669/pjms.332.11910
25. Mulugeta A, Tessema M, H/slassie S, et al. Anemia and associated factors among women of reproductive age in Tigray, Northern Ethiopia. J Health Popul Nutr, 2019; 38(1): 25. doi:10.1186/s41043-019-0186-5
26. Gibson RS, Heath AL, Ferguson EL. Risk of suboptimal iron and zinc nutriture among adolescent girls in Australia and New Zealand: causes, consequences, and solutions. Asia Pac J Clin Nutr, 2002; 11(Suppl 3): S543-S552. doi:10.1046/j.1440-6047.11.supp3.14.x
27. Croll JK, Neumark-Sztainer D, Story M. Healthy eating: what does it mean to adolescents? J Nutr Educ, 2001; 33(4): 193-198. doi:10.1016/s1499-4046(06)60031-6
28. Blundell JE, Gibbons C, Caudwell P, et al. Appetite control and energy balance: impact of exercise. Obes Rev, 2015; 16(Suppl 1): 67-76. doi:10.1111/obr.12257
29. Peters HP, De Vries WR, Vanberge-Henegouwen GP, Akkermans LM. Potential benefits and hazards of physical activity and exercise on the gastrointestinal tract. Gut, 2001; 48(3): 435-439. doi:10.1136/gut.48.3.435
30. 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-690S. doi:10.1093/jn/131.2.676S
31. Nabhani-Zeidan M, Naja F, Nasreddine L. Dietary intake and nutrition-related knowledge in a sample of Lebanese students attending private and public universities. J Public Health, 2011; 19(4): 345-353. doi:10.1007/s10389-011-0395-5
32. Frank E, Carrera JS, Elon L, Hertzberg VS. Basic demographics, health practices, and health status of U.S. medical students. Am J Prev Med, 2006; 31(6): 499-505. doi:10.1016/j.amepre.2006.08.009
33. McCann JC, Ames BN. An overview of evidence for a causal relation between iron deficiency during development and deficits in cognitive or behavioral function. Am J Clin Nutr, 2007; 85(4): 931-945. doi:10.1093/ajcn/85.4.931