PREVALENCE OF IRON DEFICIENCY ANEMIA (IDA) AMONGST NURSING STUDENTS OF MISURATA UNIVERSITY, LIBYA

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ABSTRACT

Iron deficiency anemia (IDA) is the most common type of anemia. Anemia is defined as a clinical condition characterized by a reduction in hemoglobin concentration of blood or the number of red blood cells (RBCs) is poorly below the normal. The present study was conducted to investigate about prevalence of iron deficiency anemia among nursing students and elucidate the correlations between hemoglobin level, gender, physical signs, and clinical symptoms. Sixty-one students aged 18-30 years were selected randomly, during the period from April up to December 2018. Hemoglobin (Hb) level was measured for each respondent. Pearson correlation was used to find a correlation between Hb and other parameters. where $P<0.05$ was considered statistically significant. The results showed that, there was 16% found to be suffering from anemia, when 28% of females had diagnosed low Hb levels with anemia. A significant ($P<0.05$) correlation between Hb level, sex, pale-colored inside lower eyelids, general pallor and heartbeat were detected. There were no significant ($P>0.05$) correlation between Hb level and sore mouth, anorexia, headache occurrence, dizziness and breath shortness. It was detected that, the prevalence of mild anemia among nursing students have been measured. The nutritional interventions such as change lifestyle, food fortification and diet diversification should be recommended to prevent the occurrence of anemia complications.

KEY WORDS: Anemia, Hemoglobin, Misurata, Nursing, Students.

INTRODUCTION

Iron deficiency (ID) is the most common nutritional deficiency worldwide and an important public health problem, especially in developing countries. There is no clear data about how many individuals are affected by iron deficiency worldwide, but it is estimated that ID is present in most of the pre-school children and pregnant women in developing countries and at least 30- 40% in developed countries when anemia is used as an indirect indicator of ID. WHO is defines anemia as Hb < 130 g/L in men older than 15 years, 110 g/L in pregnant women, and <120 g/L in non-pregnant women older than age 15 years[1,2].

The prevalence of anemia increases with age and in the hospital setting. Anemia decreases the capacity for work and increases health care costs. Iron deficiency is the predominant cause of anemia across countries and in both sexes, with women more commonly afflicted. Iron deficiency is also associated with restless legs syndrome (RLS), diminished quality of life, fatigue, impaired cognitive function, and infertility, all of which may occur in the absence of anemia and may be reversed with iron therapy[3,4,5,6].

ID and IDA are global health problems and common medical conditions seen in every day clinical practice. Since anemia is the most important indicator of iron deficiency, the terms ID and IDA are often used interchangeably. However, ID may develop in the absence of anemia and the tissues may be affected by this condition. Iron deficiency is manifested in different stages. If an iron requirement is below the intake, iron stores are reduced primarily. After the iron stores are reduced, hemoglobin levels may stay normal for a while which means that iron deficiency is observed in the absence of anemia. At this time, only plasma ferritin levels and plasma transferrin saturation are reduced. Negative iron balance which continues after iron stores are exhausted is manifested with decreased hemoglobin. Conclusively, a reduced body iron store has been defined as ID and the worsening of this condition and development of anemia is defined as IDA[7]. Objectives of this study were to:
- Exam iron deficiency anemia amongst students of nursing and health sciences.
- Measurement of prevalence of iron deficiency anemia among students.
- Find out the relationship between hemoglobin level versus physical signs, clinical symptoms and gender.

MATERIALS AND METHODS

Area of study:

Misurata is a city in the Misurata District in northwestern Libya, situated 187 km (116 mi) to the east of Tripoli and 825 km (513 mi) west of Benghazi on the Mediterranean coast near Cape Misurata. With a population of about 281,000, it is the third-largest city in Libya, after Tripoli and Benghazi. It is the capital city of the Misurata District and has been called the trade capital of Libya. It has lied at longitude is 32 °.377533"N and Latitude is 15°.092017"E. It located is 7 meters' height, which is equal to 23 ft. above sea level.

Research design:

This is a descriptive study that used to determine the knowledge, awareness about anemia occurrence

among nursing students. The questionnaire was personally conducted to the student in Faculty Nursing and Health Sciences, the survey was involved information's about age, gender, blood transfusion, physical signs, and clinical symptoms, related to iron deficiency anemia.

Study population:
All of the participants were informed with study purpose, procedures, and significance. They were signed the study consent forms. The study was approved by the department board, and all procedures were followed the ethical standards of the Misurata University. The study was targeted the students of the Faculty of Nursing and Health Sciences of Misurata University. Sixty-one students aged18-30 years were selected randomly as shown in (table 1).
Eligibility was determined through the following inclusion criteria: *1*) age 18–30 years; *2*) non alcoholism and nonuser of tobacco products; *3*) generally healthy; *4*) not pregnant or lactating in the past 6 month; *5*) not clinically diagnosed with an eating disorder; *6*) no metabolic, hormonal, and/or neural conditions, diseases, or medications that influence metabolism or food intake; *7*) no known bleeding disorders.

Study duration
The study was conducted within six months. From April up to end of December 2018. The duration was distributed among data collection, analysis and interpretation and report writing.

Data collection and procedures:
Questionnaires
According to a population of the study, many students from the Faculty Nursing and Health Sciences were given a personal interview and a questionnaire after that blood samples should be taken.
Blood samples collection and preparation
The 61 blood samples were obtained during the April up to end of July 2018. When only one blood sample was drawn out from each interviewed student. 2.5 ml of blood sample was drawn out into an anticoagulant tube and caped loosely. Each tubes containing a 2.5 (EDTA) Ethylene Di Amine Tetra Acetic Acid. All blood samples were collected and transferred immediately to laboratory analysis.
Blood analysis
In the laboratory, 61 of EDTA blood samples were used to analyze complete blood count (CBC). The analysis was done using the Sysmex Automated Hematology Analyzer device (XK-21N-2012) made in German. Respondents were classified according to the hemoglobin level.
Data quality management
A structured questionnaire was prepared by English and translated into Arabic language. The pre-test of the questionnaire was done before actual data collection to see for accuracy and response and to estimate which time it is needed.

Statistical analysis
To perform calculations for statistical analysis, SPSS Statistical Version 18 and Graphs were used. The descriptive statistical method was represented in the Frequency and Percent as well as Pie Chart. Pearson correlation was used to study the relationship between two variables. It is significant if P-value is less than 0.05.

RESULTS AND DISCUSSION
The prevalence of anemia is an important health indicator when it is used with other measurements of iron status, hemoglobin concentration can provide information about the severity of iron deficiency. The physical, clinical and laboratory measurements have been taken directly. The data were collected according to specified criteria of eligibility. As it is shown in (table 1). The distribution of study samples according to age groups and gender, it is indicating the majority of respondents about 45 out of 61 were attributed to age group (18-20). Whereas, other students of age groups (21-23), (24-26) and (27-30) were recorded 21%, 3%, and 2% respectively. The majority of respondents as male, they were 52% whereas, female 48% of the total of 61 samples.

(Table 1) Distribution of study sample by age and gender

Age	Frequency	Percent
18-20	45	74%
21-23	13	21%
24-26	2	3%
27-30	1	2%
Total	61	100%
Distribution of study sample by gender		
Male	32	52%
Female	29	48%

(Table 2) shows the classification of population study according to hemoglobin level. Generally, the results showed that the majority 51 students were classified normal individuals at the normal level of hemoglobin compared to 10 of students were classified abnormal individuals, those have less hemoglobin than the normal level according to WHO criteria of hemoglobin level classification. While, the results indicated that the proportion 2 males, those who have less than normal hemoglobin level compared to that proportion 8 females those who have less hemoglobin than the normal level. The results revealed that there is a significant ($P<0.05$) correlation between Hb level and gender groups. This data is finding that the proportion of cases of anemia related to iron deficiency differs among age groups. Correspondence to our study, data from Yemen and India found a higher prevalence of IDA in girls than boys. This proportion reached more than 60% among women of reproductive age versus only 15% in women aged 50 to 74. Iron deficiency anemia is the main type of anemia in younger women[8].

(Table 2) Classification of population study among hemoglobin level.

Hemoglobin level	All Sample	Male	Female
	Frequency	Frequency	Frequency
Normal	51	30 (60%)	21(40%)
Abnormal	10	2 (20%)	8 (80%)
N	61	32 (53%)	29 (47%)
The relationship between Hb and gender			
Pearson Correlation	0.0678	0.480	0.072
P-value	0.000	0.922	0.041

(*P<0.05*) indicates a significant correlation between two factors.

(Table 3) shows the distribution of samples according to the general pallor. The results showed that account 12 students with pallor while 49 students, they have not pallor of all samples. Whereas the account male and female were 3 and 9 respectively, those regarding pale skin cases have seen in this survey. The relationship between hemoglobin level and general pallor among students, the results have shown that a significant (*P*<0.05) correlation between Hb level and pallor skin of all samples. Whereas, there is no significant *(P>0.05)* correlation regarding male and female samples. These findings are agreed to [7], stated that, since the majority of iron in the body is used for the synthesis of hemoglobin, the most important finding of iron deficiency is anemia. In iron deficiency anemia, clinical findings secondary to anemia may be found as in all anemias or the diagnosis can be made during laboratory investigations in the absence of any clinical finding. This paleness in people with iron deficiency can appear all over the body, or it can be limited to one area, such as the face, gums, inside of the lips or lower eyelids and even the nails[9].

(Table 3) Distribution of Hb level and General pallor between samples.

General pallor	All Sample	Male	Female
	Frequency	Frequency	Frequency
No	49	29 (60%)	20 (40%)
Yes	12	3 (30%)	9 (70%)
N	61	32 (53%)	29 (47%)
The relationship between Hb and General Pallor			
Pearson Correlation	0.384	0.232	0.363
P-value	0.002	0.202	0.053

(*P<0.05*) indicates a significant correlation between two factors.

(Table 4) shows the distribution of samples with the pale-colored inside lower eyelids, so the results showed that about 10 students, those who have pale inside eyelid compare to other populations have normal color inside lower eyelids. The low proportion of female, who have pale-colored inside lower eyelids compared with a female, who have normal color inside lower eyelids. The results of this study revealed that, there is a significant (*P*<0.05) correlation between hemoglobin level and pale-colored inside lower eyelids among all samples of the study population. Whereas, a significant difference (*P*<0.05) between hemoglobin level and pale-colored inside lower eyelids among the

samples of female but a no significant *(P>0.05)* between hemoglobin level and pale-colored inside lower eyelids among the samples of the male in the current study. This finding is closed to that pale skin and pale coloring of the inside of the lower eyelids are other common signs of iron deficiency anemia[10].

(Table 4) Study of pale-colored inside lower eyelids in the study samples

Pale inside lower eyelids	All Sample	Male	Female
	Frequency	Frequency	Frequency
No	51	30 (60%)	21 (40%)
Yes	10	2 (20%)	8 (80%)
N	61	32 (53%)	29 (47%)
The relationship between Hb and pale-colored inside lower eyelids			
Pearson Correlation	0.317	0.380	0.042
P-value	0.013	0.827	0.032

(*P<0.05*) indicates a significant correlation between two factors.

(Table 5) shows the distribution of mouth soreness among the study population. The results showed the majority of students haven't mouth soreness, only 7 students have complained from the soreness of the mouth, but the majority of male and female, those who haven't mouth soreness. Whereas, the result revealed that there is no significant *(P>0.05)* correlation between hemoglobin level and mouth soreness among all populations study. This finding agreed with that, low hemoglobin in iron deficiency case can cause the tongue to become pale, while lower levels of myoglobin can cause it to become sore, smooth and swollen. A sore, swollen or strangely smooth tongue can be a sign of iron-deficiency anemia. Cracks on the corners of the mouth can also be a sign[11].

(Table 5) distribution of Mouth Soreness among the study population.

Mouth Soreness	All Sample	Male	Female
	Frequency	Frequency	Frequency
No	54	28 (52%)	26 (48%)
Yes	7	4 (57%)	3 (43%)
N	61	32 (53%)	29 (47%)
The relationship between Hb and Mouth Soreness			
Pearson Correlation	0.032	0.089	0.053
P-value	0.807	0.629	0.784

(*P<0.05*) indicates a significant correlation between two factors.

(Table 6) shows the distribution of samples according to dizziness occurrence. The results showed the 22 students have been complained from dizziness occurrence when the majority of students were no feeling with dizziness during the study day. The majority of males haven't dizziness occurrence compared to the majority of females, those who have been complained from dizziness occurrence during a day. Whereas, the result revealed that there is no significant correlation between hemoglobin level and dizziness occurrence

among all students in this study. Headaches and dizziness could be a sign of iron deficiency. The lack of hemoglobin means not enough oxygen reaches the brain, causing its blood vessels to swell and create pressure[12].

(Table 6) Samples distribution of Dizziness occurrence.

Dizziness	All Sample Frequency	Male Frequency	Female Frequency
No	39	26 (67%)	13 (33%)
Yes	22	6 (29%)	16 (71%)
N	61	32 (53%)	29 (47%)
The relationship between Hb and Dizziness			
Pearson Correlation	0.245	0.097	0.070
P-value	0.057	0.599	0.720

(P<0.05) indicates a significant correlation between two factors.

(Table 7) shows the distribution of samples according to breath shortness. The results showed the 20 students have complained of breath shortness when the majority 41 of students were not complained, but the majority of a male were no complained with breath shortness compared to 11 females in the same case. Whereas, the result appeared there is no significant *(P>0.05)* correlation between hemoglobin level and breath shortness among all populations in this study. Shortness of breath is a symptom of iron deficiency anemia since low hemoglobin levels mean the body isn't able to transport oxygen to muscles and tissues effectively. This means your muscles won't get enough oxygen to do normal activities, such as walking[13].

(Table 7) Shortness of breath among study population.

Shortness	All Sample Frequency	Male Frequency	Female Frequency
No	41	23 (55%)	18 (45%)
Yes	20	9 (45%)	11 (55%)
N	61	32 (53%)	29 (47%)
The relationship between Hb and shortness			
Pearson Correlation	0.139	0.026	0.257
P-value	0.284	0.888	0.179

(P<0.05) indicates a significant correlation between two factors.

(Table 8) the results showed that the 29 of students have been complained from headache occurs when the 32 students have not complained, but the majority of a male was not complained about headache occurrence compared to majority 69% of female proportion, those who have been always complained from headache occurrence during the study. Whereas, the result indicated that there is no significant *(P>0.05)* correlation between hemoglobin level and headache occurrence among all populations in this study. The finding of the current study agreed that in iron deficiency cases, low levels of hemoglobin in red blood cells mean that not enough oxygen can reach the brain. As a result, blood vessels in the brain can swell, causing pressure and headaches[12].

(Table 8) Distribution of study population with of headache occurrence.

Headache occurrence	All Sample Frequency	Male Frequency	Female Frequency
No	32	23 (70%)	9 (30%)
Yes	29	9 (31%)	20 (69%)
N	61	32 (53%)	29 (53%)
The relationship between Hb and Headache			
Pearson Correlation	0.220	0.087	0.084
P-value	0.089	0.634	0.666

(P<0.05) indicates a significant correlation between two factors.

In (table 9) the results appeared that the 26 students have complained from anorexia when the 35 students were normal appetite, the majority 72% of male was no anorexia compared to majority 59% of female proportion those who have been complained from anorexia during this survey. Whereas, the result revealed there is no significant *(P>0.05)* correlation between hemoglobin level and anorexia among all populations in this study. But anorexia may be related to body weight. Anorexia is an eating disorder characterized by significant and potentially health-affecting weight loss. People with anorexia voluntarily refuse to eat because they are continually concerned about their weight. The present study findings tended with that IDA is the most popular type of anemia and can occur in those with the eating disorder anorexia[14].

(Table 9) Distribution of Anorexia among the study population.

Anorexia	All Sample Frequency	Male Frequency	Female Frequency
No	35	23 (66%)	12 (44%)
Yes	26	9 (35%)	17 (65%)
N	61	32 (53%)	29 (47%)
The relationship between Hb and Anorexia			
Pearson Correlation	0.219	0.098	0.164
P-value	0.089	0.595	0.395

(P<0.05) indicates a significant correlation between two factors.

(Table 10) shows the distribution of heartbeat disorder in the study population. The results showed the majority 74% of students were normal heart beating, when the 26% of students have complained about heat beat disorder, so among gender group the majority 94% of male and 52% of female proportion, those who have normal heart beating but considerable proportion 48% of female, who have been heartbeat disorder. Whereas, the result revealed that there is a significant *(P<0.05)* correlation between hemoglobin level and heartbeat disorder among all population in this study. The results of the present study matched to that, in cases of iron deficiency, the heart has to work extra hard to transport oxygen around the body. This can lead to irregular or fast heartbeats and even heart murmurs, an enlarged heart or heart failure[15].

(Table 10) distribution of study population according to Heart Beat Disorder.

Heartbeat Disorder	All Sample Frequency	Male Frequency	Female Frequency
No	45	30 (78%)	15 (22%)
Yes	16	2 (12%)	14 (88%)
N	61	32 (53%)	29 (53%)
The relationship between Hb and Heart Beat Disorder			
Pearson Correlation	0.390	0.001	0.196
P-value	0.002	0.995	0.309

(*P<0.05*) indicates a significant correlation between two factors.

Conclusion and Recommendations

In this study, concluded that the prevalence of IDA among nursing and health sciences students have been measured using several assessment methods, also found a substantial prevalence of low hemoglobin levels was 16% as general. Greater proportion of female was suffering from low Hb level rather than that in male, which considered mild IDA should be appreciated according to the WHO criteria represents an 'anemia classification'. In addition, in this study found a substantial prevalence of clinical symptoms as breath shortness, dizziness, headache and heartbeat disorder. Physical signs such as general pallor, mouth soreness, pale-colored inside lower eyelids have appeared among IDA suffering students. There was evidence concerning the significant correlation between sex and IDA in students. Correspondence to our study, data from Yemen and India found a higher prevalence of IDA in girls than boys.

Anemia treatment plans often include improve dietary patterns and change eating behavior. The best diet plan for anemia includes intake foods rich in iron and other vitamins essential to hemoglobin and red blood cell production. It should also include foods that help your body absorb iron better such as animal products. It is preferable to perform a periodic detection every 6 months for the early detection and treatment of anemia before the condition.

Conflict of interest:

The authors have declared no conflict of interest and that they are solely responsible for the content and writing of the manuscript.

Author's Contribution:

Ayman Mustafa and Salem Elwahaishi: Designing of research, formulation of the plans and supervision. Ayman Mustafa and Fatima Ageel: Collection of data, performed the field experiments and Lab work. Abdalla Elgenaidi: statistical analysis of data and literature citations. Ahmed Elhamroush and Salem Elwahaishi: Helped in writing and reviewing the manuscript. All authors critically reviewed the data and the manuscript.

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