CROSS-SECTIONAL STUDY ON AWARENESS OF DIET, IRON DEFICIENCY ANEMIA, AND IRON SUPPLEMENTS AMONG STUDENTS OF GULF MEDICAL UNIVERSITY

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ABSTRACT

Objectives:
1. To assess the prevalence of iron deficiency anemia (IDA) among students of Gulf Medical University (GMU)
2. To find correlation between diet, gender, and self-reported hemoglobin levels of the students
3. To increase awareness about active ingredients used in iron supplements
4. To assess students’ knowledge about time required for iron supplements to raise hemoglobin levels

Materials & Methods: A cross-sectional study using a self-reported questionnaire was carried out among students of GMU. Students’ knowledge was assessed using a scoring system, and the median knowledge score was the cut-off value for adequacy of knowledge. The data was analyzed using Statistical Package for Social Sciences, Version 21, followed by a chi-square test to determine the significance of association. A p value of <0.05 was accepted as the significant level.

Results: A total of 335 students (237 females and 98 males), with an average age of 20.7 ± 1.75 years, participated in the study. The prevalence of anemia was high among female students (87.70%, n = 208). Students consuming iron-rich food displayed consistently higher hemoglobin levels (62%, n = 203). A large number of male students (46.20%, n = 150) regularly consumed meat. Just 28% participants (n = 91) were aware about the causes of IDA. Few participants (13.9%, n = 45) had knowledge of the active ingredients used in iron formulations, while just 44.7% participants (n = 133) had knowledge of their side effects. Only 42.20% participants were aware that it may take up to three months for their hemoglobin levels to normalize after the use of iron supplements.

Conclusion: On-campus activities should be undertaken to increase awareness among university students about their diet, IDA, and responsible use of dietary iron supplements.

Keywords: Iron deficiency anemia, hemoglobin, iron supplements, awareness, active ingredients

INTRODUCTION

Iron deficiency anemia (IDA) is a condition in which blood has reduced number of red blood cells (RBCs) due to a decrease in the body’s iron stores. It is the most common nutritional disorder globally and accounts for 50% of anemia cases1, 2. The cause of IDA can be inadequate iron intake, reduced iron absorption, high iron needs, and an increase in loss of iron3. It is crucial to identify the cause of IDA and learn about the proper use of iron supplements. A.K. Osman observed high prevalence of IDA...
in the UAE at 44.8%\textsuperscript{4, 5}. Food items such as meat and liver are a rich source of heme iron. As a result, the regions that consume meat regularly have lower cases of IDA. Other reasons for developing IDA include drugs that can reduce iron absorption, menstruation, and helminth infections\textsuperscript{6}.

Iron supplements are used to treat or prevent IDA as they improve health and performance\textsuperscript{7}. Iron supplements are available either as elemental iron, ferrous sulfate, or ferrous fumarate\textsuperscript{8, 9}. Iron plays an important role in the production of RBCs, thereby enabling the transport of oxygen to body tissues\textsuperscript{10}. IDA occurs when the iron stores in the body are depleted. It can take up to three months for hemoglobin levels to adequately increase after the use of iron supplements\textsuperscript{11}.

**Rationale**

Iron supplements are freely available over the counter, and the general public has easy access to them. Hence, their utilization pattern is primarily influenced by an individual’s knowledge. As there is paucity of published information about the knowledge level of university students regarding iron supplements, the current study could lead further research in this field.

Healthcare professionals are obligated to educate people as part of their job. Requisite knowledge among consumers of iron supplements could help tackle related misconceptions. The current study could help reduce the risk of improper utilization of iron supplements, and address the issue of inadequate knowledge about IDA and iron supplements; these would benefit the scientific community and society at large.

**Objectives**

1. To assess the prevalence of IDA among students of Gulf Medical University (GMU)
2. To find correlation between diet, gender, and self-reported hemoglobin levels of the students
3. To increase awareness about active ingredients used in iron supplements
4. To assess students’ knowledge about time required for iron supplements to raise hemoglobin levels

**MATERIALS & METHODS**

A cross-sectional study was carried out among the students of GMU, Ajman, over a period of three months. The sample size was calculated on the basis of the data reported in a previous study. The sample included 335 consenting students (100%, 237 females and 98 males) of 18 years and above from the MBBS, Pharm.D, DMD, BPT, BHS, and BBMS programs in GMU who were available in the campus at the time of data collection.

The data was collected using a self-administered questionnaire. It included questions on the following domains: sociodemographic characteristics and knowledge about diet, IDA, and iron supplements. The questionnaire was pilot tested for feasibility and clarity of questions with 5–10 students before commencing the study.

The study was conducted after obtaining the approval of the GMU Ethics Committee. An informed consent was obtained from all participants. The confidentiality of the participants’ details and information shared was maintained.

After explaining the purpose of the study, the questionnaire was distributed to the students.

The study excluded students aged below 18 years, those that failed to provide an informed consent, and those with hemoglobinopathies such as thalassemia. The data collected was compiled into a spreadsheet and analyzed using Statistical Package for Social Sciences (SPSS), Version 21. To find the significance of association, a chi-square test was carried out. A p value of <0.05 was accepted as the significant level.

**RESULTS**

The hemoglobin levels shared by the students were checked within 3–6 months of the study. Of the 237 female and 98 male students that
participated in the study, 208 female and 12 male students were found to be anemic. Figure 1 shows that anemia was highly prevalent in female participants (87.70%, \( n = 208 \)) than male participants (12.30%, \( n = 12 \)).

**Figure 1.** Prevalence of anemia among male \( (n = 98) \) and female participants \( (n = 237) \)

<table>
<thead>
<tr>
<th>Anemic</th>
<th>Not anemic</th>
</tr>
</thead>
<tbody>
<tr>
<td>87.70%</td>
<td>12.30%</td>
</tr>
</tbody>
</table>

Figure 2 displays that students consuming iron-rich food, such as meat, fish, and poultry, had consistently higher hemoglobin levels than those consuming these sources rarely, irrespective of the amount consumed.

**Figure 2.** Correlation of students’ diet with their self-reported hemoglobin levels \( (n = 329) \)

<table>
<thead>
<tr>
<th>Meat, fish, and poultry ( (8-10 \text{ g/l}) )</th>
<th>Always</th>
<th>Rarely</th>
</tr>
</thead>
<tbody>
<tr>
<td>67.00%</td>
<td>17.40%</td>
<td>5.00%</td>
</tr>
<tr>
<td>Meat, fish, and poultry ( (12-15.5 \text{ g/l}) )</td>
<td>Always</td>
<td>Rarely</td>
</tr>
<tr>
<td>57.00%</td>
<td>43.00%</td>
<td>4.00%</td>
</tr>
<tr>
<td>Meat, fish, and poultry ( (13.5-17.5 \text{ g/l}) )</td>
<td>Always</td>
<td>Rarely</td>
</tr>
<tr>
<td>62.00%</td>
<td>38.00%</td>
<td>4.00%</td>
</tr>
</tbody>
</table>

Figure 3 shows that higher number of males \( (46.20%, \ n = 150) \) regularly consumed meat than females \( (38.60%, \ n = 125) \).

**Figure 3.** Correlation of students’ consumption of iron-rich food with their gender \( (n = 326) \)

<table>
<thead>
<tr>
<th>Always</th>
<th>Very often</th>
<th>Sometimes</th>
<th>Rarely</th>
<th>Never</th>
</tr>
</thead>
<tbody>
<tr>
<td>Males</td>
<td>46.20%</td>
<td>38.60%</td>
<td>8.40%</td>
<td>5.00%</td>
</tr>
<tr>
<td>Females</td>
<td>28.00%</td>
<td>22.80%</td>
<td>8.40%</td>
<td>4.00%</td>
</tr>
</tbody>
</table>

Figure 4 displays that 28% participants \( (n = 91) \) were aware that IDA can be caused by all the mentioned conditions. However, the highest percentage of participants \( (35%, \ n = 114) \) believed that insufficient dietary iron intake is the only or major reason for IDA.

**Figure 4.** Knowledge about possible causes of IDA \( (n = 327) \)

<table>
<thead>
<tr>
<th>Insufficient dietary iron intake</th>
<th>All of the above</th>
</tr>
</thead>
<tbody>
<tr>
<td>35.00%</td>
<td>28.00%</td>
</tr>
<tr>
<td>Bleeding due to injury</td>
<td>5.00%</td>
</tr>
<tr>
<td>Parasitic worms</td>
<td>5.00%</td>
</tr>
<tr>
<td>Pregnancy</td>
<td>7.20%</td>
</tr>
<tr>
<td>Heavy menstruation</td>
<td>11.50%</td>
</tr>
<tr>
<td>Vit B12/folate deficiency</td>
<td>5.40%</td>
</tr>
<tr>
<td>Drug induced</td>
<td>3.40%</td>
</tr>
</tbody>
</table>

Figure 5 shows that most participants \( (23.4%, \ n = 76) \) did not know which active ingredient is used in iron supplements. Some participants \( (19.8%, \ n = 65) \) believed that
ferrous sulfate is the only active ingredient in iron formulations. Just 13.9% students (n = 45) were aware that all the active ingredients mentioned in the figure were part of iron supplements.

**Figure 5.** Knowledge about active ingredients commonly used in iron formulations (n = 327)

![Bar chart showing knowledge about active ingredients in iron formulations](image)

Figure 6 displays that 44.7% participants (n = 133) knew that the side effects of iron supplements can be diarrhea, constipation, and black stool.

**Figure 6.** Knowledge about side effects caused by iron supplements (n = 298)

![Pie chart showing side effects of iron supplements](image)

Figure 7 shows that just 42.20% participants were aware that it may take up to three months for hemoglobin levels to normalize after the use of iron supplements.

**Figure 7.** Knowledge about time required to raise hemoglobin levels after consuming iron supplements (n = 302)

![Bar chart showing time required to raise hemoglobin levels](image)

**DISCUSSION**

The results of the current study indicate higher prevalence of anemia in females than males (Figure 1). Few studies are available that compare the prevalence of IDA between males and females. In a study conducted among female college students in the University of Sharjah (UoS), 26.7% participants were found to be anemic. The results of another study carried out among female students in Taibah University in Saudi Arabia showed 64% participants were anemic. Consequently, the prevalence of anemia among the female students of GMU (87.70%) was higher than that among female students of UoS and Taibah University.

The findings of the current study indicate that the participants that consumed iron-rich food items, such as meat, poultry, fish, and liver, had higher hemoglobin levels. These results are very reliable as iron absorption is higher (15–18%) from foods that contain heme iron; red meat, seafood, and poultry products are the best sources of heme iron.

In the current study, males were observed to consume more iron-rich food than females, which could be one of the reasons why the prevalence of IDA in males was low, along with
additional reasons such as the absence of menstruation.

The results of the current study show that the participants had minimal knowledge about the causes of IDA. In addition, 35% participants believed that reduced intake of iron-rich food is the only or most important cause of IDA. However, IDA can be caused by multiple factors, including certain drugs (such as antacids and calcium tablets), heavy menstruation, parasitic worms, and vitamin B₁₂ deficiency⁶.

The findings of the current study show that knowledge about the composition of iron supplements was low among the participants, and many students were not aware of the active ingredients used in iron supplements. Moreover, very few students were aware that iron is available as ferrous sulfate, ferrous ascorbate, ferrous fumarate, and ferrous gluconate. According to a study carried out by M.G. Zariwala et al. in 2013, ferrous sulfate is the most widely used ingredient in iron formulations and dissolves the fastest⁷. Most students were aware that iron supplements can cause black stool, constipation, and diarrhea. In a study conducted by N.L. Sloan et al. in 2002, pregnant women consuming iron supplements reported all of the above side effects, with the intensity of these side effects increasing with dosage. Moreover, these side effects caused some women to discontinue their therapy or reduce the dosage¹⁵.

In the current study, participants’ knowledge about time taken for hemoglobin levels to adequately increase after the use of iron supplements was reasonably high. In adults, a three-month therapy is required to replenish iron stores and correct anemia. Furthermore, it is recommended that anemic patients should check their blood counts every three months for one year after initiating therapy for IDA¹⁶.

CONCLUSION
The prevalence of anemia was higher in females than males. The intake of iron-rich food was lower in females and participants having lower hemoglobin levels, regardless of their gender. The participants were aware of the causes of IDA, but their knowledge about the active ingredients used in iron supplements was very limited. However, the participants had adequate knowledge about the side effects of iron supplements and time required for hemoglobin levels to normalize after the use of iron supplements.

On-campus activities should be organized to increase awareness among university students about their diet, IDA, and responsible use of dietary iron supplements. Healthcare students should acquire skills to adequately counsel consumers about dietary iron supplements through conferences and workshops.

LIMITATIONS
The study used self-reported data. Moreover, due to the small sample size, the results of the study cannot be generalized.

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REFERENCES


