

A Cross-sectional Study of Anemia Among Medical Students and its Impact on Learning, Physical and Emotional Well-being

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Abstract

Objective: To measure the prevalence of anemia and its effect on physical activity, learning skills and social, emotional impact in medical students.

Background: Anemia is a general health issue which severely affects young adults during an intense growth period. The vast nature of medical curriculum demands hard efforts and hectic study schedule medical students at risk of anemia due to irregular eating habits which affects their learning skills and physical activity.

Methodology: A cross-sectional study was conducted among medical students (1st year and 2nd year) of Hazrat Bari Sarkar (HBS) Medical College, Islamabad, by administering a structured questionnaire. This was a year study from August 2023 to July 2024. Data was collected using a structured questionnaire, along with venous blood samples. An automated hematology analyzer located in the Department of Pathology was used to measure hemoglobin. Data Analysis was performed by appropriate statistical tests, and statistical significance was set at P-values <0.05.

Conclusion: More than half the students in our medical school were anemic and had a negative impact on their learning, physical and social well-being. This could possibly be due to their poor eating habits. The memory and academic performance of students can be improved by correction of anemia.

Keywords: Anemia, Hemoglobin, Iron Deficiency, Medical Students, Physical Activity.

Conflict of Interest: None

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Introduction

Anemia worldwide, is mostly due to iron deficiency, seen as microcytic and hypochromic red cells in a peripheral smear.¹ Anemia is a general health issue for almost all groups of ages but severely affects young people mostly in the second decade of life during an intense growth period.^{2,3,4} The condition leads to impaired energy levels, impaired body immune system, increased disease conditions, especially during pregnancy as well in children. As a risk factor, the low socioeconomic conditions can lead to nutritional anemia in all ages. but specifically among small children. Worldwide the incidence is reported at 24.8% (of world

population) with high prevalence in females and preschool children.³

The iron deficiency anemia leads to chronic fatigue, diminished well-being, and impaired cognitive function.⁴ The incidence is increased among young adults and pregnant women due to increased physiological requirements and reduced iron intake. The other causes may include chronic blood loss and poor absorption from the intestine.⁵ The key etiological factors that are accountable for iron deficiency anemia include age, sex, dietary deficiencies, social class, blood loss through menstrual, and stress.^{6,7}

The current study aims to determine the hemoglobin status in young adult medical undergraduate students of age between 19 to 22 years. This age group is vulnerable in both genders for dietary deficiencies as there is increased physiological need of micronutrients including iron. We also elucidate the association of anemia with BMI.

Methodology

Study design, setting and sampling strategy

This is a simple cross-sectional study conducted by a questionnaire, administered to undergraduate medical students of MBBS 1st and MBBS 2nd year male, and female students of HBS Medical College from August 2023 to September 2024. The approval to conduct this study was obtained from the institutional ethical board (IREB HBS Medical and Dental College Islamabad). All undergraduate medical students of MBBS 1st year and MBBS 2nd year students were recruited after obtaining their informed written consent. A sample size of 70 was chosen for this investigation based on a computation made with Epi Info™ Version 7. A reduced sample size was selected to comply with the logistical and practical limitations of the study, even though the optimal sample size calculated was 158 by utilizing a 95% confidence level and 5% margin of error. The choice was selected with the resources at hand, time restrictions in mind, and the simplicity of fitting the research into the academic calendar in mind. We made sure the sample remained typical of the population by using simple random sampling throughout the lectures, so even with a smaller sample size, the validity of our findings was maintained.

Data and sample collection

Demographic and other relevant data were collected using a pre-designed questionnaire. Then, about 3ml of venous blood was obtained from the same students by venipuncture into an EDTA tube under aseptic conditions. The Hemoglobin level was measured using automated analyser in Department of pathology, HBS Medical Hospital, Islamabad).

Estimation of Hemoglobin (Hb)

Hemoglobin (Hb) concentration was measured using Hematology Analyzer, model Sysmex XP-100 (Sysmex Corporation, Kobe, Japan)." at the Laboratory of HBS Medical Hospital, Islamabad. If the Hb concentration was less than the cut-off points recommended by the World Health Organization (WHO); namely, 13.0 g/dL for adult males and 12.0 g/dL for adult non-pregnant females, the subject was labelled as anemic.

Statistical Methods

To analyze research data IBM SPSS v.20 was used. The data of 70 participants (20 males and 50 female students of (MBBS^{1st} year and MBBS^{2nd} year) were analyzed by descriptive and inferential statistics. The symptoms were compared with gender, age and hostel/day scholar status of participants. Significance (p-value) was measure for each statement in males and females. To compare the symptoms with gender, chi-square test was performed. Statistical significance was considered at P-value < 0.05.

Results

Participant Characteristics

Based on hemoglobin levels we classified the enrolled medical students into anemic and control (normal) groups. The anemic and controls were further classified on the basis of age between 19 years to 22 years. To answer the question of whether anemia is common in day scholars or hostel students we also divided all the participants into hostlers and days Scholars.

Factors associated with Anemia

A detailed questionnaire was constructed to investigate the effects of anemia such as general health, psychological well-being, physical effects and the anemia impact on academic performance. To have such information we designed total of fourteen questions and calculated the p-value to have a significance level (Table 2).

Prevalence of anemia in medical students:

Shows that anemia was prevalent among 45(64.28%) out of 70 students medical students. Out of 45 anemic students, 32 were female and 13 were male anemic students. Among anemic's maximum number (n=20) belong to the 19-year-old of age group. Analysis of all the information are provided in Table 2.

Demographic details:

In the current study, we enrolled a total of 70 medical students including 20 males and 50 females of HBS Medical College Islamabad, as shown in Table (1). Total anemic (males and females) was 45 while non-anemic (control) was 25. All the students belong to the age group between 18 years and 21 years age group. The mean±standard deviation hemoglobin (Hb) concentration for anemic and control students is 10.07±1.02 (g/dl) and 13.72±1.80 (g/dl). Most students n=52 (73 %) of enrolled students were day scholars living with their parents and siblings. Table (1) shows that anemia among medical students at HBS Medical Dental College, Islamabad was not significantly associated with age, gender, and residential status with p-values of 0.9370, 0.1790, and 0.9040 consecutively.

Table 1: Demographic Information.

Factors	Category	Group		Statistical Analysis (<i>p</i> -value)
		Control	Anemic	
Gender	Male	7	13	<i>p</i> > 0.05
	Female	18	32	
Age	18 Years	7	15	<i>p</i> > 0.05
	19 Years	3	20	
	20 Years	9	17	
	21 Years	6	3	
Residential Status	Hostler	7	12	<i>p</i> > 0.05
	Day Scholar	18	33	

Effect of anemia on general health:

The data analysis revealed significant findings in the students with low hemoglobin levels (anemic) suffer more fatigue compared to the control. A further positive correlation is observed in anemic group and physical activity (*P* value 0.00). Anemics suffer from tachycardia during simple physical activity. Another significant correlation (*p* value 0.005) is observed when anemics were asked if they suffer or find it hard to retain information or recall during exams. Interestingly, the anemic group experiences emotional impact as well with

mood swings significantly higher than a control group with a significant value (*p*-value 0.002). We hypothesized that anemics need more breaks or rest periods during study because that overly exhaust in routine activity. No correlations were observed in all these questions (Table 2). We further noticed that anemia does not affect students' fatigue or low energy during the study, their academic performance, and interest in classroom discussions.

Statement	Response Type	Group		<i>P</i> -value
		Control	Anemic	
Have you been experiencing fatigue or Weakness during the day?	No	14	9	<i>p</i> < 0.05
	Yes	9	17	
	Sometimes	2	19	
Do you require more breaks or rest periods during study sessions?	No	9	15	<i>p</i> < 0.05
	Yes	16	20	
	Sometimes	0	10	
Do you find it harder to retain information or recall it during exams?	No	14	21	<i>p</i> < 0.05
	Yes	11	10	
	Sometimes	0	14	
Do you experience shortness of breath or rapid heart rate during physical activities?	No	14	5	<i>p</i> < 0.05
	Yes	11	10	

	Sometimes	0	30	
Are you able to complete routine tasks without feeling overly exhausted?	No	9	5	<i>p</i> < 0.05
	Yes	16	19	
	Sometimes	0	21	
Has anemia affected your ability to work, study, or engage in hobbies?	No	12	11	<i>p</i> < 0.05
	Yes	4	8	
	Sometimes	9	1	
Have you experienced or going through any social or emotional impact?	No	18	4	<i>p</i> < 0.05
	Yes	7	14	
	Sometimes	0	2	
Do you need assistance or modification to carry out tasks that required physical exertion?	No	20	26	<i>p</i> > 0.05
	Yes	2	4	
	Sometimes	3	15	
Do you engage in regular physical activity. Kindly mentioned you work out duration daily.	No	12	11	<i>p</i> > 0.05
	Yes	7	4	
	Sometimes	6	14	
Have you experienced or going through any social or emotional problem?	No	12	10	<i>p</i> > 0.05
	Yes	13	10	
Do you experience fatigue or low energy during class or while studying	No	10	11	<i>p</i> > 0.05
	Yes	15	27	
	Sometimes	0	7	
Have you noticed any changes in your academic performance, such as a decrease in grades or difficulty concentrating?	No	14	3	<i>p</i> > 0.05
	Yes	5	4	
	Sometimes	6	3	

Discussion

Anemia is regarded as a public health condition that impacts both developed and developing countries. It not only affects human physical health but also social and economic life.^{2,3,8} In an earlier study from Pakistan it is reported that 29.6% of non-pregnant and 36.5% of pregnant females suffer from anemia. Another study conducted on students from a remote area of Pakistan revealed that 58.8% of males and 70.0% of females were anemic.⁹ The school-going age in males, as well as

females, is an important period of physical and mental growth and also a key period for acquiring new knowledge. Prolonged iron deficiency diet or poor bioavailability and requirement of iron rich diet during development and pregnancy are main factors. The iron losses resulting from excessive menstruation and worm infestations can also contribute to anemia.¹⁰

School-going age is very important age in terms of physical and mental growth, development and acquiring new knowledge. It can lead to irreversible learning loss for young students specifically 10–14 year age group and a primary cause of loss of disability-adjusted life.¹¹

In this questionnaire-based study in medical students, we intended to estimate the prevalence of anemia and its effect on student learning, and physical and cognitive health. According to demographic data greater number of participants in the current study revealed mild or severe anemia (68.28%). Morphologically it appeared to be microcytic hypochromic anemia probably due to an iron deficiency diet. Similar findings were reported by Pandey S and colleagues.¹² We further observed that the occurrence of anemia is higher in females (n=32) compared to males (n=13). These findings are similar to those reported earlier in an Indian study.¹³

Furthermore, our results extend previously reported findings regarding depression and physical activity among anemic.¹⁶ We also observed less and short physical activity (p -value 0.002) or shortness of breath or mild tachycardia ($p=0.001$) and social or emotional impact ($p=0.002$). We also found a positive correlation when estimating students who feel overly exhausted in routine physical tasks ($p=0.01$). In the current we observed no correlation between anemia and classroom study-related tasks or mental exertion ($p=0.13$) or whether students suffer fatigue or low energy while studying ($p=0.07$). These results also supported by a recent study.¹⁴

Clinicians should recommend more physical activity, for any acceptable duration to patients with depression and anemia. Large demographic studies are required to stratify depression and anemia by severity in our population.

It is suggested that health professionals should recommend Iron iron-rich diet and mild physical activity for a shorter duration of time to improve the physical activity among anemic. Further study is needed to stratify depression or social issues due to anemia in a larger cohort. Our study has a few limitations such as due to a low study sample we cannot recommend physical activity, and also could not exclude the potential effect of a recent pandemic. We used self-reported answers to questionnaires to quantify physical activity rather than using objective accelerometer recordings, which is also one limitation to our study. Also, subjective recall of physical activity variance by anemia status, cannot be clarified. Studies in a large cohort with exact hemoglobin levels among females and males, calculated type and time of physical activity, the exact type of social and mental conditions, and participation in the level of classroom activity can produce more dependable and quality results.

Conclusion

More than half of the students in our medical school were anemic and had a negative impact on their learning, physical and social well-being. Possibly Due to vast curriculum and hectic study routine, the medical students follow irregular eating habits and consume junk foods. There is a dire need for creating awareness of eating a healthy diet and adopting a healthy lifestyle. Treatment of anemia could significantly improve the memory and academic performance of students.

References

1. Warner MJ, Kamran MT. Iron Deficiency Anemia. [Updated 2023 Aug 7]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2024 Jan-. Available from: <https://www.ncbi.nlm.nih.gov/books/NBK448065/>
2. World Health Organization. The World Health Report 2002: reducing risks, promoting healthy life. Geneva: WHO; 2002.
3. De Benoist B, Cogswell M, Egli I, McLean E. Worldwide prevalence of anaemia 1993-2005; WHO Global Database on Anaemia. Geneva: WHO; 2008.
4. Manjula V, Parameshwari P, Pothen L, Sobha A. Prevalence of anemia among female undergraduate students of Government Medical College Kottayam, Kerala. *Int J Med Health Sci.* 2014;3(2):133-8. Google Scholar
5. Camaschella C. New insights into iron deficiency and iron deficiency anemia. *Blood Rev.* 2017 Jul 1; 31(4):225-33.
6. WHO. Global nutrition targets 2025: Anemia policy brief. (WHO/NMH/NHD/14.4). Geneva: 2014; World Health Organization.
7. Shams S, Asheri H, Kianmehr A, Ziaee V, Koochakzadeh L, Monajemzadeh M, et al. The prevalence of iron deficiency anemia in female medical students in Tehran. *Singapore Med J.* 2010;51:116
8. Mehta K. Prevalence of nutritional anemia among college students and its correlation with their body mass index. *Int J Sci Res.* 2015;4:1882-1886.
9. Mazhar S. Prevalence of anemia and dietary iron intake among female adolescents (grade 8-12) in Lahore. *Journal of the Dow University of*

Health Sciences (JDUHS). 2015 Dec 28;9(3):99-105.

10. Amaha ND. Ethiopian progress towards achieving the global nutrition targets of 2025: analysis of sub-national trends and progress inequalities. BMC Research Notes. 2020 Dec;13:1-5.
11. World Health Organization. Global accelerated action for the health of adolescents (AA-HA!): Guidance to support country implementation. World Health Organization; 2023 Oct 11.
12. Pandey S, Singh A. A cross-sectional study of nutritional anemia among medical students in a medical college, at Bilaspur, Chhattisgarh. National journal of medical research. 2013;3(02):143-6.
13. Verma M, Chhatwal J, Kaur G. Prevalence of anemia among urban school children of Punjab. Indian Pediatrics. 1998 Dec 1;35(12):1181-6.
14. Nam HK, Park J, Cho SI. Association between depression, anemia and physical activity using isotemporal substitution analysis. BMC Public Health. 2023 Nov 13;23(1):2236.

Authors Contribution:

^{1,6}Substantial contributions to the conception or design of the work;

^{2,3,4,5}the acquisition, analysis, or interpretation of data for the work & Final approval of the version to be published

^{1,5,6} Drafting the work or revising it critically for important intellectual content.