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The Effect of Developing and Implementing Health Education and Nutrition Training Program on Self-Management Practices among Patients with Iron Deficiency Anemia, Alexandria Main University Hospital, Egypt

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Abstract

Iron deficiency anemia (IDA) is most common nutritional deficiency disorder in Egypt and remains a formidable health challenge. Females in the reproductive period are prone to develop iron deficiency. Iron deficiency leads to many non-hematological disturbances which include growth and development, depressed immune function; reduces physical work capacity; decreases the cognitive function. Many researches consistently demonstrate that many patients with iron deficiency anemia do not have a solid understanding of basic information about their condition - how it is diagnosed, iron deficiency anemia high risk population, causes of iron deficiency anemia, the purpose and potential side effects of iron deficiency anemia medications, safety concerns, the risks and potential consequences of iron deficiency anemia. Patient education is an important component of quality care and is considered to be a therapeutic outcome for patients with iron deficiency anemia. **Aim:** the present study was aimed to: assess the effect of developing and implementing health education and nutrition training program on self-management practices among patients with iron deficiency anemia. **Method:** A cross-section in design conducted was conducted by using a self-designed standardized pretested questionnaire. IDA educational program was implemented and after 3 months post- test and Hb level were measured. **Results:** 91% women and 9 % male were surveyed for Iron Deficiency Anemia educational program. 56.0% of women had a poor knowledge of causes of IDA. There was a statistical significant differences between the pre-test and post-test of total score of patients' knowledge (t= 63.848 P= 0.000). , there was highly statistically significant differences between pre/post program implementation in hemoglobin level (P < 0.00). **Conclusion:** Awareness regarding IDA is directly linked with the educational and social status of a community and is found to be increasing with the passage of time with exploration and accessibility to media and health care facilities. Women of younger ages are more concern about their own health and much careful about their expected babies in terms of nutritional facts as compared to the elder ladies.

Keywords: ***Health Education Program, Self-Management Practices, Iron Deficiency Anemia.***

INTRODUCTION

Iron deficiency anemia occurs when iron deficiency is sufficiently severe to diminish erythropoiesis and causes the development of anemia. Iron deficiency is the most prevalent single deficiency state in the world. "IDA is currently estimated to affect more than 500 million people" around the world.[1-3] The main cause of high prevalence of iron deficiency is nutritional inadequacy owing to low socioeconomic conditions. Women bear the main burden of iron deficiency as it is more common among premenopausal women. Iron deficiency anemia was found in 72.7% of anemic women".[2] Nowadays, the most common intractable nutritional problem worldwide is anemia; whereas nearly 2 billion have hemoglobin concentration below the recommended average level.[4,5] There are many predisposing factors that enhance the occurrence of anemia as dietary iron deficiency, parasitic infestations, infectious diseases such as malaria, deficiencies of important micronutrients as folate, vitamin B12 and vitamin A, or other inherited conditions that affect red blood cells (RBCs), such as thalassemia.[6-8]

Recent evidences[5-10] show that young adults especially females are at an increased risk of developing anemia. This could be contributed to an increase in their iron demand during puberty, excessive menstrual losses (due to polymenorrhea and menorrhagia), and insufficient dietary iron intake (especially of animal origin) and faulty dietary habits.[3,4] The World Health Organization (WHO) global estimates of anemia prevalence averaged 56%, with a range of 35-75% depending on the geographic location. Anemia affects approximately 30-55% of young adults all over the world.[4] WHO estimated that 150 million

individuals in the Eastern. Mediterranean region suffer from some type of anemia.[11] South Asia has the highest prevalence of anemia in the world, which is attributed to high rates of malnutrition. One study[4] showed that the prevalence of iron deficiency anemia among female university students was 23.9 %.[7] Overweight and obesity are major public health problems.[12-14] Women in their reproductive years have a particular high demand for haemopoiteic nutrients. During pregnancy, iron requirements exceed storage iron for most women. The increased need by the body for iron is due to increase in the red cell mass iron needs of the fetus and iron losses during delivery (WHO, 1992). In non-pregnant state or during lactation, regular menstrual losses, malaria and parasitic infestation such as hookworm are also important causes *(Ibid.)*. In Sub-Saharan Africa an estimated 42 percent of women aged 15 to 45 years are anaemic with a prevalence of more than 50 percent during pregnancy. Anemia in women of childbearing age is associated with an increased risk of complications during pregnancy such as; abortions, premature deliveries, low birth weight and causes infants to enter life with sub-optimal iron stores (FAO; 1997a).

Adolescents and sickle cell patients are among those at risk for anemia. Changes associated with puberty such as increased growth of the body tissues and hence of the body mass in boys and menarche in girls make them more vulnerable (Milman *et al*, 1999). Sickle cell patients are at increased risk due to repeated sequestration of the red blood cells and other crisis during their lifetime. However, folic acid deficiency is the main problem rather than iron deficiency. Anemia in the elderly though hasn't attracted much attention, is significantly high. Some studies (Izaks *et al*, 1999) have demonstrated association of increased mortality risk in the elderly due to anemia. Generally, anemia in adults reduces their working capacity both physically and mentally (Howson et al, 1998; FAO, 1997a).

Obesity is considered as a leading preventable cause of death worldwide.[15] According to WHO, obesity is more common among women than men.[10] Faulty feeding habits could be attributed to the occurrence of iron deficiency anemia among young adults. The most prevalent habits accustomed in this age group include changing the main meals for snacks, skipping breakfast, reducing the intake of fruits and vegetables, and the increasing consumption of sodas and high calorie foods.[16-20] These habits can result in iron deficiency and increase the risk of obesity.[15] Iron deficiency anemia was more encountered in many studies among overweight and obese adults,[15,17] and also among overweight children, adolescents and young adults.[18,19] others prove an inverse relationship between hemoglobin level and BMI.[13]

Quality of life is worse in patients with IDA than in the general population. Quality of life for patients with IDA is negatively affected by higher physical morbidity rates, and iron drug side effects, Furthermore, it may be reduced by higher psychological problems which include anxiety and depression, lower self-esteem, increased helplessness, defensive aggressiveness, poorer academic achievement and higher unemployment or under-employment.[21-23] Self-management strategies related to IDA control for adults produce significant gains in overall wellbeing and condition adaptation. Furthermore, they are likely to experience a good health perception and a sense of mastery over their condition.[21] Educational programs can add considerably to improved personal coping, better treatment tolerability and personal resilience. Education related to living with IDA can enhance self-management and facilitate better lifestyle choices for people with IDA; however the mode of education needs to be taken into consideration so that it suits the needs of the individual.[24] The content of these education modules have a special focus on helping people with IDA y gain a better understanding of their condition and improving capabilities in self-management. Receiving specific IDA self-management education lead to improvements in quality of life and well-being.[25]

Nurses play a pivotal role in educating patients with IDA. Education for people with IDA and their families plays an important role in developing self-confidence, and becoming competent in self-management, which entails being aware of one's own needs and being able to access resources to meet those needs. Obtaining requisite knowledge and skills related to e IDA and its management can also promote optimal well-being and quality of life for people with IDA and their families.[26] Going with this context, this study will be conducted to determine the effect of health education program on self-management practices level and quality of life in patients with IDA.

AIM OF THE STUDY

The present study was aimed to: Assess the effect of developing and implementing a health education and nutrition training program on self-management practices among patients with iron deficiency anemia

RESEARCH HYPOTHESES

To fulfill the aim of this study the following hypotheses will be formulated:

1. Adult patients with iron deficiency anemia who receive health education exhibit higher knowledge mean scores than those who do not receive it.
2. The developed health education and nutrition training program will contribute a significant improvement in the level of self-management practices among patients with iron deficiency anemia.

MATERIALS AND METHOD

Materials

Research design:

A cross-section in design conducted was conducted by using a self-designed standardized pretested questionnaire

Setting:

The present study was conducted at Alexandria Main University Hospital in medical wards and out patients Departments, Egypt.

Subjects:

- The Epi- info-7 program[27] was used to estimate the minimum sample size using " $n= z^2p (1-p) /d^2$ " by applying the following parameters:
    1. Population size of newly diagnosed with iron deficiency anemia over the year 2016 = 200
    2. Expected frequency =50%
    3. Acceptable error = 10%
    4. Confidence coefficient = 95%

- A convenient sample of 100 adult patients suffering from iron deficiency anemia were selected.

Inclusion criteria: Patients will be considered eligible to participate in the study if they met the following criteria:

1. Age group from 20 up to 60 years old.
2. Both sexes
3. Had a diagnosis of iron deficiency anemia for at least 6 months.
4. Able to communicate verbally.
5. Receiving standard treatment for iron deficiency anemia.
6. Patient has stable clinical condition at the time of assessment.
7. Not scheduled for surgery.

Tool of the study:

One tool was used for data collection.

Iron Deficiency Anemia Patient's Knowledge Structured Interview Schedule: This tool was developed in Arabic language by the researchers after thorough review of relevant recent literatures[3,7, 12-15] to assess patients ' knowledge related to iron deficiency anemia. It was consisted of two parts.

Part I:

A- Socio-demographic data; this part was used to collect data about patient's general characteristics; age, sex, residence area, marital status, level of education, occupation, income, and the level of education.

B- Patients' Clinical Data; this part was used to collect data about patient's history and clinical characteristics such as; duration of illness (Years), family history of iron deficiency anemia, patient's past medical history and history of previous surgeries.

Part II:

This part was developed to assess patients' knowledge related to iron deficiency anemia such as: meaning of anemia, factors precipitating iron deficiency anemia, signs & symptoms, complications, risks, medication side effects, Females were asked about menstruation as IDA precipitating factor.

Scoring system:

Patients' knowledge responses will be scored on 3 points Likert Scale; a score of 2 will be given to correct and complete answer, 1 score will be given to correct and incomplete answer, while 0 score will be given to wrong answer or don't know. Total score will be classified as the following:

- Those who have knowledge % score (> 75%) will be categorized as having good knowledge level.
- Those who have knowledge % score (50≤75%) will be categorized as having satisfactory knowledge level.
- Patients who have knowledge % score below (50%) will be categorized as having poor knowledge level

Method

1. Official permission to conduct the study obtained from the hospital directors and from the head of department to collect the data after explaining the aim of the study.
2. Piloting of the Data Collection Tool

2.1- Development of the Study Tools:

2.1 a- Iron Deficiency Anemia Patient's Knowledge Structured Interview Schedule was developed by the researcher after thorough review of recent relevant literature.[3,7,12-15,27-29] The developed tool was submitted to 5 experts specialized in the field of Medical Surgical Nursing, Alexandria University for testing its content validity, clarity, and comprehensiveness of it and the necessary modifications were done, accordingly.

2.1 b- The developed tool and health education booklet were submitted to 5 experts specialized in the field of Medical Surgical Nursing, Alexandria University for testing its content validity, clarity, and comprehensiveness of it and the necessary modifications were done, accordingly.

2.1 c- A pilot study was conducted on 8 patients to test clarity, feasibility of the developed tool, and necessary modifications were done.

2.1 d- Pre-testing of the tool was done in two health facilities for the purpose of ascertaining the sustainability of the questions in the local cultural setting. Evaluation was done on the content and flow of the questions and answers, acceptance, validity of the answers and time needed to complete the interview. Thereafter, the content and flow of the questions were modified and rearranged accordingly to facilitate easy comprehension.

3. Data Analysis

4.1 a Statistical Package for Social Sciences (SPSS) 26 for WINDOWS was used to analyses the data. A χ^2- test was used to analyses categorical variables for the difference. For continuous variables, student t-test was applied. Significance level was accepted when $p < 0.05$ and all *p*-values presented are two-tailed.

4. The study was carried out in four phases:

4.1- Assessment phase:

4.1 d- It was carried out using the developed tool to collect the baseline data and to identify patients' needs and knowledge for health education and developing the educational handout.

4.1 b- Hemoglobin level was measured by using (The *Insight*® Hb Haemoglobin) apparatus. The *Insight*® Hb Haemoglobin Testing System is intended for the quantitative determination of haemoglobin (Hb) and calculated hematocrite (Hct) in capillary and venous human whole blood. It provides results in less than 15 seconds and requires only a single drop of whole blood.

4.1 c- Primary data on knowledge, attitudes and practices among patients with anemia were obtained through a cross-sectional study in the intervention and control areas in October 2017. The study areas were among the sentinel districts for anemia surveillance. The intervention area was randomly selected among those patients where health education and nutrition training was provided to the patients.

4.2 Planning phase:

4.2 a Health education and nutrition training program was designed by the researchers based on assessment phase and recent review of literature (3, 7, 12-15, 20-22).

4.2 b- Illustrative colored educational booklet in simple Arabic language was developed by the researchers. It included clear, simple and brief explanation of the IDA.

4.2 c- The educational content was delivered in one session through face-to-face lectures. The educational content was divided into two parts.

The first part, was consisted primarily of education about the medical aspects of anemia, which including; components of blood, normal level of hemoglobin, meaning of anemia, causes of anemia, the different types of anemia, the signs and symptoms related to IDA and the diagnostic procedures related to anemia.

The second part included the self- management practices information related to diet rich iron, medication information.

4.2 d- After the development of this illustrated handout, it was submitted to the jury members to assure its content validity, clarity and completeness. Some modifications in content, sequence and order of instructions as well as wording of some statement were suggested by the experts and considered by the investigator in the final print out format. The development of the IDA Illustrated educational booklet required five months for its development and validity testing.

4.3 Implementation phase:

The participants in this phase received the educational program. Patient education and illustrated booklet were given to the patient and clearly explained by the researchers using simple language with consideration of his/her educational level. At the beginning of implementing the health education and nutrition training programme there was baseline data for the knowledge, attitudes and practices. In the presence of a baseline data the results were interpreting. Therefore, natural changes in knowledge, attitudes and practices have been observed.

4.4 Evaluation phase:

- Post-test was done for each patient to determine the impact of implementing the health education program on health related knowledge among adult patients with IDA. It **was** conducted after three months post implementation of health education program using tools I.
- Follow up for every patient was done after 3 months to evaluate the hemoglobin level by using the same apparatus.
- Data collection was carried out over nine months in the period from the beginning of December 2017 to the end of April 2018.
- The appropriate Statistical tests used to analyze the obtained data to determine the impact of implementing a health education program on self-management practices among adult patients with IDA.

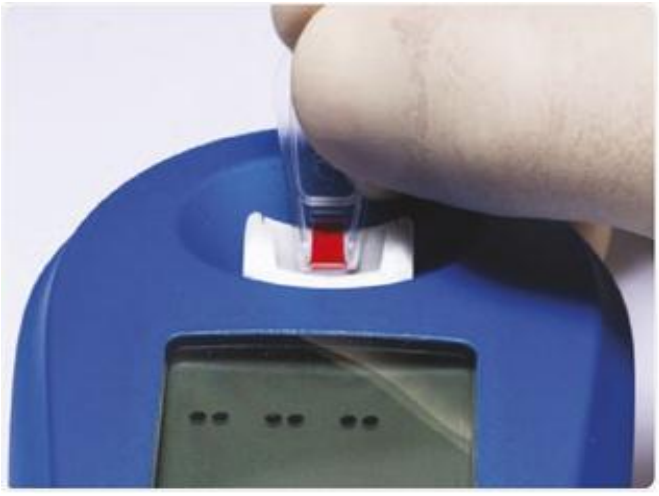
5- Laboratory Methods:

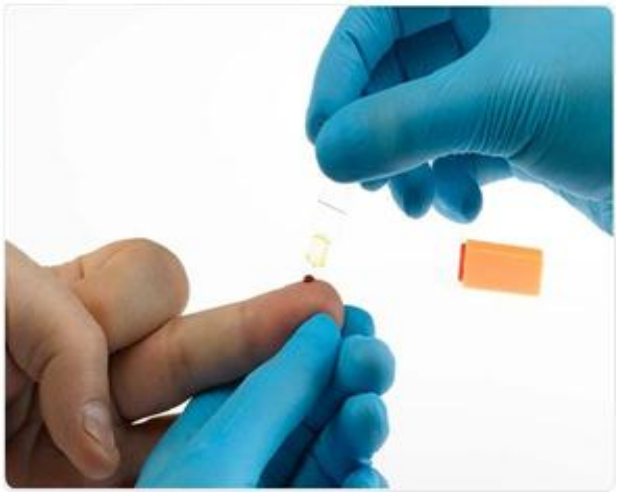
Data on Hemoglobin:

Secondary data for hemoglobin levels for patients were obtained. Data used in this study was collected twice, in the beginning of participation (pre implementation) and after three months (post implementation) through the anemia surveillance system.

6- Hemoglobin Measurements

Hb Hemoglobin Analyzer System method was used to determine the Hgb concentration using disposable lancets, a finger-prick is done, and blood samples collected in a disposable micropipette. Hb Hemoglobin Analyzer System stands out from its competitors in many ways. It offers a wider Hb measurement range of 5.6 to 23.5 g/dL; it provides hematocrit in percentage (%)





7- Intervention Strategies

Intervention strategies for improving iron status are basically grouped into two. These are the food-based strategies, which include fortification of foods with micronutrients and dietary diversification to increase production and consumption of foods rich in iron, vitamin C and folate. Health and nutrition education to

improve and ensure regular consumption of foods rich in iron, folate and vitamin C and to reduce consumption of interfering substances is also important for the prevention and control of anemia.

8- Ethical CONSIDERATIONS

Informed verbal consent was sought from the representatives of the communities and the households selected for the study. Explanation was given to the in charge of the health facility and the respondents from the household on the purpose of the study prior to the interview. Individuals who decided not to participate in the study were respected of their decision.

9- Limitations of the study:

9.1- Study Population

Hemoglobin levels were taken at the Alexandria Main University Hospital. Therefore, the results may only reflect a small segment of the population i.e. for only those who have come to the hospital.

9.2- Hemoglobin Measuring Technique

The measures hemoglobin concentration within seconds from a drop of whole blood without any need of electricity. Therefore, technical errors are more likely to occur may influence the results.

Findings on knowledge, attitudes or practices in this study should therefore be interpreted with caution.

9.3- Duration of implementation

As a result of increased duration of implementing the health education and nutrition training programme over three followed months some patients withdrawing after several sessions which leading to exclude them from the selected subjects thus leading to increase period of data collection.

Despite of the limitations outlined above, the findings obtained in this study we think can still reflect what is happening in these populations.

RESULTS

Table 1: Presents frequency distribution of IDA patients in relation to bio-sociodemographic characteristics.

Regarding patients' age, the results revealed that the highest percentage in both groups were among the age group 20 to less than 25 years, it was 63 % and the mean ± SD age was 25.07 ± 5.238 years. In relation to patients' sex, the highest percentages was female patients 91% .60% of patients were single and 66% were students.12% of IDA patients have gum bleeding and 13% of them took IDA medication. In addition, 95.0% of patients had no medical history and 88.0% of them had no gum bleeding. Regarding the duration of IDA 55.0% of patients had anemia form 6 to 12 months.

Table (1): Illustrates the Bio- sociodemographic Characteristics of the IDA Patients

Bio-sociodemographic data	No.	%
Age in years		
- 20-<25	63	63.0
- 25-<30	16	16.0
- 30-<35	11	11.0
- 35- 40	10	10.0
mean ± SD	25.07 ± 5.238	
Sex		
- Male	9	9.0
- Female	91	91.0
Marital Status		
- Married	40	40
- Single	60	60
Educational level		
- Secondary	8	8.0
- University	92	92.0
Occupation		
- Student	66	66.0
- Professional	11	11.0
- Clerk	12	12.0
- House wife	11	11.0
Medical history		
- No	95	95.0
- Allergy	5	5.0
Gum bleeding		
- No	88	88.0
- Yes	12	12.0
Duration of IDA		
- >6 months	40	40.0
- 6-12 months	55	55.0
- <1 year	5	5.0
IDA medication		
- No	87	87.0
- Yes	13	13.0

N = 100

Table (2): displays the relation between bio- sociodemographic characteristics and total score of pre - test regarding knowledge level of causes, symptoms and iron rich diet among IDA patients. Regarding patients' knowledge about the causes of anemia, 44.4 % of male and 56.0% of women patients had poor level of knowledge while 2.0 % of women had good knowledge. In addition, more than half of patients' who had university education had poor knowledge. In relation to symptoms of IDA anemia, 17.6 % of women have satisfactory knowledge while 11.2% of men have satisfactory knowledge. Also, all patients who had graduated from universities had poor knowledge of iron rich diet. It was observed that no a statistically significant difference between the sociodemographic data and total score of pre-test regarding causes, symptoms among IDA patients (P= 0.894 and P= 0.208) respectively.

Table (2): Displays the relation between Bio- sociodemographic Characteristics and Total Score of Pre - Test regarding Knowledge Level of Causes, Symptoms and Iron Rich Diet among IDA Patients.

	Knowledge level of causes								Knowledge level of symptoms								Knowledge level of diet							
	Unknown		Poor		Satisfactory		Good		Unknown		Poor		Satisfactory		Good		Unknown		Poor		Satisfactory		Good	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Age in years																								
20-<25 (n= 63)	17	26.9	33	52.4	12	19.0	1	1.6	23	36.5	30	47.6	10	15.9	0	0.0	0	0.0	63	100	0	0.0	0	0.0
25-<30 (n= 16)	6	37.5	8	50.0	1	6.3	1	6.3	3	18.8	10	62.4	3	18.8	0	0.0	0	0.0	16	100	0	0.0	0	0.0
30-<35 (n= 11)	4	36.4	6	54.5	1	9.1	0	0.0	3	27.3	7	63.6	1	9.1	0	0.0	0	0.0	11	100	0	0.0	0	0.0
35 - 40 (n= 10)	2	20.0	8	80.0	0	0.0	0	0.0	3	30.0	4	40.0	3	30.0	0	0.0	0	0.0	10	100	0	0.0	0	0.0
Test	FET= 7.104 P= 0.610								FET= 3.934 P= 0.702															
Sex																								
Male (n= 9)	3	33.3	4	44.4	2	22.3	0	0.0	4	44.4	4	44.4	1	11.2	0	0.0	0	0.0	9	100.0	0	0.0	0	0.0
Female (n= 91)	26	28.6	51	56.0	12	13.2	2	2.2	28	30.8	47	51.6	16	17.6	0	0.0	0	0.0	91	100.0	0	0.0	0	0.0
Test	FET= 1.531 P= 0.752								FET= 0.747 P= 0.724															
Educational level																								
Secondary (n=8)	3	37.5	4	50.0	1	12.5	0	0.0	1	12.5	4	50.0	3	37.5	0	0.0	0	0.0	8	100.0	0	0.0	0	0.0
University (n=92)	26	28.3	51	55.4	13	14.1	2	2.2	31	(33.7	47	(51.1	14	15.2	0	0.0	0	0.0	92	100.0	0	0.0	0	0.0
Test	FET= 0.946 P= 0.894								FET= 2.983 P= 0.208															

Table 3: Illustrates that 77.0 % of the patients had poor knowledge level about IDA medication, while 3.0% had satisfactory knowledge level before program implementation, which improved to reach 89.0% had good knowledge level, 1.0% had satisfactory level and 10.0% had poor knowledge level after program implementation. In addition, there was a statistically significant difference between mean score of knowledge pre and post the educational program (t= 28.806, P= 0.000).

Table 3: Illustrates the level Knowledge before and after the Educational Program regarding IDA Medications

Level of Knowledge about IDA Medication	Before Program (pre-test)		After Program (post-test)		Test
	No.	%	No.	%	t= 28.806
Unknown	20	20.0	0	0.00	P= 0.000
Poor knowledge	77	77.0	10	10.0	
Satisfactory	3	3.00	1	1.00	
Good	0	0.00	89	89.0	
Mean ± SD	1.060 ± 0.722		4.570 ± 0.934		

N= 100

Table 4**: illustrates the distribution** of IDA patients regarding total score of patient's knowledge level and Total mean percent before and after the educational program implementation. It was found that, all of patients had poor score of knowledge in pre-test, while post-test (89.0%) had good score. There was a statistical significant difference between the pre-test and post-test (t= 63.848 P= 0.000).

Table 4: illustrates the distribution of IDA patients regarding total score of patient's knowledge level and Total mean percent before and after the educational program implementation:

Level of Knowledge	Before program (Pre-test)		After program (Post-test)		Test
	No.	%	No.	%	
Poor knowledge	100	100.0	0	0.00	t= 63.848
Satisfactory	0	0.00	11	11.00	
Good	0	0.00	89	89.0	
Mean ± SD	11.93 ± 4.414		43.74 ± 3.915		P= 0.000
Mean percent ± SD	22.51 ± 8.328		82.53 ± 7.386		

N= 100

Table 5: Shows that, the mean of **hemoglobin level was improved** pre/post program (from 10.33 ± 0.500 to 12.11 ± 0.85 respectively) in male patients and (from 9.41 ± 0.794 to 10.43 ± 1.05 respectively) in female patients. In addition, there was highly statistically significant differences between pre/post program implementation in hemoglobin level (P < 0.00).

Table 5: shows the Hemoglobin level (Hb) before and after the educational program implementation:

Sex	Hemoglobin level			Test
		Hb level before	Hb level after 3 months	
Male	Minimum Maximum	9.50 mg/ dl 11.00 mg/ dl	10.00 mg/ dl 13.00 mg/ dl	t= 7.068 P = .000
	Mean ± SD	10.33 ± 0.500	12.11 ± 0.85	
Female	Minimum Maximum	8. 00 mg/ dl 11.00 mg/ dl	9.00 mg/ dl 13.00 mg/ dl	t= 17.835 P = .000
	Mean ± SD	9.41 ± 0.794	10.43 ± 1.05	

Discussion

Iron deficiency anemia is a common haematological and public health problem worldwide. The results of this study concluded that the knowledge of causes, symptoms and diet of IDA all patients have poor knowledge in the pre-test and there was no association between the level of knowledge and sociodemographic data and there was no association between them. This is congruent with Al-Qaoud et al (2015)[30] who stated that the prevalence of anaemia among preschool children differs according to the socio-demographic characteristics recorded but There was no significant sex difference observed in the prevalence rate of anemia. This may be due to the selected sample in the present study was different. In addition, a study conducted by (Mohamed et al., 2006)[31] the knowledge of iron rich foods was poor. Higher level of knowledge was observed in subjects with higher educational background (p<.001). (Kuar and Singh)[32] Carried out study in India to explore the effect of education on knowledge, attitude and practice of pregnant women showed that 93% of the educated women were in favour of including iron rich foods in their diet as compared to 67% in the group with no education (p< 0.001).

Our study clearly reflected that the level of knowledge of IDA patients before the educational program was poor. This could be attributed to many causes including culture beliefs, lack of health education and counselling by health team. In addition to, less than quarter of sample were unaware of knowledge regarding IDA medication and factors affecting the absorption of medication. This due to poor awareness related to the value of the iron and the importance of prevention of IDA. While after applying the educational program, most patients became had good knowledge level and there were statistically significant differences between pre and post- test regarding their knowledge and practice about IDA (p < 0.000). This is may be due to the participant's redness to promoting and maintaining their health status. In addition, that education seems to be critical in awareness regarding IDA. These findings was consistent with Casal et al (2011),[33] kain et al (2001)[34] and Kafatos et al (2004)[35] who emphasized that education is the most fundamental and permanent strategy to achieve changes in food habits and to obtain a balanced nutrition that required during the different life stages. Also, Mohamed et al (2016)[36] there was poor knowledge about folic acid among pregnant women and increase mean total knowledge scores after the educational program. So, there is need to increase the knowledge of females about the using and importance of folic acid in all setting of the community especially MCH centres. Furthermore, this study agree with Glagoleva et al (2015)[37] who reported that "positive changes in the structure of nutrition of study participants 12 months after the intervention: in relation to the initial level there was increased consumption of ascorbic acid and calcium in students, decreased consumption of animal fats in adults and students, there was noted a trend towards increased consumption of dietary iron (p = 0.059). The obtained results testify to the effectiveness of educational programs as a means for the improvement of the structure of the nutrition in different groups of the population and primary prevention of micronutrient deficiencies and diseases with dietary risk factors, including anemia."

As regard the haemoglobin level, there was improvement in the haemoglobin in male and female patients after the application of IDA educational program (p =0.000) which means the developed educational program IDA patients showed significant impact in the haemoglobin level as a result from a remarkable increase in the participants' level of knowledge regarding diet, dietary habits, medications and factors affecting the absorption of iron. This results was agree with the results of Al Hassan (2015)[38] who found that the mean of Hb was 9.8 g/dL in the university female students in the Saudi Arabia and recommended an implementation of Health programs targeting public awareness to improve the nutritional habits and quality and quantity of the diet health and nutritional status of the university students and focus on the improvement. Also, in the line of this result, Kamala et al (2009)[39] confirmed that an education program along with routine iron supplementation can improve haemoglobin levels and reduce anemia prevalence in pregnant women.

On the other hand , Moore et al (2009)[40] who applied the Self-care deficit nursing theory and examined the effect of a community-based nutrition education program on the nutritional knowledge, haemoglobin levels, and nutritional status of Nicaraguan adolescent girls and the nutritional knowledge of their mothers, found that there was no significant improve in the Girls' haemoglobin level but girls' and mothers' nutritional knowledge scores significantly improved in most cases after participation of the program. It is clear from the forgoing discussion that the IDA educational program was very effective in achieving post-test outcomes.

Conclusion and Recommendations

Findings of this study indicate that the observed high prevalence of anemia in the intervention area may partly be explained by lack of good knowledge on anemia among the majority of patients. Further, this may have led to poor practices for the prevention and control of anemia at community level In addition, the study points to the insufficient knowledge of patients about IDA in the pre-test. Based upon the results of the current study, the following recommendations are suggested; accordingly, relevant health education and nutrition training programs are needed. There is very urgent need for regular update courses for health workers concerning IDA. Overall an effective communication plan for prevention and control of iron deficiency anaemia (IDA) needs. Support for effective training, counselling and educational programme based on new national dietary guidelines for women and young children. The strategy should include use of the channels of the public health service, and the mass media for public education toward families to improve their food choices and meal composition in terms of good iron nutrition that are iron-rich and enhance iron absorption which are already common to their diet. Also, the message should be encouraging the compliance in the use of iron supplements. For further researches, evaluate the effect of educational program after 6 or 12 months to evaluate the retained knowledge regarding IDA. Therefore, there is a need for reviewing the health education and nutrition training programme, so that its future implementation can bring desirable change through improved knowledge among the patients, involvement of policy makers and active cooperation of the nurses.

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