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Prevalence of Anaemia among Students in the Jardinah Region and Its Relationship to Dietary Behaviours

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A B S T R A C T

School students are among the most vulnerable groups to malnutrition. It's possible that it's a result of eating habits that are incorrect, which results in complications and physical changes. These changes may be in the short or long term in successive age stages, which causes many disorders and defects in their healthy development and growth. This study was conducted during the period of 2022-2023, focusing on the dietary habits of students in four randomly selected schools in the Jardinah area of Benghazi city. The study involved administering a questionnaire to assess dietary behaviours, including breakfast consumption, fruit intake, water consumption, and measuring haemoglobin levels. The study sample consisted of 33 male and female students, ranging in age from 9 to 18 years. The study findings revealed that among school students, the prevalence of anaemia was 15.5% for males and 12.1% for females, the highest rates observed in the 9-11-year-old age group. Additionally, a significant proportion of students demonstrated healthy dietary habits. Specifically, (60.6%) of the participants reported regular breakfast consumption, while (54.5%) reported consuming fruits. Furthermore, the study highlighted that (42.4%) of the students reported regular water intake. It has been found that schoolchildren typically adhere to the habit of having breakfast, eating a substantial amount of fruits and vegetables, and regularly drinking water. This may be a contributing factor to the moderately low prevalence of anaemia compared to the classification established by the World Health Organization for the severity levels of anaemia.

1. Introduction

1.1. Nutrition problems among school students

Students in schools are regarded as one of the groups most at risk for malnutrition, whether in terms of quality or quantity, which results in complications and physical changes; these changes may be short-term or long-term in subsequent life stages, which causes many disorders and imbalances in their healthy development and growth (*Elrotob, 2021*).

Arab's countries have paradoxical nutritional problems, according to statistics those linked to unhealthy eating patterns and nutritional deficits, including underweight, iron deficiency anaemia, and deficiencies in calcium and vitamin D particularly those linked to lifestyle modifications and overnutrition, such as diabetes, high blood pressure, and obesity (*Musaiger, et al., 2011a*) and (*Musaiger, et al., 2011b*). Children and adolescents are at increased risk of developing iron deficiency anaemia because of their increased demand for iron during growth and puberty. In maximum cases, they pass undiagnosed due to abnormal and far-flung visits to fitness clinics, doctors, and hospitals (*Soliman & Azmi, 2007*).

Anaemia is a circumstance wherein there's a low degree of haemoglobin withinside the blood, both due to the fact there are few purple blood cells and/or little haemoglobin in every cell. Although there are numerous distinct types of anemia, iron deficiency is the most common type. Across the world, iron deficiency anemia is among the most prevalent nutritional problems (*Giovannini, et al., 2008*). The

133

World Bank estimates that one-half of the world's population suffers from malnutrition and that two million people suffer from diseases related to iron, iodine, and vitamin A deficiency (*Soliman & Azmi, 2007*). Anemia during childhood leads to a decline in physical and mental abilities, as well as a loss in focus on art and academic achievement. It also presents a serious risk to girls' future safe pregnancy (*Tesfaye, et al., 2015*).

Anemia has been proven to have an effect on intellectual improvement and gaining knowledge of capacity. In infancy it could motive a everlasting lack of IQ (intelligence quotient) later in life, shortened interest span, irritability, and fatigue, issue with concentration, lethargy, weak spot and expanded susceptibility to infection. Consequently, anemic youngsters generally tend to do poorly on vocabulary, reading, and different tests (*Kordas et al., 2004)*. In growing nations it`s now no longer best poverty however social elements additionally play in bad nutrition, bad fitness control amongst women in early life as they stay omitted for being a lady child (*Chaluvaraj, et al., 2018*).

The most common causes of anemia are poor eating habits, a lack of iron-rich foods, an excessive intake of foods that reduce iron absorption, such as tea and coffee, and a lack of foods and drinks that help absorb iron, such as foods high in vitamin C, which is abundant in some fruits (*Musaiger, et al., 2011a*).

1.2. Some school students have bad eating habits

A. Breakfast escape: Breakfast is regarded as the initial meal of the day, usually consumed by mid-morning at the latest. It is often considered the most crucial meal due to various advantages, such as aiding in the prevention of excess weight and obesity, as well as lowering the risk of cardiovascular diseases. (*Giovannini, et al., 2008*). Breakfast food make a contribution to enhancing cognition amongst school - age-children (*Widenhorn-Müller, et al., 2008*) and (*Dykman & Rivik, 2002*). Lack of appetite, the habit of skipping breakfast, and running out of time to eat breakfast can all contribute to the habit of not eating it (*Aditian, 2009*). Another hand, Young girls commonly have traits of bad consuming habits. Among different matters the dependency of now no longer consuming breakfast, lazy to drink water, a bad weight loss plan due to the fact they need to slim, the dependency of snacking on low-vitamins ingredients and consuming speedy food. So that teens aren't capable of meet the range of vitamins wanted through the frame for the synthesis of haemoglobin formation. If this takes place for a long term it'll reason haemoglobin degrees to keep lowering and reason anaemia (*Brown et al., 2004*).

B. Refusing to eat fruits: Better consumption of vegetables and fruits has been recommended by national dietary guidelines and public health organizations in order to prevent chronic disease (e.g. cardiovascular diseases and diabetes) (*Wang DD, et al., 2021*). It is commonly known that fruits and vegetables offer protection against non-communicable chronic diseases (NCDs) (*Hartley, et al., 2013*). Fruits and veggies are the best natural sources of vitamin C. A few authors discovered that eating fruits and vegetables improves the body's ability to absorb iron (*Fleming, et al., 2002*).

C. Not getting enough water to drink: Research has indicated that consuming water can enhance students' preparedness for learning by elevating their cognitive functioning level (*Edmonds, et al., 2009*).

Increasing water intake in kids, teens, and adults may also help prevent excessive weight gain (*Stookey, et al., 2007*). In general, for every kilogram of body weight, schoolchildren generally require a quarter of a cup of water per day; however, this also depends on the temperature, humidity, and level of physical activity (*Musaiger, 2012*).

1.3. Objectives of Study

Anaemia is characterized by a low level of iron in the body and is a prevalent nutritional deficiency worldwide. It poses a significant problem, particularly in developing countries like Libya. Therefore, the objective of this study was twofold: to determine the prevalence of anaemia among primary, intermediate, and secondary school students in the Jardinah region, and to explore the dietary behaviours of students.

2. Materials and Methods

2.1. Subjects and study area

A cross-sectional design was used for this study. Male and female students from four public schools in Benghazi's Jardinah district were selected for the academic year 2022-2023, representing primary (9-11 years old), intermediate (11-12 years old), and secondary (13-18 years old) levels. The selection of schools was based on their accessibility to the communities they serve.

2.2. Sample collection

Collection of blood sample from a vein. 2 ml of venous blood was withdrawn by sterile venipuncture in an EDTA tube for CBC analysis from a convenient sample of 33 healthy students for the estimation of haemoglobin (Hb). All blood samples were analysed using MINDRAY BC-3000 Auto Haematology Analyser.

Data were collected by visiting district schools, filling out a questionnaire, and questioning randomly selected target students, and a diet survey was conducted using a questionnaire. This study relied on a questionnaire

according to the Likert scale. The questionnaire consisted of haemoglobin percentage, breakfast intake, eat fruits daily, and drink water regularly.

2.3. Standards for Anaemia Diagnosis

The World Health Organization (WHO) cut-offs for anaemia were defined as a haemoglobin level of less than 12.0 g/dl for girls and boys less than 13 g/dl. Haemoglobin levels between 9.0 g/dl and the cut-off points were considered mild anaemia, 7.0–8.9 g/dl was considered moderate anaemia, and < 7.0 g/dl was considered severe anaemia (*Mohapatra, et al., 2014*).

2.4. Level of Anaemia

When the haemoglobin concentration is above 10.0 g/dl but below the cut-off level, it is classified as mild anemia; when it is between 7 and < 10.0 g/dl, it is classified as moderate anemia; and when it is below 7 g/dl, it is classified as severe anemia. Based on the level of prevalence recommended by WHO in 1996, anaemia prevalence can be classified as low, medium, or high at the population level (*Soliman & Azmi, 2007*).

2.5. Analysis of results

The data was analysed using SPSS (Statistical Package for the Social Sciences) version18.

1 Results

By collecting questionnaires targeting 33 students, including 18 male and 15 female students, as shown in (Table 1), this data was extracted and presented through statistical tables and graphs to achieve various results.

Table 1: The gender distribution in the study.

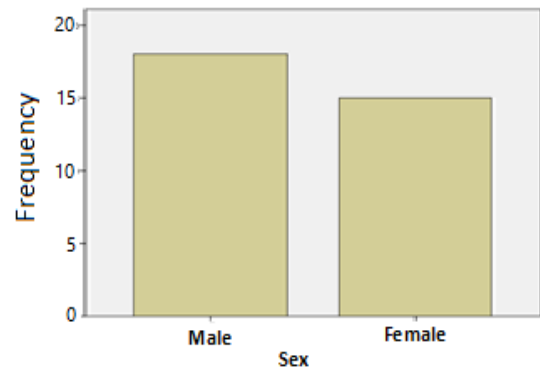| Sex	Frequency (n)	Percent %
Males	18	54.5 %
Females	15	45.5 %
Total	33	100

3.1. Age

The study included age groups consisting of both males and females, ranging from 9 to 18 years old. The largest group was the 12-year-olds, while the 14-16 year old group had the lowest percentage, as illustrated in Figure 1.
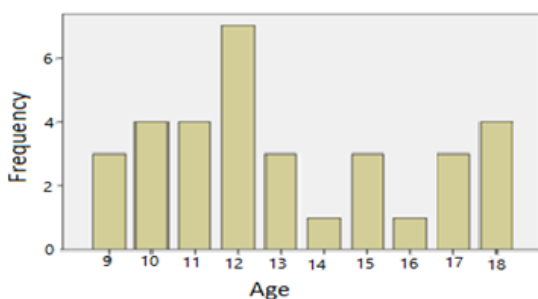
Fig. 1: Age distribution of students included in the study.

3.2 Sex

The study documented that the prevalence of anaemia among males was 15.2%, whereas among females it was

12.1%, as illustrated in Figure 2.

Fig. 2. Frequency distribution of males and females included in the study.

3.3. Hemoglobin percentage

Based on (Table 2) of the study, it was discovered that among males, 13 samples (39.4%) were free from anaemia, while 5 samples (15.2%) exhibited anaemia. Likewise, among females, 11 samples (33.3%) were not affected by anaemia, whereas 4 samples (12.1%) did show signs of anaemia. Table 3 emphasizes that the age group most affected by anaemia is between 9-11 years.

Table 2: Frequency and percentage of normal and abnormal among males and females included in the study.

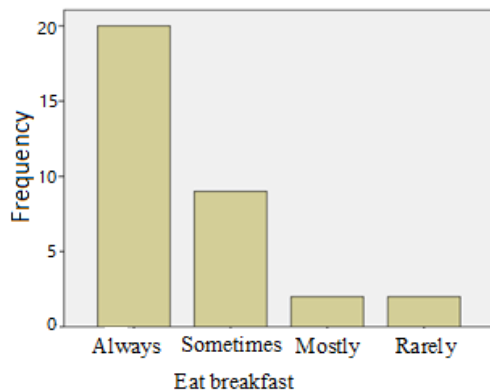| Type	Frequency (n)	Percent %
Normal males	13	39.4 %
Abnormal males	5	15.2 %
Normal females	11	33.3 %
Abnormal females	4	12.1 %
Total	33	100

Table 3: Distribution of the total number of samples and

Age group	The first group (9-11 years old)	The second group (12-15 years old)	The third group (16-18 years old)	Aggregate group
Normal samples	7	9	8	24
Anemia samples	4	3	2	9
Total	11	12	10	33

anemia samples in the study.

3.4. Breakfast

The chart illustrates that the majority of respondents, comprising 60.6% and 27.2% respectively, expressed an interest in breakfast. Most of them reported eating breakfast daily (always), while some mentioned consuming breakfast occasionally (sometimes). Additionally, a small percentage of respondents, representing 6.1%, stated that they often or rarely eat breakfast, as depicted in figure 3.

Fig.3: Frequency distribution of breakfast consumption among the students included in the study.

3.5. Eat fruits

Figure 4 displays the frequencies and percentages of responses between genders regarding their fruit consumption habits. It reveals that 54.5% and 24.2% of the respondents answered that they sometimes and always eat fruit, respectively. Meanwhile, those who reported, and rarely eating fruit accounted for 3.0% and

6.1% respectively. Additionally, there was a 12.1% percentage of respondents who declined to answer.
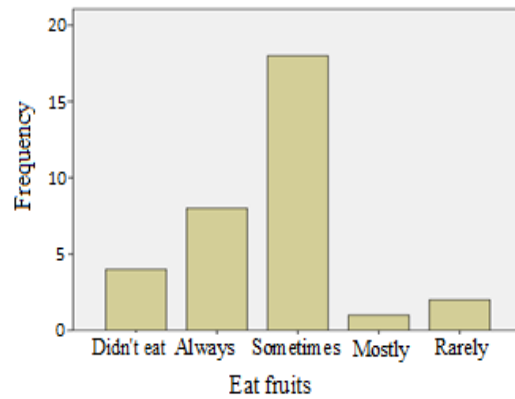
Fig.4: Frequency distribution of fruit consumption among the students included in the study.

3.6. Drink water regularly

Figure 5 presents the frequency of daily water consumption among students. The study reveals that a majority of both male and female students responded with "always" and "sometimes" (42.4%). In contrast, a smaller percentage reported "often" and "rarely" drinking water, accounting for (12.1%) and (3.0%) respectively.
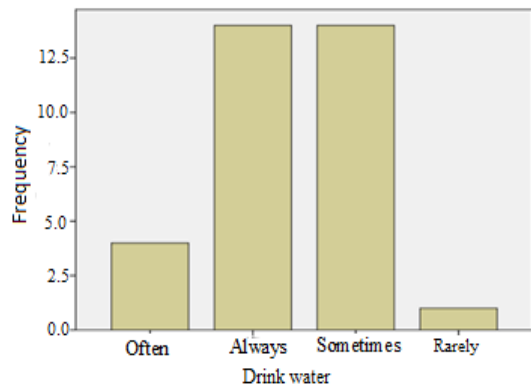
Fig. 5: Frequency distribution of water consumption among the students included in the study.

1 Discussion

The objective of the current study was to assess the prevalence of anaemia and nutritional behaviours among primary, middle, and secondary school students in the Jardinah area of Benghazi. The findings revealed that the highest prevalence of anaemia was observed in the 9-11 year age group for both males and females 136

with prevalence rate of 15.2% for males and 12.1% for females. These results are consistent with the prevalence of anaemia among students in Sabratha, Western Libya, where it was reported as 11.08% for males and 12.9% for females (*Jbireal, 2020*). The World Health Organization states that when anaemia prevalence rises above 5%, it is deemed a public health concern (*WHO, 2004*).

Additionally, the investigation demonstrated that the World Health Organization's classification of anaemia's severity placed the condition in the mild category. Anaemia is classified as mild when it occurs in the range of 5% to 19.9%, moderate when it occurs in the range of 20% to 39.9%, and severe when it occurs in the range of 40% or more (*WHO, 2001*).

Most children with mild anaemia don't show any symptoms at all (Janus, 2010). Most of these people continue to be ignorant of their anaemia. The high prevalence of mild and moderate anaemia among children requires significant attention in order to reduce the overall prevalence of anaemia.

According to the current study, 60.6% of the students regularly ate breakfast. These results are in line with an American study that found children consumed breakfast at rates of 69–80% (*Deshmukh, et al., 2010*). This could be one of the reasons why the prevalence of anaemia hasn't increased among our student body.

As stated by a review of research on breakfast habits, between 10% and 30% of children in Europe skipped breakfast. Children in America were found to skip breakfast at the highest rate (*Rampersaud et al., 2005*). In the current study, the percentage of students who did not eat breakfast was 6.1%. This finding provides evidence of the dedication of Libyan families to the tradition of consuming breakfast.

The study found that the percentage of students who consumed fruit was 24.2 -54.5% higher compared to those who did not consume it, with a prevalence of 3.0 – 6.1% for non-consumers. The results indicated that increased choice in food selection was associated with higher daily intake of fruits and vegetables among primary school-aged children, and it also served as a positive predictor for preference towards these food groups. Giving kids the freedom to select the veggies they want to eat at school can foster autonomy, which has been demonstrated to increase intrinsic motivation. (*Zeinstra et al., 2007*). Fruit presentation has the potential to influence children's eating habits, with sliced fruit being recommended as being more likely to be consumed than whole portions (*McCool et al., 2006*).

The study also revealed an impressive finding regarding the students' water consumption habits. The highest percentage (42.4%) was recorded for those who reported drinking water, while the lowest percentage

(3.0%) was observed among those who rarely consumed water regularly.

When determining daily water needs, various factors such as fluid balance, water turnover, and consumption studies provide similar values under specific conditions. On average, adult men require a daily water intake of 3.7 L, while adult women require 2.7 L, which fulfills the needs of the majority of individuals. However, engaging in strenuous physical exercise and being exposed to heat can significantly increase daily water requirements, and there can be substantial individual variability among athletes. Water, which constitutes the majority of the human body's chemical composition, typically represents 50% to 70% of body weight in an average young adult male (*Sawka et al., 2005*). Approximately 5% to 10% of total body water is replenished daily (*Raman et al., 2004*).

1 Conclusions

The results of this study revealed that the overall prevalence of anemia among students in Jardinah was mild, with rates of 15.2% in males and 12.1% in females, based on the full number of understudies included within the consider. It was found that breakfast consumption was a common practice among the schoolchildren examined. Encouraging breakfast consumption among school children is important to ensure they meet their daily nutritional and energy requirements. Parents and caregivers should be educated about the benefits of breakfast for children. The study also recommended the significance of nutrition education for school children, focusing on hygienic food preparation and nutrition. Additionally, the survey observed a high consumption of fruits and vegetables, which may be attributed to health awareness and the cultural emphasis on fiber content.

Water is the fundamental and indispensable nutrient for life. Healthy individuals regulate their daily body water balance with precision, despite varying water needs, intake, and exposure to hydration-related stressors. As long as food and fluid are readily available, this regulation is accomplished through sophisticated physiological and behavioral adaptations.

Conflict of interest: The authors declare that there are no conflicts of interest.

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