World Journal of Nursing Sciences 5 (3): 117-126, 2019
ISSN 2222-1352

DOI: 10.5829/idosi.wjns.2019.117.126

Impact of Health Promotion Directive Based on Health Belief Model on Pregnant Women Diagnosed with Iron Deficiency Anemia

[1]Inaam Abdel-Ati, [1]Ebtesam E.L. Sayed Shama, [2]Zeinab Baraia, [3]Heba Magdy Sharaa and [3]Nadia Abdel- Latif Ali

[1]Department of Maternity, Obstetric and Gynecological Nursing,
Faculty of Nursing- Port Said University, Port Said, Egypt
[2]Department of Maternity, Obstetric and Gynecological Nursing,
Faculty of Nursing- Suez Canal University, Ismailia,, Egypt
[3]Department of Community Health Nursing-Faculty of Nursing- Cairo University, Cairo, Egypt

Abstract: Mothers during pregnancy are the most susceptible group of community to iron deficiency anemia. Iron deficiency anemia (IDA) is one of the main health problems in Egypt and other developing countries. As a result, many deaths occur in mothers and infants. So, caring for these groups is a very important issue that is reflected on family and community health. The aim of this study was to evaluate the impact of health promotion directive based on Health Belief Model on pregnant women diagnosed with Iron Deficiency Anemia. In this study a quasi-experimental study design was used (time series design) pre/post-test, two groups were studied (Control group & Study group), 120 pregnant women diagnosed with IDA were divided into two groups: study group (n=60) and control group (n=60). Pregnant women were selected from two family health centers. Data was collected by an interview questionnaire developed by the researcher based on the Health Belief Model to measure the knowledge and reported practice of pregnant women regarding IDA. Results displayed that there were significant differences ($P < 0.05$) observed in the study group for all HBM constructs. Regarding dietary behaviors of pregnant women, statistically significant improvements were found after program implementation ($p<0.001$). Also, a significant improvement was found in each group in relation to: eating habits & cooking practices of pregnant women, their reported practice and nutritional habits after program implementation ($p<0.001$).Conclusion: health promotion directive based on Health Belief Model had proper impact on pregnant women with IDA as it was effective in improving pregnant women knowledge and health behavior, improving women's nutritional performance habits and rising hemoglobin level that improve pregnant women general heath. The study recommended that, pregnant women should be provided with health promotion directive about Iron Deficiency Anemia based on HBM to improve their knowledge and promote their health.

Key words: Iron Deficiency Anemia · Health Belief Model · Pregnant Women

INTRODUCTION

Anemia is a global public health problem affecting two billion people worldwide. Almost half of all preschool children, pregnant women and close to one-third of non-pregnant women are anemic Worldwide [1]. It is reported that 56% of pregnant women in developing countries and 18% in developed countries are anaemic and in Africa, the estimated prevalence in pregnant women is 50-60% [2]. According to WHO, anemia is classified as mild degree (Hb 9.0-11.0 g\dl), moderate (7.0-9.0 g\dl) and severe (4.0-7.0 g\dl) [3]. The prevalence of iron deficiency in pregnancy varies from 20 to 90% depending on women with bleeding, 55% were found to be iron deficient. Iron deficiency anemia (IDA) is determined as hemoglobin values less than 11g/dl of blood.

Corresponding Author: Heba Magdy Sharaa, Department of Community Health Nursing-Faculty of Nursing, Cairo University, Cairo , Egypt.

Anemia resulting from failure to meet increased iron requirements during pregnancy, inadequate intake of iron, closely spaced births and infections that destroy red blood cells, interfere with red blood cell formation, increase blood loss and/or deplete nutrient uptake e.g. malaria, hookworm, HIV, diarrhea and others. IDA might cause intra-uterine growth retardation, pre-term delivery and peri-natal mortality and morbidity, sore tongue, fragile nails and headache, as well as sense of tired and less energy, pale skin, gums, nail beds, eyelid linings, rapid heartbeat, Irritability, weakness, breath shortness, low blood pressure when compared with non-anemic pregnant women, so all anemic pregnant women should have iron supplementation to correct anemia by oral or parenteral iron that can be continued for 3 months [4].

Health promotion is the process of enabling people to increase control over and to improve their health. It moves, beyond a focus on individual behavior towards a wide range of social and environmental interventions**.** The Health Belief Model (HBM) illustrates the relationship between beliefs and health and it is based on the hypothesis that preventive health behavior consists of personal beliefs used to understand health behavior and possible reasons for non-compliance with recommended health actions, which can provide guidelines for program development allowing planners to understand and address reasons for noncompliance [5, 6].

Changes in behavior according to Health Belief Model (HBM) are based on six components: perceived susceptibility: the belief that one is susceptible to the problem, perceived severity: the belief that a health problem is serious, perceived benefits: the belief that changing one's behavior will reduce the threat and perceived barriers: a perception of the obstacles to changing one's behavior. "Readiness to act" (cues to action): which explain the individual's readiness to act and stimulate one's own behavior. The final component is self-efficacy, which means: one's confidence in the ability to successfully perform an action and change behavior [7].

Nurses, who are working in primary health care settings and family health centers, play a very vital role in promoting health during pregnancy. The nurse's role within the aspect of health promotion has shifted from a disease model to a health model. The most important role is figured in teaching the pregnant women the importance of routine iron supplementation and frequency measuring the hemoglobin level. The other crucial role is instructing and informing the mothers about the importance of maintaining health during pregnancy especially those related to nutritional aspects and change their eating habits and practices that contribute to nutritional deficit [8].

Maternal mortality is one of the important indicators of quality of health services in community and anemia during pregnancy is one of the important causes for maternal mortality which contributed to 22,000 maternal deaths [9]. Anemia has been known to be associated with low birth weight, premature delivery, intra uterine growth retardation and thus increased peri-natal mortality [10]. Considering the importance of the problem of iron deficiency anemia in pregnant women, the **aim** of the current study was to evaluate impact of health promotion directive based on Health Belief Model on pregnant women diagnosed with Iron Deficiency Anemia.

MATERIALS AND METHODS

Design: A quasi-experimental study design was used (Time series design) pre/post-test; two groups are studied (Control group & Study group).

Setting: The present study was carried out in two Mother Child Health Care Centers (Family health centers) in Port Said city, Egypt, namely Osman Ibn –Afan and El Arab Fist. These centers were selected from 20 primary health care centers representing the six districts of Port-said. These centers receive pregnant women daily from 9 am to 2 pm; the pregnant women are registered (New and recurrent cases), tested for the hemoglobin level, perform abdominal ultrasound and are given an appointment to the following visit.

Sampling: A purposive sample of 120 pregnant women from the previously mentioned settings, who attended for antenatal follow-up during the time of data collection were included in the current study. Women of pilot study (12) were included in the sample. The inclusion criteria included the following: pregnant women in the first or second trimester of pregnancy (Gestational age of 3-4 months), normal pregnant women, her HB levels are less than 10 g/dl and who are willing to participate in the study. Women were excluded from the study if they were experienced pregnancy complications as bleeding, high blood pressure during pregnancy, or any other disease that interfere with iron metabolism. The sample was randomly divided into an intervention (60) and control (60) group. The minimum sample size using power = 90, □0.05 was obtained in each group

Tools: Data was collected by a structured interviewing questionnaire sheet based on HBM. The questionnaire was developed by the researcher to measure the knowledge and reported practice of pregnant women regarding IDA. It consisted of two sections:

Section (1): Socio demographic data such as (age, educational level, occupation, income and telephone number).

Section (2): It is composed of 2 parts: **A-** Knowledge of the studied women regarding Iron Deficiency Anemia and its prevention. It was adopted from Padmavathi and Hephzibah [11]. This part was used before and after implementation of the program based on the Health Belief Model which included 20 questions about knowledge about anemia (As its meaning, signs and symptoms, causes, high risk group, complications, effect on pregnancy, treatment and prevention of anemia).

Scoring for Knowledge Part: For each knowledge question, a correct response was scored 2 and the incorrect 1 (Satisfactory knowledge for complete answer and unsatisfactory knowledge for incomplete answer & don't know). Knowledge was considered unsatisfactory: if the percent score was less than 60% and satisfactory: if the percent score was = 60%.

Health Belief Model Constructs: This part is composed of two sections: **Section (1):** Composed of the main four HBM constructs: perceived risk of IDA (Four items), perceived susceptibility to IDA (Five items), perceived benefits of preventing anemia (Six items), perceived barriers of preventing anemia (Six items), self-efficacy to perform anemia prevention (7 items) and cues to action of preventing anemia (Six items).

Scoring of this Part: The answers to the questions about each of the above mentioned constructs and the nutritional preventive behaviors of anemia were recorded on a Likert scale rating from 1 to 3(Agree, no idea and disagree), accordingly, each of the options was scored as follows: "Agree" was scored 3 points, "no idea" was scored 2 points and "Disagree" was scored 1 point. The total score for the main four HBM constructs of a participant was calculated by the addition of the total score of all sections and classified as the following:

- High ≥ 75 %
- Moderate 50-75
- Low < 50%

Section 2: Composed of the dietary preventive behaviors of anemia (With 12 questions) regarding anemia preventive behavior.

Scoring of this Section: For each behavior, the positive response scored (2) and the negative response scored (1). The total behavior score was calculated by adding the scores for the positive one and classified as the following:

- Satisfactory ≥ 60 % of total knowledge score.
- Unsatisfactory < 60% of total knowledge score.
- Training classes included two sessions of approximately two-hour duration (9-11am) (Based on readiness of mothers). By health promotion directive we mean health education sessions that is created by the researcher including knowledge about IDA, how to prevent it during pregnancy and reported practice regarding healthy diet behavior during pregnancy.
- The researchers developed power point presentation about anemia based on HBM with simple Arabic language to suit women' level of understanding based on the needs identified in the assessment phase from the intervention group. Also, a review of related literature and the conclusion& recommendations of relevant studies were done by the researchers. All of the education sessions were conducted by the researchers who had adequate experience in the field of health education and full understanding of this mode of delivery. At the beginning of the classes, a question and answer session was conducted for the initial survey of the women's knowledge, which was followed by a lecture, presentation of training booklet and then group discussions. All participants were followed up by the researcher for 3 months and one month later, both groups were re-evaluated by questionnaire. After final evaluation, mothers in the control group were given one day of training and received an educational brochure.

Statistical Analysis: Data collected and analyzed using SPSS software, version 20. After data manipulation was done all numeric data were expressed in the form of range (Minimum to maximum), mean and standard deviation (SD). Categorical data were expressed in the form of frequencies and percentages. Independent sample t test: which was used to compare between the means of two normally distributed independent groups, respectively and the Chi-square test was used for categorical variables to test the association between the variables. Moreover, correlation between the model variables was calculated by

applying linear correlation and calculation of Pearson's correlation coefficient. Statistical significance was considered at the 5% level.

RESULTS

Generally, all of 120 pregnant females completed the study and the response rate was 100%. The mean age of the study 26.84±4.39, compared to those in the control group mean age of 26.24±4.32. Meanwhile, more than one third and one fourth of the study and control groups had secondary level of education (32.3% vs. 25.6% respectively) and they were mostly housewives (65.6% vs. 0.0% respectively). Moreover, most of them had an income that met their life expenses and were living in rural areas (37.8%, 20.0% vs. 33.0%, 40.0% respectively). There were no significant differences between the intervention and the control groups in regard to their demographic characteristics.

Concerning women's obstetrical history, more than three fifths of women in both the study and control groups (63.3% vs. 61.1% respectively), have been pregnant for two or three times, with no statistical significant difference. Meanwhile, the majority of the studied women had short interval (<2 years) between the current pregnancy and the previous delivery (70.3% vs. 67.7% respectively). Furthermore, a sizable proportion in both the study and control groups did not use any contraceptives (28.9% vs. 31.1% respectively).

Concerning current pregnant data at the first visit indicates that the majority of women in both the study and control groups had their gestational age between 12-14 weeks (81.0% vs. 68.0% respectively). The table also shows that 16.7% of women in the study group were exposed to threatened abortion compared to 10.0% in the control group. Moreover, almost half of women in the study group were overweight and obese (22.0%) compared to 20.0% in the control group.

Table (1) demonstrates the positive mean level of women awareness about IDA in the study and control groups throughout intervention phases. Significant differences $P < 0.05$ were observed in the study group for all HBM constructs, whereas no significant differences occurred in the control group ($p > 0.05$).

Fig. 1 displays the mean score of total women perception about IDA throughout the intervention phases. It points to statistically significant improvements in the study group at the post-test from 39.2±2.9 to 49.0±2.4 compared to women in the control group (37.9±3.3 to 38.3±2.9 respectively), with statistically significant difference (P=0.001*).

Table (2): shows that pregnant women in the study group became more compliant to take iron therapy after the implementation of the program during the second and third visits compared with the control group with statistically significant difference (P=0.001*). They showed regular taking of medication during the second visit (94.1% vs. 18.0%) and third visit (96.0% vs. 30.5%).

Table 1: Pregnant women's awareness regarding IDA according to the difference between subscale scores of food HBM constructs through study phases (n=120)

	Study n=60		Control n=60	
	Mean±SD		Mean±SD	
	Pre	Post	Pre	Post
Perceived risk of iron deficiency anemia	9.82±2.34	18.64±1.49	10.9±2.1	11.2±1.8
P+	<0.001*		0.4025	
Perceived susceptibility to iron deficiency anemia	7.32±1.24	8.52±1.36	5.6±0.8	5.8±0.8
P+	<0.001*		0.1735	
Perceived Benefits	10.0±0.0	23.4±0.4	10.1±0.5	10.2±0.6
P+	<0.001*		0.3233	
Perceived Barriers	22.88±2.0	28.7±1.5	22.6±1.1	22.9±1.2
P+	<0.001*		0.1561	
Self-Efficacy	4.0±0.0	8.2±1.0	3.7±0.8	3.8±0.9
P+	<0.001*		0.5213	
Cues to Action	4.3±1.2	9.6±1.3	4.2±1.3	4.3±1.4
P+	<0.001*		0.6859	
Total perception regarding IDA	32.2±3.6	48.3±2.1	31.7±4.9	31.9±1.6
	<0.001*		0.525	

P+: P value of Paired t-test * $P < 0.05$ (Significant)

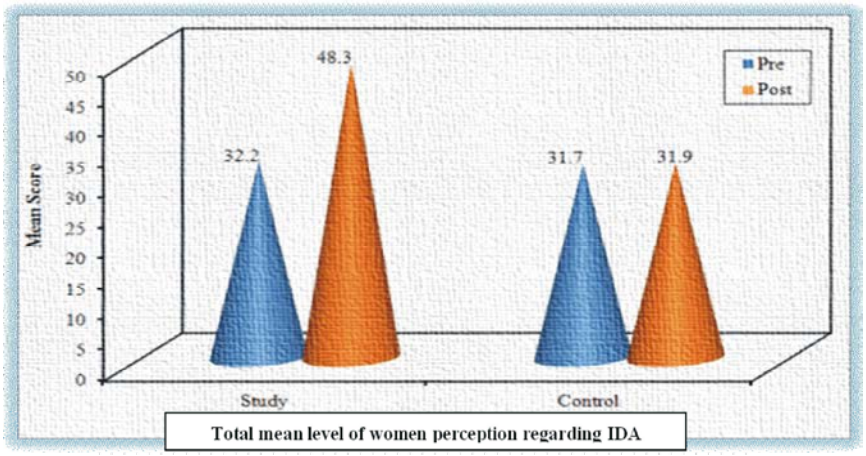

Fig. 1: Total mean scores of women perception regarding IDA in the study and control groups throughout intervention phases

Table 2: Compliance to health promotion directive in the study and control groups throughout intervention Phases (n=120)

Compliance to health promotion directive	Pre-intervention		2nd Visit		3rd Visit	
	Study	Control	Study	Control	Study	Control
Use of iron supplements	18.8±3.6	20.7±6.8	96.4±3.4	21.2±2.6	100.0±0.0	38.9±1.9
P	0.058		<0.001*		<0.001*	
Regular taking of iron	10.3±2.6	18.0±4.1	94.1±6.4	18.0±1.1	96.0±8.1	30.5±3.4
P	<0.001*		<0.001*		<0.001*	
Following diet regimen	5.0±3.9	6.6±4.7	51.0±5.9	8.5±1.1	77.8±5.7	9.0±0.19
P	0.045*		<0.001*		<0.001*	
Attended regular health teaching classes	22.0±8.6	25.0±8.5	77.8±6.7	40.3±2.6	92.4±6.9	47.3±4.9
P	0.057		<0.001*		<0.001*	

P+: P value of Paired T-test * P < 0.05 (Significant)

Table 3: Nutritional habits among studied women Pre- Post application of Program (n=120)

Variables	Study group %		Control group%		*P*1	*P*2
	Pre	Post	Pre	Post		
Eating balanced diet rich in iron						
▪ Satisfactory (Always)	8.3	73.3	8.3	8.3		
▪ Unsatisfactory(Never & Sometime)	91.7	26.7	91.7	91.7	<0.001*	1.000
Eating plant and animal proteins						
▪ Satisfactory (Always)	8.3	73.3	8.3	8.3		
▪ Unsatisfactory(Never & Sometime)	91.7	26.7	91.7	91.7	<0.001*	1.000
Eating row green vegetables& fruits daily						
▪ Satisfactory (Always)	20.0	93.3	21.7	23.3		
▪ Unsatisfactory(Never & Sometime)	80.0	6.7	78.3	76.7	<0.001*	0.822
Drinking tea or cola with meal						
▪ Satisfactory (Never)	13.3	95.0	15.0	16.7		
▪ Unsatisfactory (Always & Sometime)	86.7	5.0	85.0	83.3	<0.001*	0.793
Preferring salty food as salty fish and Pickles						
▪ Satisfactory (Never)	32.3	80.0	6.7	6.7		
▪ Unsatisfactory (Always & Sometime)	66.7	20.0	93.3	93.3	<0.001*	1.000
Eating chips and chocolate more than fruits						
▪ Satisfactory (Never)	6.7	93.3	8.3	6.7		
▪ Unsatisfactory (Always & Sometime)	93.3	6.7	91.7	93.3	<0.001*	1.000

p_1: p value for Chi square test for comparing between pre and post in study group p_2: p value for Chi square test for comparing between pre and post in control group *: Statistically significant at $p \leq 0.05$

Table 4: Total cooking practices &eating habits Pre- Post application of Program

	Study group %		Control group %			
(reported variables)	Pre	Post	Pre	Post	*p1*	*p2*
<60% Unsatisfactory	90	33.3	91.7	90.0	<0.001*	0.752
≥60% Satisfactory	10	66.7	8.3	10.0		

p_1: p value for Chi square test for comparing between pre and post in study group p_2: p value for Chi square test for comparing between pre and post in control group *: Statistically significant at $p \leq 0.05$

Table 5: Mean Hb level among study and control groups through study stages

	Study group (n = 60)			Control group (n = 60)		
Hemoglobin level	Pre	End of 2nd Trimester	During 3rd Trimester	Pre	End of 2nd Trimester r	During 3rd Trimester
Mean±SD.	9.20±1.27	10.88±0.76	11.8±0.7	9.69±0.63	9.77±1.12	9.89±1.02
F(p)		115.778 (<0.001*)			0.678 (0.509)	

* P < 0.05 (significant F: adjusted P value of Repeated measures ANOVA

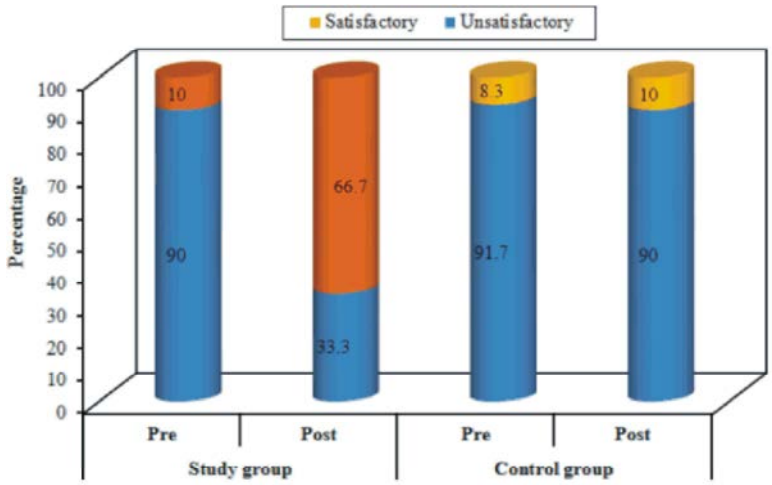

Fig. 2. Total cooking practices &eating habits Pre- Post application of Program

Table (3) points out to women dietary behaviors throughout program phases. It shows that statistically significant improvement was found at the post-test (p<0.001) regarding all dietary habits among pregnant women. The intake of animal or plant proteins was very low in the study group (8.3%) at the pre-program phase and improved to 73.3% at post-tests. On the other hand, drinking cola or tea with meals has been decreased after program implementation from 86.7% (pre) to 5% (post program) with significant difference (p= <0.001*).

Table (4): demonstrates statistically significant improvements in the post-intervention dietary habit of women in the study group in all tested elements (p<0.001*). In total, 10% of the women had satisfactory habit at the pre intervention phase and this increased to 66.7 % at the post-test (p<0.001*). Statistically significant differences could be revealed in control group between pre and post intervention tests. In total, 8.3% of the women had satisfactory knowledge at pre the intervention phase and this slightly increased to 10.0% at the posttest.

Table (5): this table indicates that hemoglobin level in the study group has been improved among pregnant women in the 2nd and 3rd trimester after program implementation (P<0.001).

DISCUSSION

Pregnancy period is one of the most critical periods of women's life and has a major impact on their lifestyle and nutritional behaviors and the nutritional status of women during pregnancy can have a significant impact on their health and on the development of the fetus. This study aimed to evaluate impact of health promotion directive based on Health Belief Model on pregnant women diagnosed with Iron Deficiency Anemia. In this regard, anemia caused by iron deficiency is a serious

health problem and affects the psychological and physical growth which could have a significant impact on fetus development and health. Based on the findings after the intervention, mean scores of knowledge, perceived susceptibility, perceived severity, perceived barriers, perceived benefits and preventive behaviors in the interventional group compared to the control group, significantly increased [12].

The results of the current study proved that pregnant women necessary needs include proper knowledge about nutrition during prenatal care and the potential risks rising from lack of beneficial nutrition on mothers and their fetus health and encourage them to have training about good nutritional habits by using health promotion directive based on HBM. Comparing the mean knowledge scores between the two groups, showed that there was significant difference in both groups at different stages of the study, improvement in Knowledge, perceived benefits and severity, dietary behaviors significantly progress among women in the study group in the second and third investigations compared with the first time while control group did not. This finding may explain the importance of antenatal education to facilitate health promoting action among pregnant women, thus decreasing perceived barriers and improving their nutrition habits and achieving healthy practice. Also, increasing the mothers' perception of the benefits of healthy dietary habits over time will change women behavior and attitude toward preventing IDA.

In this respect, de Jersey *et al*. [13] observed a group of Australian expectant mothers and found that their nutrition knowledge during pregnancy was poor. They need knowledge regarding healthy diet during pregnancy such as taking enough fruits and vegetable, in addition to, one in ten women followed important dietary recommendations. These researchers suggested that although knowledge played a key role for behavior change, nutrition knowledge was independently associated with intake of fruits and vegetables by women and this knowledge inadequacy cannot lead to appropriate behavior.

Also, Mageed *et al*.[14] found a high significant difference ($p<0.001$) in relation to the mean scores of knowledge among the studied pregnant women regarding IDA pre versus after intervention of nutritional educational guideline (NEG).In the opposite manner, Khorramabad *et al*. [15] study in Iran about Effects of Education Based on Health Belief model on dietary behaviors of Iranian Pregnant Women, observed, no significant differences between the two groups in terms of dietary behaviors, pre- intervention and after the intervention,

In the present study, the majority of participants held a number of incorrect women's beliefs & dietary practices as preferred takeaway and junk foods by many women as well as unhealthy dietary habits in cooking, saving foods as may destroy micronutrients as iron which had a significant improvement among women in the study group after intervention compared to those in the control group. These positive effect enhanced by simple teaching of different sources of iron rich foods, regulate iron supplementation time and overcome its side effects.

In congruence with the mentioned finding, LaBrosse [16] had conducted a study in Nebraska and reported positive changes in the beliefs of women in the intervention group in comparison to the control group for all HBM constructs except for cues to action. Recently Khoramabadi *et al*. [15] study in Iran found that there were statistical differences for all variables except for the perceived benefit and the majority of the model constructs have significantly progressed in the experimental group compared to the control group.

Concerning the obedience to the management protocol in the study and control groups throughout intervention phases, the present study revealed that most of the study group take iron therapy and follow IDA diet plan after the application of the program during the second and the third visit compared with the control group with statistically significant difference. These findings are in agreement with Oriji *et al*. [17] eighty-seven percent 'overall compliance' reported from Port Harcourt, Nigeria in 2011. Also, Ugwu *et al*. [18] in their study about compliance of pregnant women regarding iron supplementation in Southeastern Nigeria., they reported that the compliance rate was sixty-five percent.

The results showed that educational program based on HBM was effective in improving nutritional behaviors in the prevention of anemia in the intervention group, this might be due to that if people have a higher perception of the threats or health problems, they take into account possible health warnings that may occur and thus take action to prevent health problems or health threats and make great change in their attitudes and behaviors. The results of the present study agree with Zelalem *et al*. [19] who reported that after the implementation of nutrition education, there were positive effects of nutrition education observed in knowledge change and behavior improvement pre and post assessment respectively.

Also, Javaher *et al*. [20] in his study on pregnant women reported a similar result. Also Hamideh *et al*. [21] reported that there was a significant difference between the control group and the intervention group in all constructs of HBM and nutritional behavior. In addition, Dadang *et al*. [22] found that education improves knowledge of nutrition during pregnancy and nutritional behavior and the constructs of HBM. The increased trends of intake of animal and plant proteins and eating green vegetables and fruits daily after intervention in the study group were observed. These trends are in agreement with Rahal *et al.* [23] who demonstrated that the intake of green and leafy vegetables enhance preserving the main value of nutrients and lower the risk of chronic diseases, as well as maintain health benefits for humans.

In the current study, more women in both groups had eating habits which interfere with iron absorption, such as intake tea, coffee and cola during mealtimes or having an unbalanced nourishment food before the intervention. The post-intervention assessment revealed significant decrease in these food habits. Moreover, the mean numbers of daily meals that contain iron increased. These changes indicate a positive impact of the educational program among women in the study group. In this regard, Santiago *et al.* [24] mentioned that this is not a simple task, as many foods, beverages and medications carry known or unknown risks. For instance, caffeine which can be found in coffee, sodas, energy drinks and tea was labeled as a teratogen, so the FDA advised limiting intake of caffeine during pregnancy, noting the substance's association with fetal mortality, birth defects and decreased birth weights.

The current study has also demonstrated that the majority of women in both groups took iron therapy with water and very low proportion took it in with fruit juice. In this respect, Ibrahim and Hafez [25] studied the effect of an iron-deficient diet on rat tongue with special reference to the efficacy of iron supplementation: light and scanning electron microscopic study. It was reported that the absorption rates of iron could rise significantly from less than 5% to more than 15% when women drink juice and sources of vitamin C with iron supplement and food that containing iron. Also, these results are consistent with the result of Mageed *et al.* [14] who showed that more than two thirds of both groups "Drink water with iron tablet."

The findings of the present study was expected in relation to HBM model constructs, thus there were statistical differences for all variables post intervention among the study group compared with the control group. Similar finding was reported by Oriji *et al.* [17] study about factors determining compliance to routine iron supplementation in pregnancy at the University of Portharcout Teaching Hospital, who found that perceived susceptibility, seriousness of anemia is associated with health behaviors in preventing and treatment of IDA in pregnant women.

Similar finding was reported by AL-Tell *et al.* [26] who found positive relationship between pregnant women's perception level regarding anemia and their eating practices and significant difference was observed when comparing study with control group. In the same manner, Khoramabadi *et al.* [15] study in Iran about Effects of Education Based on Health Belief Model on dietary behaviors of Iranian Pregnant Women, observed, no significant differences between the two groups in terms of dietary behaviors, pre- intervention. But after the intervention, 86.7% of women in experimental and 13% percent of women in the control groups, were in level 3 of dietary behaviors (Optimal dietary behaviors), which indicates that the majority of women who received educations based on the HBM, achieved optimal dietary behaviors.

Finally, the present study finding revealed that a hemoglobin level was elevated among the study group during the first and second assessment compared to those in the control group. This finding is in the same line with Thompson and Darwish [27] about Environmental chemical contaminants in food: review of a global problem reported a rise in HB level among the study group during the period between 4-9 months of pregnancy after the application of the intervention program. Meanwhile, Mageed *et al.* [14] found that by the application of complementary nutritional intervention (CNI) program, the mean HB pre-program was anemic among the study group and in the control group, with no significant difference between the study and control groups but significant after program implementation.

CONCLUSIONS

In this research and based on the statistical results, it was shown that health promotion directive based on HBM is effective in improving pregnant women' knowledge and health behaviors regarding anemia. In general, the results of the present study showed HBM was able to increase the preventive behavior of iron deficiency anemia and confirmed that educational programs based on HBM has been effective on the

adoption of preventive behaviors of iron deficiency anemia. This type of education is low cost and can prevent pregnancy complications and its adverse outcomes. The results of this study also showed that after implementation of health promotion directive, there was an improvement in dietary habits among pregnant women with IDA.

Recommendations: Based on study results, it is recommended that, pregnant women should be provided with health promotion directive about Iron Deficiency Anemia based on HBM to improve their knowledge and health beliefs. Further study should be conducted at different community settings to foster the health of pregnant women with Iron Deficiency Anemia. Training programs are recommended for nurses working in MCH centers in order to improve their knowledge and skills, so they will be able to educate and counsel pregnant women regarding nutrition.

REFERENCES

1. Gebreamlak, B., A. Dadi and A. Atnafu, 2017. High Adherence to Iron/Folic Acid Supplementation during Pregnancy Time among Antenatal and Postnatal Care Attendant Mothers in Governmental Health Centers in Akaki Kality Sub City, Addis Ababa, Ethiopia: Hierarchical Negative Binomial Poisson Regression. PLoS ONE, 12(1): e0169415. doi: 10.1371/journal.pone.0169415.
2. Adesuyi, E.O., 2016. Attitude of Pregnant Women Attending Ante-natal Clinic towards Adequate Diet in the Prevention of Anaemia in Selected Hospitals in Osogbo BJMMR, 14(12): 1-10.
3. Rajeev, K. and M. Swamy, Bijendra Banjade, 2014. Knowledge and Practice of Anemia among pregnant women attending antenatal clinic in Dr. Prabhakar Kore hospital, Karnataka-A Cross sectional study. IOSR Journal of Dental and Medical Sciences (IOSR-JDMS), 13(4): 74-80 • January 2014.
4. Moreno-Fernandez, J., J. Ochoa, G. Latunde-Dada and J. Diaz-Castro, 2019. Iron deficiency and iron homeostasis in low birth weight preterm infants: A systematic review. Nutrients, 11(5): 1090-1104.
5. Auerbach, M., J. Abernathy, S. Juul, V. Short and R. Derman, 2019. Prevalence of iron deficiency in first trimester, non-anemic pregnant women. The Journal of Maternal-Fetal & Neonatal Medicine, 3(6): 1-4 (2019) doi: 10.1080/14767058.2019.1619690.
6. Majeed, T., M. Chauhan, J. Allan and C. Magee, 2019. Establishing Absolute Iron Deficiency Anemia before Referring Patients to Colorectal Fast Track Clinics Can Help to Increase the Diagnostic Yield of the Bowel Cancer Screening Program. European Journal of Surgical Oncology, 45(11): 2199-
7. Msengi, I., 2019. Development and Evaluation of Innovative Recycling Intervention Program Using the Health Belief Model (HBM). Open Journal of Preventive Medicine, 9(4): 29-41.
8. McLean, S., M. Francis, N. Lacy and A. Alvarado, 2019. Point-of-Encounter Assessment: Using Health Belief Model Constructs to Change Grading Behaviors. Journal of medical education and curricular development, 6, 2382120519840358.
9. Nivedita, K., 2016. Knowledge, attitude and practices of pregnant women regarding anemia, iron rich diet and iron supplement and its impact on their hemoglobin levels. International Journal of Reproduction and Contraception Obstetrics and Gynecology, 5(2): 425-431.
10. Swapna, M., 2017. A Study to assess the knowledge and practices regarding Prevention of Anemia among antenatal Women attending selected Health Centers of Haryana. International Journal of Research in Social Sciences, 7(6): 406-413, June 2017.
11. Padmavathi, N. and K. Hephzibah, 2015. Awareness of anemia in pregnancy among the caregivers of pregnant women in Saveetha Medical College Hospital. International Journal of Scientific and Research Publications, 5(3): 2250-3153.
12. Hosseini, Z., Z. Karimi, S. Mohebi, G. Sharifirad, A. Rahbar and Z. Gharlipour, 2017. Nutritional Preventive Behavior of Osteoporosis in Female Students: Applying Health Belief Model (HBM). International Journal of Pediatrics, 5(1): 4137-44.
13. de Jersey, J., M. Nicholson, K. Callaway and L. Daniels, 2013. An observational study of nutrition and physical activity behaviors, knowledge and advice in pregnancy. BMC Pregnancy and Childbirth, 13(1): 115.
14. Mageed, A., H. Moustafa, S. Nour Eldin, I. Abd Allah and H. Amasha, 2017. The Impact of Management Protocol on Pregnant Women with Iron Deficiency Anemia Using Health Promotion Model. Zagazig Nursing Journal, 13(2): 67-85.
15. Khoramabadi, M., M. Dolatian, S. Hajian, M. Zamanian, R. Taheripanah, Z. Sheikhan and A. Seyedi-Moghadam, 2016. Effects of education based on health belief model on dietary behaviors of Iranian pregnant women. Global Journal of Health Science, 8(2): 230.

16. LaBrosse, M., 2011. Intervention to Increase Knowledge and Consumption of Folate-rich Foods Based on the Health Belief Model. University of Nebraska - Lincoln DigitalCommons@University of Nebraska-Lincoln. Master Thesis he Graduate College at the University of Nebraska.
17. Oriji, V., C. Enyindah and S. Nyeche, 2011. Factors determining compliance to routine iron supplementation in pregnancy at the University of Portharcout Teaching Hospital. Nigerian journal of medicine: Journal of the National Association of Resident Doctors of Nigeria, 20(1): 131-134.
18. Ugwu, E., A. Olibe, S. Obi and O. Ugwu, 2014. Determinants of compliance to iron supplementation among pregnant women in Enugu. Southeastern Nigeria, 17(5): 611-612.
19. Zelalem, A., M. Endeshaw, M. Ayenew, S. Shiferaw and R. Yirgu, 2017. Effect of Nutrition Education on Pregnancy Specific Nutrition Knowledge and Healthy Dietary Practice among Pregnant Women in Addis Ababa. Clinics Mother Child Health, 14: 3.
20. Javaher, T., S. Nikpour, K. Haji, N. Sanaie and P. Shariat, 2013. The effect of education based on health belief model on health beliefs of women with urinary tract infection. International Journal. Community Based Nursing Midwifery, 2(1): 2-11.
21. Hamideh, M., A. Parivash, D. Alireza and K. Hamidreza, 2017. Effect of Intervention Based on Health Belief Model on the Change in Nutritional Behavior of Pregnant Mothers with Iron Deficiency Anemia Health referred to Urmia Centers", Pharmacophore, 8(6S): e-1173859. ISSN-2229-5402.
22. Dadang, S. and A. Faisal, 2015. Nutrition Knowledge, Attitude and Practice of Mothers and Children Nutritional Status Improved after Five Months Nutrition Education Intervention. International Journal of Sciences, 23(2): 424-442.
23. Rahal, A., A. Mahima, A. Verma, A. Kumar, R. Tiwari, S. Kapoor and K. Dhama, 2014. Phytonutrients and nutraceuticals in vegetables and their multi-dimensional medicinal and health benefits for humans and their companion animals: A review. J. Biol. Sci., 14(1): 1-19.
24. Santiago, S., G. Park and K. Huffman, 2013. Consumption habits of pregnant women and implications for developmental biology: a survey of predominantly Hispanic women in California. Nutrition Journal, 12(1): 91-105.
25. Ibrahim, S. and M. Hafez, 2012. Effect of an iron-deficient diet on rat tongue with special reference to the efficacy of iron supplementation: light and scanning electron microscopic study. Egyptian Journal of Histology, 35(2): 292-303.
26. Al-tell, M., K. El-Guindi, N. Soliman and H. El-nana, 2010. Effect of Nutritional Interventions on Anemic Pregnant Women's Health Using Health Promotion Model. The Medical Journal of Cairo University, Vol. 78, No. 2, March: 109-118, 2010.
27. Thompson, L. and W. Darwish, 2019. Environmental chemical contaminants in food: review of a global problem. Journal of Toxicology. Volume 2019, Article ID 2345283, 14 pages.