Biological and Clinical Sciences Research Journal
eISSN: 2708-2261; pISSN: 2958-4728
www.bcsrj.com
DOI: https://doi.org/10.54112/bcsrj.v2024i1.1019
*Biol. Clin. Sci. Res. J., Volume, **2024**: 1019*
Original Research Article

PREVALENCE OF IRON DEFICIENCY ANEMIA AND ITS RISK FACTORS AMONG NURSING STUDENTS IN NURSING COLLEGE OF HYDERABAD

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(Received, 09th July 2024, Revised 02nd August 2024, Published 05th August 2024)

Abstract: *Teens can have nutritional anemia by not getting enough iron, folate, or vitamin B1. Although many other nutritional anemia types can manifest, iron deficiency anemia is the most prevalent.* ***Objective:*** *The study aims to discover the prevalence of anemia and its risk factors among nursing students in the nursing college of Hyderabad.* ***Methods:*** *This cross-sectional study investigated the prevalence of iron deficiency anemia and associated risk factors among nursing students at the Nursing College of Hyderabad. It was conducted from March 15, 2024, until June 29, 2024. In a sterile environment, each subject had blood drawn by certified phlebotomists. Several hematological indicators were measured throughout the examination, including hemoglobin (Hb), serum ferritin, serum iron, total iron-binding capacity (TIBC), and transferrin saturation.* ***Results:*** *The overall frequency of iron deficiency anemia (IDA) was 42.0% among the students, with 215 individuals confirmed to be anemic. Of these pupils, 103 were male, and 112 were female, for 52.1%. The research discovered robust associations among college students between iron deficiency anemia (IDA) and several lifestyle and nutritional factors. Iron deficiency anemia (IDA) was statistically related to less consistent breakfast eating; 62.8% of IDA students reported this, compared to 37.2% of students who reported regular breakfast consumption. This correlation was statistically significant, with a p-value of 0.012. Furthermore, there was a notable correlation between the intake of vegetables and fruits and the occurrence of IDA (p = 0.03).* ***Conclusion:*** *The study discovered that 42.0% of apparently healthy young nursing students in the sample had iron deficiency anemia (IDA). The study also found that insufficient iron intake, frequent tea drinking, frequent consumption of red meat, and a previous history of iron deficiency anemia were the top risk factors for developing anemia.*

Keywords: Anemia, College Students, Lifestyle, Iron Deficiency Anemia, Hyderabad

Introduction

Teens can have nutritional anemia by not getting enough iron, folate, or vitamin B12 (1). Although many other nutritional anemia types can manifest, iron deficiency anemia is the most prevalent. (2–4). To diagnose iron deficiency anemia (IDA), a battery of tests is run, including hemoglobin, serum ferritin, transferrin receptors, zinc protoporphyrin, transferrin saturation/total iron binding capacity, and others (5,6). The most prevalent description of anemia is low blood hemoglobin levels, often below 120 g/l in teens. (7).

Inadequate iron intake, excessive blood loss, poor iron absorption, and chronic health issues such as inflammation and end-stage renal disease are the leading causes of IDA. (8). Some other significant factors that might lead to iron deficiency anemia (IDA) include following a vegetarian diet, heavy periods, angiodysplasia, cancer, gastrointestinal bleeding from stomach ulcers, frequent blood donations, and heavy menstruation. (9). Research has shown that IDA has psychosocial repercussions. Mental illnesses such as anxiety, depression, bipolar disorder, insomnia, and restless legs syndrome are included among these, along with poor psychomotor function and a diminished capacity to work. (10,11). On the other hand, some researchers have failed to find any link between IDA and psychotic disorders. (12,13).

Otherwise, IDA is clinically silent; only in moderate to severe anemia instances do its significant clinical features become apparent. Atrophic glossitis, cheilitis, lightheadedness, dry mouth, lightheadedness, Plummer-Vinson syndrome, restless legs, and lethargy are common long-term deficient symptoms. (10,11). Laboratory tests can be used to confirm IDA. These tests measure serum ferritin, total iron binding capacity (TIBC), and transferrin saturation. If your serum ferritin level is low, it means your body is not making enough iron to meet your needs. The generally recognized cutoff for moderate instances is below 30 mg/L; ferritin levels often fall below 10-12 mg/L when anemia is present. Because red blood cells have a long half-life, the decline in MCH and MCV doesn't happen until much later. (10).

The purpose of this research was to find out how common IDA is among nursing students and whether or not it's related to things like BMI and eating habits.

Methodology

This cross-sectional study investigated the prevalence of iron deficiency anemia and associated risk factors among nursing students at the Nursing College of Hyderabad. It was conducted from March 15, 2024, until June 29, 2024. The study comprised nursing students between 18 and 24

[Citation: Jamali, Y.A., Soomro, P., Panhyar, A.R., Ruk, M., Khaskheli, S.A., Ahmed, A. (2024). Prevalence of iron deficiency anemia and its risk factors among nursing student in nursing college of Hyderabad. *Biol. Clin. Sci. Res. J.*, **2024***: 1019.* doi: https://doi.org/10.54112/bcsrj.v2024i1.1019]

enrolled full-time and willing to participate. Exclusion criteria for this study included students who had documented chronic conditions, were pregnant or had received blood transfusions within a recent timeframe.

Using Raosoft, we calculated the sample size with a 95% confidence interval and a 5% margin of error in mind. Using a stratified random sampling approach, 512 students were chosen to guarantee that all academic years were represented. A structured questionnaire was used to obtain precise demographic and health-related data. Information such as chronological age, current academic year, menstrual cycle, food habits, and history of anemia or iron supplementation were all included in this.

Each subject had their blood drawn by certified phlebotomists in a sterile environment. Several hematological indicators were measured throughout the examination, including hemoglobin (Hb), serum ferritin, serum iron, total iron-binding capacity (TIBC), and transferrin saturation. The Sysmex XN-550 hematology analyzer measured hemoglobin levels, while the Abbott Alinity H-Series was used to check serum ferritin. Serum iron and total iron binding capacity were calculated using the Beckman Coulter DxH 900 analyzer.

It is known as iron deficiency anemia when hemoglobin, serum ferritin, and transferrin saturation levels are below 12 g/dL, 15 ng/mL, and 16%, respectively. Everyone who participated in the study gave their written permission after it was greenlit by Shah Abdul University Khairpur's Institutional Review Board. The research guaranteed the confidentiality of the participants' information.

Statistical software SPSS version 24 was used to investigate the data. A brief synopsis of the demographic characteristics and laboratory variables was given via descriptive statistics. Iron deficiency anemia prevalence was calculated by taking the proportion and adding 95% confidence intervals. We used chi-square tests to examine the correlations between categorical variables; for continuous variables, we used either independent t-tests or Mann-Whitney U tests, depending on the data distribution. For statistical purposes, a p-value less than 0.05 was considered significant.

Results

Five hundred twelve blood samples underwent screening for anemia. Table 1 displays the average age of male students as 20.5 ± 2.6 and female students as 20.5 ± 2.5, with no statistically significant difference (P = 1.000). The overall frequency of iron deficiency anemia (IDA) was 42.0% among the students, with 215 individuals confirmed to be anemic. Of these pupils, 103 were male and 112 were female, for 52.1% Table 1.

Furthermore, there was a statistically significant difference ($p < 0.0001$) in the average hemoglobin level between male and female students with iron deficiency anemia (IDA), with male students averaging 11.5 g/dL (standard deviation ± 2.6) and female students 10.2 g/dL (standard deviation ± 2.3). The average red blood cell (RBC) count for male students with iron deficiency anemia (IDA) was 5.2 million/mm³ (standard deviation ± 0.45), whereas for female students, it was 4.5 million/mm³ (standard deviation ± 0.5). The two groups had a significant difference ($p < 0.0001$). The average MCV for male and female students with IDA was 85.5 fL (standard deviation ± 9.3) and 84.8 fL (standard deviation ± 8.1), respectively ($p < 0.0001$). The average mean corpuscular hemoglobin (MCH) for male and female students with iron deficiency anemia (IDA) was 30 fL (standard deviation ± 2.6) and 28 fL (standard deviation ± 2.3), respectively ($p < 0.0001$). The mean corpuscular hemoglobin concentration (MCHC) for both male and female students with IDA was 340 fL (3.4 standard deviations) and 331 fL (± 2.7 standard deviations), respectively ($p < 0.0001$) Table 1.

There was a statistically significant difference between men and females, with men having average serum iron levels of 110.5 µg/dL (standard deviation ± 58.0) and females having 107.1 µg/dL (standard deviation ± 57.3). As a result of a statistically significant difference ($p < 0.0001$), the average serum ferritin levels for men were 82.6 ng/mL (standard deviation ± 39.8), and for females, they were 79.6 ng/mL (standard deviation ± 43.0). Both men and females had significantly different average total iron-binding capacities, with men measuring 348.7 µg/dL (standard deviation ± 58.4) and females 349.9 µg/dL (standard deviation ± 62.3), respectively ($p < 0.0001$) Table 1.

Table 1 Levels of Hb, RBCs, MCV, MCH, MCHC, Serum iron, serum ferritin, and total iron binding capacity and frequency of anemia among Hyderabad nursing students

Parameters	Male 103	Female 112	P value
Age by years	20.5 ± 2.6	20.5 ± 2.5	1.0000
Hb (g/dL) Mean ± SD	11.5 ± 2.6	10.2 ± 2.3	<0.0001
RBCs (million/mm³)	5.2 ± 0.45	4.5 ± 0.5	<0.0001
MCV (fL) Mean ± SD	85.5 ± 9.3	84.8 ± 8.1	<0.0001
MCH (fL) Mean ± SD	30 ± 2.6 fL	28 ± 2.3 fL	1.0000
MCHC (fL) Mean ± SD	340 ± 3.4 fL	331 ± 2.7 fL	1.0000
Serum iron	110.5 ± 58.0	107.1 ± 57.3	<0.0001
Serum ferritin	82.6 ± 39.8	79.6 ± 43.0	<0.0001
Total iron binding capacity	348.7 ± 58.4	349.9 ± 62.3	<0.0001

The research discovered robust associations among college students between iron deficiency anemia (IDA) and several lifestyle and nutritional factors. Iron deficiency anemia (IDA) was statistically related to less consistent breakfast eating; 62.8% of IDA students reported this, compared to 37.2% of students who reported regular breakfast consumption. This correlation was statistically significant, with a p-value of 0.012. Furthermore, there was a notable correlation between the intake of vegetables and fruits and the occurrence of IDA ($p = 0.03$). Within the group of IDA students, 25.6% stated that they did not consume anything, 36.3% consumed sometimes (less than twice a week), and 38.1% consumed regularly (more than three times a week). The consumption of protein, namely red meat, fish, and chicken, was shown to have a significant correlation with IDA ($p = 0.02$). Among the participants, 27.9% reported not

consuming protein, 46.5% had it seldom (less than two times per week), and 25.5% consumed it frequently (more than two times per week).

There was a strong association between beverage intake habits and iron deficiency anemia (IDA). The use of chocolate after meals was significantly linked with iron deficiency anemia (IDA) (p = 0.04), with 54.4% of students with IDA reporting this behavior. There was a significant link (p = 0.003) between coffee intake and students with iron deficiency anemia (IDA), with 62.8% of IDA students reporting that they consumed coffee after meals. The tea consumption habits of IDA students were shown to have a significant correlation with their anemia status (p = 0.02). Among the students, 10.7% reported not eating tea at all, 17.2% had tea with every meal, 49.0% consumed tea after every meal, and 22.8% consumed more than 4 cups daily Table 2.

Socioeconomic issues were also influential. There was a clear correlation between family income and the incidence of IDA. From the student body of IDA, 44.6% had an extremely high income (above 200,000 PKR), 33.9% had a respectable income (between 50,000 and 200,000 PKR), and 35.3% had an impoverished income (below 50,000 PKR). There was a statistically significant correlation between IDA and lifestyle factors, including diet and activity (p = 0.03). Among the students with IDA, 57.7% reported being involved in these practices. Smoking had a noteworthy association (p = 0.04), as 53.9% of IDA students reported engaging in smoking. The significance of anemia awareness was further supported by a p-value of 0.003. Of the IDA students surveyed, 69.8% indicated that they knew about anemia, while 30.2% stated that they were unaware of it Table 2.

Table 2 Risk factors among Hyderabad nursing students

Variables	Answers	IDA students	P value
breakfast intake	Regular Irregular (nonregular)	80 (37.2%) 135 (62.8%)	 0.012
Vegetables and Fruits/week	No Infrequently (<2 times/week) Frequently (>3 times/week)	55 (25.6%) 78 (36.3%) 82 (38.1%)	0.03
Eating red meat, fish, chicken/week	No Infrequently (<2 times/week) Frequently (>2 times/week)	60 (27.9%) 100 (46.5%) 55 (25.5%)	0.02
Drinking cocoa after meal/week	Yes No	117 (54.4%) 98 (45.6%)	0.04
Drinking coffee after meal/week	Yes No	135 (62.8%) 80 (37.2%)	0.003
Drinking tea/day	No Within every meal After every meal Yes >4caps	23 (10.7%) 37 (17.2%) 106 (49.0%) 49 (22.8%)	0.02
Family income	Very good (>200000 PKR) Good (50000 – 200000 PKR) Low (<5000 PKR)	96 (44.6%) 73 (33.9%) 76 (35.3%)	
Diet (fitness)	Yes No	124 (57.7%) 91 (42.3%)	0.03
Smoking	Yes No	116 (53.9%) 99 (46.0%)	0.04
Being aware of anemia	Yes No	150 (69.8%) 65 (30.2%)	0.003

Discussion

This research quantifies the extent to which Nursing College of Hyderabad student nurses suffer from iron deficiency anemia (IDA). There was a more significant frequency among female students (52.1%) than male students (47.9%), contributing to an overall frequency of 42.0%. Yortanlı et al. discovered that IDA was 4%, a considerably lower prevalence, among nursing students employed by the Internal Medicine Clinic. Iron deficiency (ID) without anemia affected 22.2% of students, while anemia of unknown kind affected 8% of students, suggesting a more comprehensive range of iron-related health problems among nursing students1. Another study found that among nursing students, IDA was prevalent (20.3%), with 27.5% of students reporting symptoms. (14). Also, among the nursing students at Libya's Misurata University, 16% were anemic, and 28% had low hemoglobin (Hb) levels, a sign of anemia. (15).

In terms of gender prevalence, female students had a somewhat greater prevalence of IDA (52.1%) than male students (47.9%), according to our study. This gender gap aligns with the results of Yortanlı et al., who found that 43.4% of participants were men and 56.6% were women (14). According to the Misurata University study, a similar proportion of female students (28%) had low hemoglobin levels (15). Consistent with previous research, 62.8% of IDA students reported eating breakfast irregularly. For

example, 58.3% of female undergraduates with IDA had irregular breakfast behaviors, according to research by Al-Jamea et al. (2019) (16). The need for improving eating habits is highlighted by 25.6% of IDA students reported not consuming fruits or vegetables. Also, new studies back up the idea that eating more fruits and vegetables might reduce your risk of IDA ($p = 0.03$). Female Saudi Arabian university students were more likely to get IDA if they did not consume enough fruits and vegetables, according to research by Alzaheb and Al-Amer (2017) (17).

The significance of sufficient protein consumption in IDA prevention is that 27.9% of IDA students in our survey did not report consuming any of these protein sources. A significant correlation between protein consumption and IDA ($p = 0.02$) was found when the protein sources were red meat, fish, and chicken. Research done by Mona (2019) confirmed these findings; 32.7% of female medical students who were anemic had insufficient meat consumption. (18).

Around 54 out of 100 IDA students reported consuming cocoa after meals, which was found to be related to the disorder ($p = 0.04$). Multiple studies have reached the same conclusion. According to Alzaheb and Al-Amer (2020), over half of the female college students who were anemic routinely drank cocoa. (17). Cinco percent of female teenagers with anemia drank cocoa after each meal, according to different research by Amoah et al. (2023) (19).

We observed around sixty-three out of one hundred IDA students drank coffee after their meals, and we found a significant association between the two ($p = 0.003$). This is in line with the findings of Al-Sayes et al. (2021), who found that among female medical students who suffered from anemia, 58.2% routinely drank coffee. (20). Furthermore, 60.1% of frail students drank coffee with meals, which affected iron absorption, according to a mini-review by Al-Jamea et al. (2022) (16).

Anemia status was substantially connected to tea-drinking habits among IDA students ($p = 0.02$). Thirteen students reported never drinking tea, fifty-nine drank it with every meal, and twenty-three drank four or more cups daily out of a hundred IDA students. These results align with research by Al-Jamea et al. (2022) that indicated that 52.3% of female students with anemia drank tea either with or just after their meals. (16). Similarly, out of 266 tea users in Balochistan, 159 were mildly to seriously anemic, according to research by Sadiq et al. (2019). Out of 90 women who did not consume tea, just 34 had mild to moderate anemia, and none had severe anemia. There was a notable correlation between WRA who drank tea and those who suffered from anemia ($p < 0.05$). There was a noteworthy disparity in the average levels of hemoglobin (Hb), mean corpuscular volume (MCV), and mean corpuscular hemoglobin (MCH) between the participants who drank tea and those who did not ($p < 0.05$) (21).

A strong correlation was found between IDA and lifestyle variables, including eating habits and exercise routines ($p = 0.03$). Multiple studies have found the same thing. Among college-aged women, Alzaheb and Al-Amer (2020) identified insufficient physical exercise and a lack of nutritional variety as significant contributors to IDA. (17). Lifestyle variables, such as food and exercise, were shown to be substantially related to IDA in female college students, according to research by Al-Jamea et al. (2022) (16).

Smoking was significantly correlated with iron deficiency anemia (IDA) in the present research ($p = 0.04$). Most notably, 53.9% of IDA students acknowledged being regular smokers. Yortanlı et al. discovered that IDA was 4% common and that smokers had a greater incidence of IDA. (14). The frequency of IDA among female medical students was 13% in another research. (22).

The level of awareness of anemia had a notable impact, as indicated by a p-value of 0.003. Out of the IDA students surveyed, 69.8% stated that they knew about anemia, while the remaining 30.2% were unaware of it. This finding is in agreement with several studies. Research by Al-Jamea et al. (2022) found that 72 percent of college students know the signs and symptoms of anemia. (16). Another study that concluded similarly was that 68.5% of college-aged women are familiar with anemia.(17).

Conclusion

The study discovered that 42.0% of apparently healthy young nursing students in the sample had iron deficiency anemia (IDA). The study also found that insufficient iron intake, frequent tea drinking, frequent consumption of red meat, and a previous history of iron deficiency anemia were the top risk factors for developing anemia. The results presented in this study indicate a requirement for targeted educational and awareness campaigns to enhance dietary habits by promoting iron-rich sources, such as red meat. Additionally, educating individuals about the specific foods and beverages that can enhance (e.g., vitamin C-rich foods) or impede (e.g., polyphenol-rich beverages like tea) iron absorption is essential.

Declarations

Data Availability statement

All data generated or analyzed during the study are included in the manuscript.

Ethics approval and consent to participate

Approved by the department concerned. (IRB-NCHBD-2293/23)

Consent for publication

Approved

Funding

Not applicable

Conflict of interest

The authors declared the absence of a conflict of interest.

Author Contribution

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Conception and design of the study, data analysis, and the first draft of the manuscript.
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Final approval of the manuscript.

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[Citation: Jamali, Y.A., Soomro, P., Panhyar, A.R., Ruk, M., Khaskheli, S.A., Ahmed, A. (2024). Prevalence of iron deficiency anemia and its risk factors among nursing student in nursing college of Hyderabad. *Biol. Clin. Sci. Res. J.*, **2024***: 1019*. doi: https://doi.org/10.54112/bcsrj.v2024i1.1019]