



July.2021 Volume 27 Issue 4

Manuscript ID ZUMJ-1906-1270

DOI 10.21608/zumj.2019.13936.1270

## ORIGINAL ARTICLE

### Effect of Nutritional Education Intervention on Knowledge, Attitude and Practice of Pregnant Women towards Dietary Habits, Physical Activity and Optimal Gestational Weight Gain

Al-Zahraa Mohammad Soliman\*, Al-Sayed Hassan, Howaida Henary Fahmy, Amira El-Sayed Abdelsalam

Department of Community Medicine, Faculty of Medicine, Zagazig University, Zagazig, Egypt



#### \*Corresponding author:

Al-Zahraa Mohammad Soliman

Assistant lecturer of public health and community medicine

Department of Community Medicine,

Faculty of Medicine, Zagazig

University, Zagazig, Egypt

E-mail: [emsolyman@gmail.com](mailto:emsolyman@gmail.com)

Submit Date 2019-06-26

Revise Date 2019-07-27

Accept Date 2019-08-01

#### ABSTRACT

**Background:** Obesity has been recognized by the World Health Organization as a pandemic nutritional disorder. Egypt has the highest levels of overweight and obesity in Africa with 44% and 39% respectively. This study was done to assess the effect of the nutritional health education program on changing knowledge and attitude and practice towards nutrition of mothers during pregnancy and its role on gaining optimal weight.

**Methods:** An interventional study (pre-posttest), in Zagazig University Antenatal Care Outpatient Clinic. Patients' criteria: 115 pregnant women in the first trimester, aged 18-35 years, Nonsmokers, take no medication and don't have any chronic medical disorder with Body mass index (BMI) between 18.5 and 24.9 kg/m<sup>2</sup>. Procedures: Data collection through a questionnaire of three parts; women's characteristics, pretest and posttest, the health education sessions were applied on the pregnant women and the change was detected. **Results:** There was statistically significant difference in total knowledge from (66.5±28.9) to (117.6±25.3) and total attitude from (3.3±2.1) to (9.5±2.8) scores in the pregnant women after the nutritional education sessions with improvement from 45.5% to 80.5% and from 27.3% to 79.2% in knowledge and attitude respectively (p-value <0.001). The change in habits and practice was statistically significant (p-value <0.001). The average weight gain of the studied group was (16.1±8.5) kg ranged from 9 to 18 kg. **Conclusion:** The health education sessions were effective in improving pregnant women's knowledge, attitude and practice. The healthy diet succeeded in improving gestational weight gain.

**Key words:** weight gain; pregnant women; nutritional education sessions

#### INTRODUCTION

Obesity has been recognized by the World Health Organization as a pandemic nutritional disorder which represents a progressive problem to the health of populations of an increasing number of countries worldwide [1]. Egypt has the highest levels of overweight and obesity in Africa with 44% and 39% respectively [2].

WHO, 2016 estimated that 2.8 million people die every year as a result of being overweight or obese, and that 35.8 million of

global disability-adjusted life years (DALYs) are caused by overweight and obesity [3].

Some complications of obesity for the mothers are excessive gestational weight gain (GWG) using Institute of Medicine (IOM) criteria increases maternal risks for preeclampsia, gestational diabetes, caesarean section and postpartum weight retention with associated long-standing health consequences [4-5].

Excessive GWG has also been associated with complications for the baby, including a fourfold increased risk of large-for-

gestational-age (LGA) infants [6] and a permanent increase in BMI and blood pressure and an abnormal metabolic profile in childhood and early adult life [7].

The burden of obesity in pregnancy increases to affect the community as the increased risk of abdominal and instrumental vaginal delivery [8-9] which in turn leads to longer hospital inpatient stays and results in an increased overall health service cost .

Low GWG is associated with preterm birth and increased risk of small-for-gestational-age (SGA) infants [5].

According to the Institute of Medicine (IOM) and the National Heart, Lung, and Blood Institute of the National Institutes of Health (2009), the recommended weight gain for obese women during pregnancy is up to 6.8 kilograms; for overweight women, gain should be from 6.8 to 11.2 kilos and for non-obese women, between 11.2 to 15.9 kilos [10].

Nutrition during pregnancy is an important factor for the pregnant women and their developing fetus. They must consume enough calories and nutrients to provide the essential requirements for both themselves and the developing fetus. Moreover, adequate nutrition during pregnancy is important for the development of the placenta, for a healthy delivery and for future lactation [11].

#### METHODS

**Study design and settings:** An interventional study (pre-posttest) was conducted in the Antenatal Care Clinic of Obstetrics and Gynecology Department at Zagazig University Hospitals in the period from May 2017 to June 2019.

**Target group:** pregnant females in the first trimester attended the Antenatal Care Clinic at Zagazig University Hospitals, aged 18-35 years, Nonsmokers, take no medication and didn't have any chronic medical disorder with Body mass index (BMI) between 18.5 and 24.9 kg/m<sup>2</sup>.

**Sample size:** Calculated through Open-EPI version (3.01), according to the following collected data: Assuming that the knowledge of pregnant female about healthy nutrition during pregnancy was changed from 9% before intervention to 31% after intervention

[12], the power of precision was 80%, and the confidence interval was 95%, so the sample size was 115 pregnant women.

**Sample technique:** systematic random selection of the sample population from all pregnant females, the selection of the target group persisted about 6 months (from July 2017 to December 2017).

The recommended weight gain for obese women during pregnancy is up to 6.8 kilograms; for overweight women, gain would be from 6.8 to 11.2 kilos and for non-obese women, between 11.2 to 15.9 kilos.

**Data collection:** All participants in the study were subjected to a semi-structured questionnaire which was used to collect information about Socio-demographic data such as age, marital status, level of education, income, residence, sources of health information and service delivery [13]. Obstetric history and family history of obesity were detected. Another semi-structured questionnaire was filled before the health education program (pretest) and refilled again after the health education program (posttest) through face to face interview to assess the difference in females' knowledge about healthy food and supplements and effect of optimal weight gain.

The nutritional education session persisted for 20 minutes after collection of data using (Health education message) which covered knowledge about:

1- Knowledge about healthy foods, importance of calcium intake, importance of iron intake and the foods decrease absorption of iron, anemia during pregnancy, importance of folic acid intake, importance of supplementation intake and Knowledge about ideal gestational weight gain during pregnancy.

2- Attitude: pregnant opinion about importance of getting enough calcium during pregnancy, importance of getting enough iron during pregnancy, opinion about vulnerability of pregnant women to anemia, bad effect of anemia on pregnant women and pregnancy outcome, the importance of folic acid during pregnancy, if supplementation is important during pregnancy.

- 3- Definition of obesity in pregnancy, its risk factors (modifiable and non-modifiable).
- 4- Behavioral practice about avoiding caffeine intake and practicing simple physical activity.

Through the study, these follow up visits ranged in time from 15 to 20 minutes one session per month, the patients were taught about the healthy balanced diet which must be followed.

**Data management and scoring system:** The collected data were entered, checked and statistically analyzed using SPSS program (Statistical Package for Social Science) version 22.0 [14]. For the statistical calculations, data coding was done, and qualitative data were represented as frequencies and percentages, Chi-square test ( $\chi^2$ ) and Mc Nemar test were carried out for testing the association between the qualitative data. Quantitative data were presented as mean, SD and median and compared using paired t-test and Wilcoxon signed rank test. Correlations were tested by Pearson test. The test results were considered significant when  $p$ -value  $\leq 0.05$ .

#### **Scoring system:**

##### **i- Scoring socio-economic status:**

- Socio-economic level was classified into low, moderate, high level depending on the score calculated using quartiles;

- score less than 50% (low)= <19.5
- score 50%- less than 75% (moderate)= 19.6-29.25
- score 75% and more (high)=  $\geq 29.25$

-This is the updated scale for assessing the socio-economic status [13].

##### **ii- Scoring of knowledge and attitude:**

Scoring system for knowledge questions was as follows:

- 1- Questions with various correct answers:

Each chosen correct answer took 1 degree.

- 2- Questions with yes, don't know and no answers were scored as follows:

Yes = 2, don't know =1, no =Zero.

Total knowledge about:

-Healthy foods types was (23), Importance of calcium and vitamin D intake was (18), Importance of iron intake was (21), Anemia was (34), Folic acid was (16),

Supplementations intake was (18) and knowledge about weight gain in pregnancy was (16), So total score of all items of knowledge about healthy nutrition during pregnancy was (146).

##### **iii- Scoring of attitude:**

Attitude questions with Likert scale as not important, important to some extent, important, very important answers were scored as follows:

Not important = 0, important to some extent= 1, important = 2 and very important= 3. These questions were (4, 8, 10 and 36), so total attitude toward importance of healthy foods was (12)

##### **iii- Scoring of behavior and practice:**

Scoring system for behavior and practice questions was as follows:

- 1- Questions about how many times:

In question (35) once daily=3, two or three times=2 and more than 3 times=1 in contrast with question (38) once daily=1, two times=2 and three or more than 3 times=3.

- 2- Questions with yes and no answers were scored as follows:

Yes = 2 and no =1.

So total score of all items of behavior and practice about healthy nutrition during pregnancy was (10)

#### **Ethical Considerations:**

An official permission was taken from Zagazig University, Faculty of Medicine, obstetrics and gynecology department. The title and objectives of this study were explained to the participants to ensure their cooperation and informed consent was obtained. The work has been carried out in accordance with The Code of Ethics of the World Medical Association (Declaration of Helsinki) for studies involving humans and Institutional Review Board (IRB) of the Faculty of Medicine, Zagazig University approved the study protocol (No. 3168). An informed consent was obtained from all participants of this study and they were told about the aim of the study, and were informed that the data would be used for scientific purposes only.

#### **RESULTS**

Almost sixty percent (50.9%) of the studied group was less than 26 years old

(range from 20-37 years old). About (40.9%) of them and (50.0%) of their husbands were either preparatory or secondary educated. More than half of women (69.1%) were housewives. The majority of them (70.9.9%) were resident of rural areas and half of them (50.9%) didn't have enough income. Half of them (48.2%) were of low social class. (86.4%) were using audio-visual sources like T.V. and radio as sources of health information. while only (32.7%) of them were using governmental health services. **Table 1.**

**Fig 1.** shows that family history of obesity was present on (40.9%) of women (mainly first-degree relatives).

There was statistically significant difference in all items of knowledge of pregnant women about health nutrition during pregnancy (healthy food, calcium, iron, folic acid and supplementation intake, anemia causes and its complications and obesity causes and how to avoid) from (66.5±28.9) before the health education sessions to (117.6±25.3) after them

with improvement from 45.5% to 80.5%.

**Table 2.**

The total attitude score of pregnant women about health nutrition during pregnancy regarding all items (importance of calcium, iron, sun exposure and practice physical exercise) was statistically significant different from 3.3±2.1 before the health education sessions to (9.5±2.8) after intervention with improvement from 27.3% to 79.2%. **Table 3.**

The change in habits and practice of the pregnant women towards health nutrition during pregnancy before and after the health education sessions was statistically significant. **Table 4.**

The weight gain of the studied group was (16.1±8.5) kg ranged from 9 to 18 kg, most of the study group (63.6%) had optimal weight gain and (31.8%) had over weight gain, while only (4.5%) had subnormal weight gain. **Fig 2.**

**Table 1.** Socio-demographic characteristics of the studied group:

Variable	The <i>studied</i> group (110) mean $\pm$ SD (Range) median	
Age (years):	27.1 $\pm$ 4.4 (20-37) 26	
<b>Variables</b>	<b>NO (110)</b>	<b>%</b>
1- Female age (years):		
<26	56	50.9%
$\geq$ 26	54	49.1%
2- Education of husband		
Illiterate	9	8.2%
Read and write	20	18.2%
Primary	15	13.6%
Preparatory\secondary	45	40.9%
High	21	19.1%
3- Education of wife		
Illiterate	12	10.9%
Read and write	16	14.5%
Primary	8	7.3%
Preparatory\secondary	50	45.5%
High	24	21.8%
4-Occupation of husband	21	
Unskilled manual worker	39	19.1%
Skilled manual worker or farmer	39	35.5%
Trades/business	7	35.5%
Clerk	4	6.4%
Professional		3.6%
4-Occupation of wife		30.9%
Working	34	69.1%
Housewife	76	
5- Residence		
Rural	78	70.9%
Urban	32	29.1%
6- Income		
Not enough	56	50.9%
Enough	54	49.1%
Enough and more	0.0	0.00%
7- Social class		
Low	53	48.2%
Moderate	45	40.9%
High	12	10.9%
8- sources of health information		
-Printed materials	15	13.6%
-Audiovisual message	95	86.4%
9- provision of health services		
-Health insurance	17	15.5%
- governmental health service	36	32.7%
-Traditional healer/self-care	47	42.7%
-Private	10	9.1%

**Table 2.** Comparing female knowledge of the studied group about health nutrition during pregnancy before and after the intervention;

Items	Pre intervention (N=110)	Post intervention (N=110)	Test	p-value
	Mean $\pm$ SD Range Median (% of total score)	Mean $\pm$ SD Range Median (% of total score)		
- Knowledge about healthy food during pregnancy HS=23	13.9 $\pm$ 3.6 (12-24) 14 60.4%	20.6 $\pm$ 2.6 (13-24) 21 89.6%	17.6 <sup>^</sup>	0.001**
- Knowledge about Calcium during pregnancy HS=18	7.6 $\pm$ 3.3 (4-18) 6 33.3%	16.1 $\pm$ 2.4 (7-18) 17 94.4%	22.3 <sup>\$</sup>	0.001**
- Knowledge about Iron during pregnancy HS=28	13.8 $\pm$ 3.9 (8-22) 13 46.4%	19.3 $\pm$ 3.6 (9-22) 21 75.0%	11.7 <sup>^</sup>	0.001**
- Knowledge about Folic acid during pregnancy HS=16	3.8 $\pm$ 5.8 (00-15) 0.0 23.7%	12.2 $\pm$ 3.6 (2-16) 13 81.3%	15.4 <sup>\$</sup>	0.001**
- Knowledge about supplementation during pregnancy HS=18	8.5 $\pm$ 5.1 (0.0-18) 6 33.3%	12.9 $\pm$ 4.5 (1-18) 15 83.3%	8.9 <sup>\$</sup>	0.001**
- Knowledge about anemia during pregnancy HS=30	7.3 $\pm$ 12.5 (0.0-31) 0.0 24.3%	25.1 $\pm$ 12.7 (0.0-34) 32 83.7%	10.1 <sup>\$</sup>	0.001**
- Knowledge about obesity during pregnancy HS=16	9.3 $\pm$ 2.9 (0.00-16) 8 58.1%	11.4 $\pm$ 4.7 (0.00-16) 12 71.2%	7.8 <sup>\$</sup>	0.001**
-Total Knowledge score HS=146	66.5 $\pm$ 28.9 (33-125) 53 45.5%	117.6 $\pm$ 25.3 (44-146) 127 80.5%	16.1 <sup>\$</sup>	0.001**

HS= highest score, <sup>^</sup>=paired T-test, <sup>\$</sup>= Wilcoxon signed rank test. \*\*= highly significant p value

**Table 3.** Comparing attitude of the studied group towards healthy diet during pregnancy before and after the intervention;

Items	Pre intervention (N=110)		Post intervention (N=110)		Test	p-value
	F (110)	%	F (110)	%		
1- Ca has important role during pregnancy						
-Don't know	71	64.5%	10	9.1%	134.9	<0.001**
-Not important	26	23.6%	5	4.5%		
-To some extent	11	10.0%	15	13.65		
-Yes important	2	1.8%	80	72.7%		
2-Sun exposure is important for pregnant women						
-Don't know	59	53.6%	10	9.1%	110.5	<0.001**
-No important	26	23.6%	5	4.5%		
-To some extent	18	16.4%	15	13.6%		
-Yes important	7	6.4%	80	72.7%		
3-Iron intake has important role during pregnancy						
-Not important					122.9	<0.001**
-Important To some extent	31	28.2%	10	9.1%		
-Important	54	49.1%	5	4.5%		
-Very important	18	16.4%	20	18.2%		
	7	6.4%	75	68.2%		
4-Practice simple physical activity has important role during pregnancy						
-Not important	14	12.7%	7	6.3%	108.4	<0.001**
-Important To some extent	79	71.8%	10	9.1%		
-Important	10	9.1%	49	44.5%		
-Very important	7	6.4%	44	40.0%		
<b>Variable</b>	<b>Pre intervention</b>		<b>Post intervention</b>		<b>Test</b>	<b>p-value</b>
-Total attitude score					16.9\$	0.001**
Mean ± SD	3.3±2.1		9.5±2.8			
Range	(0.0-11)		(1-12)			
Median	3		11			
% of total score (12)	27.3%		79.2%			

\*\*= highly significant p-value, \$= Wilcoxon signed rank test.

**Table 4.** Comparing habits and practice of the studied group during pregnancy before and after the intervention;

Items	Pre intervention (N=110)		Post intervention (N=110)		Test	p-value
	F (110)	%	F (110)	%		
1-Caffeine intake						
No	40	36.4%	74	67.3%	21.1	<0.001**
1-once daily	30	27.3%	23	20.9%		
2-twice daily	30	27.3%	13	11.8%		
3- three times daily	10	9.0%	0.00	0.00%		
2-Physical activity is important for pregnancy						
Don't know					41.8	<0.001**
No	40	36.4%	20	18.2%		
Yes	32	29.1%	6	5.4%		
	38	34.5%	84	76.4%		
3-Do physical activity						
No:					38.9	<0.001**
1-once weekly	72	65.5%	26	23.6%		
2-twice weekly	10	9.1%	24	21.8%		
3- three times or more weekly	28	25.4%	50	45.4%		
	0.0	0.00%	10	9.1%		

**Table 5.** maternal weight gain after the health education sessions in the studied group;

Variable	The studied group(110)	
Weight gain (kg):		
Mean ± SD	16.1±0.5	
(Range)	(9-18)	
median	13	
Variable	NO(110)	%
Subnormal weight gain	5	4.5%
Optimal weight gain	70	63.6%
Over weight gain	35	31.8%



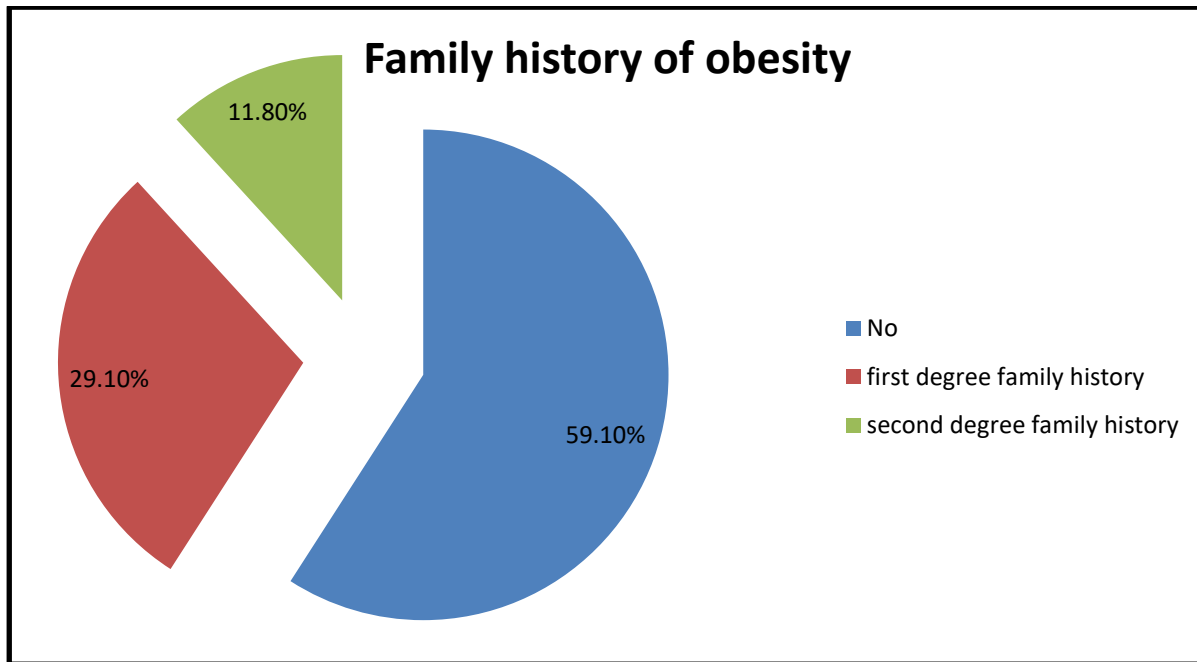


Fig 1. Family history of obesity among the studied group

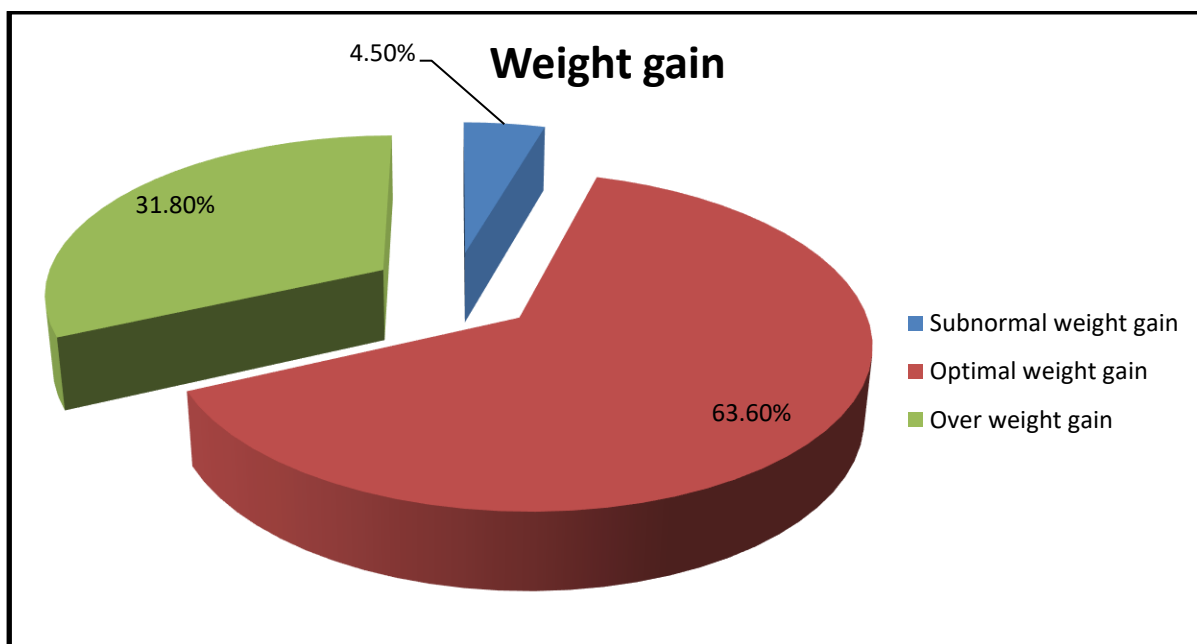


Fig 2. Weight gain categories after intervention among the studied group.

**DISCUSSION**

Obesity markedly increased among women in childbearing period. Most of weight gain during pregnancy is above the recommendations of the Institute of Medicine (IOM), which is defined as the excessive gestational weight gain (EGWG) [15]. The lifestyle interventions have been effective to prevent excessive GWG in low-income and normal-weight women [16-17]. In this study, the reported significant results were related to

change in KAP towards healthy nutrition along with physical activity. The aim of our work was improvement of knowledge and attitude of pregnant females towards healthy nutrition during pregnancy and achieving optimal weight gain.

The current study showed that there was statistically significant improvement in all items of knowledge of pregnant women about health nutrition during pregnancy (healthy food, calcium, iron, folic acid and

supplementation intake, anemia causes and its complications and obesity causes and how to avoid) from (66.5±28.9) before the health education sessions to (117.6±25.3) after them with improvement from 45.5% to 80.5%, consistently with **Girard & Olude** who reported that nutrition education resulted in an increase in the level of nutritional knowledge [18] and similar results by **Fallah et al.**, the awareness level of pregnant women about healthy nutrition was significantly increased from 9% before intervention to 31% after the nutritional education intervention ( $P < 0.001$ ). [12]

Conversely some Turkan studies found that women did not have adequate knowledge about nutrition during the pregnancy period [19-20].

In the present study, there was statistically significant improvement in all items of attitude of pregnant women about health nutrition during pregnancy (importance of calcium, iron, sun exposure and practice physical exercise) from 27.3% before the health education sessions to 79.2% after intervention. this is in agreement with [12] who found that awareness levels were estimated to be weak (31%), moderate (66%) and good (9%) and the corresponding rates after educational intervention were weak (6%), moderate (63%) and good (31%). This significant difference was independent from maternal characteristics of age and levels of literacy and in obese mothers in particular. They concluded that a nutritional education intervention will have a positive effect on nutritional awareness of pregnant women [12].

The change in habits and practice of the pregnant women towards health nutrition during pregnancy before and after the health education sessions was statistically significant ( $p$ -value  $< 0.001$ ), consistently with **Dunnam Y and Jeewon R**, who reported that NE programs have been effective in positive behavior modification measured in terms of eating pattern and health quality [21]. Also **Guelinckx I**, reported that Fat intake, specifically saturated fat intake, decreased and protein intake increased from the first to the third trimester, Calcium intake

and vegetable consumption increased during pregnancy in all groups and increasing total physical activity [22].

**Zelalem et al.**, proved that the pregnancy specific dietary practice of the pregnant women increased from 46.8% to 83.7% after the nutritional education sessions. [23] and **Aşçı Ö and Rathfisch G** found that the lifestyle interventions had a significant effect on improving lifestyle behaviors, percentage of energy from protein, minerals and vegetable intakes [24].

The weight gain of the studied group was (16.1±8.5) kg ranged from 9 to 18 kg, most of the study group (63.6%) had optimal weight gain and (31.8%) had over weight gain, while only (4.5%) had subnormal weight gain (**figure 2**) which is similar to [12] whose results were 41% had normal weight, 28% were overweight, 26% were obese and 5% were underweight depending on BMI. Only one woman had an abnormal blood pressure, one had diabetes, one had nephropathy, and six women had a history of cardiovascular disease, also our present study is coincided with a study conducted by [25] whose study was ended by 79 % within the Institute of Medicine guidelines, 9 % below, and 11 % above. Patient-report of provider advice on physical activity and nutrition were consistent with guidelines, Provider recommended weight gain (pounds) was significantly associated with women's intended weight gain and opposite to [26] who cited that gestational weight gain in 27.6% of pregnant women was in normal IOM recommended range; while, weight gain in 49% and 23.2% of pregnant women was below and above recommended range respectively.

In a study by **Ebrahimi F. et al.**, [27] women gained an average of (12.87± 3.57) kg during pregnancy while 54% did not gain weight within the Institute of Medicine (IOM)-recommended range.

**Walker R.**, concluded that weight management interventions during pregnancy can be successful in reducing weight gain in pregnancy [28] similar with **Polley BA. et al.**, [29] whose intervention significantly decreased the percentage of normal-weight women who exceeded the IOM

recommendations (33 vs 58%,  $P < 0.05$ ) and postpartum weight retention was strongly related to weight gain during pregnancy ( $r = 0.89$ ).

Intervention by Phelan S., et al. [30] decreased the percentage of NW women who exceeded IOM recommendations (40.2% compared with 52.1%;  $P = 0.003$ ) and increased the percentages of NW and OW/OB women who returned to their pregravid weights or below by 6 months postpartum (30.7% compared with 18.7%;  $P = 0.005$ ).

Aşçı Ö and Rathfisch G found that the proportion of women who were within the IOM recommendations was higher in the intervention group (51.1 %) than in the control group (28.9 %). with no difference between groups in dietary intakes and total GWG ( $p > 0.05$ ) [24].

Stang J and Huffman LG, had a good evidence to support the role of diet, physical activity and behavior changes on improving weight gain during pregnancy [31]. Vincze et al. reported significant reductions in gestational weight gain with the intervention when compared to control group [32].

### CONCLUSION

The study concluded that nutritional education program to pregnant women can improve their knowledge, attitude, habits and practice towards healthy nutrition during pregnancy and optimize weight gain to meet the Institute of Medicine (IOM), 2009.

### Acknowledgments:

The authors would like to thank all the staff members of the Community Medicine Department, Obstetrics and Gynecology Department and Pediatric Medicine Department who helped us to complete this work. Also, authors are very grateful to all included women for their valuable contribution in this work.

**Conflict of interest:** No conflict of interest.

**Funding process:** No funding.

### REFERENCE

- 1- WHO. Obesity: preventing and managing the global epidemic. Geneva: WHO publications; 2000
- 2- Amugsi D. A., Dimbuene Z. T., Mberu B., Muthuri S., & Ezech, A. C. (2017); Prevalence and time trends in overweight and obesity among urban women: an analysis of demographic and health surveys data from 24 African countries, 1991–2014. *BMJ open*, 7(10), e017344.
- 3- World Health Organization. Obesity. Situation and trends: Global Health Observatory (GHO) data. 2016 available on [http://www.who.int/gho/ncd/risk\\_factors/obesity\\_text/en/](http://www.who.int/gho/ncd/risk_factors/obesity_text/en/) (accessed 1 Feb 2017).
- 4- Nehring I, Schmoll S, Beyerlein A, et al. 2011. Gestational weight gain and long-term postpartum weight retention: a meta-analysis. *American Journal of Clinical Nutrition* 94: 1225–31.
- 5- Alavi N, Haley S, Chow K, et al. 2013. Comparison of national gestational weight gain guidelines and energy intake recommendations. *Obesity Reviews* 14: 68–85.
- 6- Chung GY, Taylor RS, Thompson JMD, et al. 2013; Gestational weight gain and adverse pregnancy outcomes in a nulliparous cohort. *European Journal of Obstetrics and Gynecology and Reproductive Biology* 167(2): 149–53.
- 7- Fraser A, Tilling K, Macdonald-Wallis C, et al. 2010; Association of maternal weight gain in pregnancy with offspring obesity and metabolic and vascular traits in childhood. *Circulation* 121(23): 2557–64.
- 8- Sebire NJ, Jolly M, Harris JP, Wadsworth J, Joffe M, Beard RW, et al. 2001; Maternal obesity and pregnancy outcome: a study of 287,213 pregnancies in London. *Int J Obes Relat Metab Disord*. 25(8):1175–82.
- 9- Cedergren MI. 2004; Maternal morbid obesity and the risk of adverse pregnancy outcome. *Obstet Gynecol*. 103(2):219–24.
- 10- Institute of Medicine and National Research Council. 2009. *Weight Gain during Pregnancy: Reexamining the Guidelines*. Washington, DC: The National Academies Press. Available on <https://doi.org/10.17226/12584> last accessed May, 2019.
- 11- Kominiarek MA and Rajan P. 2016; Nutrition Recommendations in Pregnancy and Lactation. *Med Clin North Am*. 100(6): 1199–1215. doi: 10.1016/j.mcna.2016.06.004.
- 12- Fallah F, Pourabbas A, Delpisheh A, Veisani Y, Shadnough M. 2013; Effects of Nutrition Education on Levels of Nutritional Awareness of Pregnant Women in Western Iran. *Int J Endocrinol Metab*. 11(3):175-178. DOI: 10.5812/ijem.9122.
- 13- El-Gilany A., El-Wehady A., & El-Wasify M. (2012); Updating and validation of the socioeconomic status scale for health research in Egypt. *Eastern Mediterranean Health Journal*, 18(9).
- 14- SPSS, Chicago, IL, USA
- 15- Valsamakis G, Kyriazi EL, Mouslech Z, Siristatidis C, Mastorakos G. 2015; Effect of maternal obesity on pregnancy outcomes and long-term metabolic consequences. *Hormones (Athens)*. 14(3):345–57. doi: 10.14310/horm.2002.1590. [PubMed: 26188222].

- 16- Ruchat SM, Davenport MH, Giroux I, Hillier M, Batada A, Sopper MM, et al. 2012; Nutrition and exercise reduce excessive weight gain in normalweight pregnant women. *Med Sci Sports Exerc.* 44(8):1419–26. doi:10.1249/MSS.0b013e31825365f1. [PubMed: 22453250].
- 17- Hui AL, Back L, Ludwig S, Gardiner P, Sevenhuysen G, Dean HJ, et al. 2014; Effects of lifestyle intervention on dietary intake, physical activity level, and gestational weight gain in pregnant women with different prepregnancy Body Mass Index in a randomized control trial. *BMC Pregnancy Childbirth.* 14:331. doi: 10.1186/1471-2393-14-331.
- 18- Girard AW, Oludea O. 2012; Nutrition Education and Counselling Provided during Pregnancy: Effects on Maternal, Neonatal and Child Health Outcomes. *Paediatric and Perinatal Epidemiology;* 26 (1):191–204.
- 19- Özkan, I. A., & Mete, S. (2010); Pregnancy planning and antenatal health behaviour: findings from one maternity unit in Turkey. *Midwifery,* 26(3), 338–347.
- 20- YAVUZ, S., & AYKUT, M. (2014). KAYSERİ MELİKGAZİ EĞİTİM ARAŞTIRMA SAĞLIK GRUP BAŞKANLIĞI BÖLGESİNDE GEBE KADINLARIN GEBELİKTE BESLENME KONUSUNDAKİ BİLGİ DÜZEYLERİ VE BESLENME DURUMU. *Sağlık Bilimleri Dergisi,* 23(1), 10-20.
- 21- Dunneram, Y., & Jeewon, R. (2015); Healthy diet and nutrition education program among women of reproductive age: A Necessity of multilevel strategies or community responsibility. *Health promotion perspectives,* 5(2), 116.
- 22- Guelinckx, I., Devlieger, R., Mullie, P., & Vansant, G. (2009); Effect of lifestyle intervention on dietary -habits, physical activity, and gestational weight gain in obese pregnant women: a randomized controlled trial. *The American journal of clinical nutrition,* 91(2); 373-380.
- 23- Zelalem A, Endeshaw M, Ayenew M, Shiferaw S, Yirgu R (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: 265.
- 24- Aşçı, Ö., & Rathfisch, G. (2016); Effect of lifestyle interventions of pregnant women on their dietary habits, lifestyle behaviors, and weight gain: a randomized controlled trial. *Journal of Health, Population and Nutrition,* 35(1).
- 25- Whitaker K M., Wilcox S., Liu J., Blair SN., & Pate R R. (2016); Provider advice and women's intentions to meet weight gain, physical activity, and nutrition guidelines during pregnancy. *Maternal and child health journal,* 20(11), 2309-2317.
- 26- Farhangi M A., (2016); Gestational weight gain and its related social and demographic factors in health care settings of rural and urban areas in northwest Iran. *Ecology of food and nutrition,* 55(3), 258-265.
- 27- Ebrahimi F, Shariff ZM, Tabatabaei SZ, Fathollahi MS, Mun CY, Nazari M. (2015); Relationship between socio-demographics, dietary intake, and physical activity with gestational weight gain among pregnant women in Rafsanjan City, Iran. *J Health Popul Nutr.* 33(1):168–176.
- 28- Walker R., Bennett C., Blumfield M., Gwini S., Ma J., Wang F.& Truby H. (2018); Attenuating pregnancy weight gain—what works and why: a systematic review and meta-analysis. *Nutrients,* 10(7), 944.
- 29- Polley B A., Wing R R., & Sims C J. (2002); Randomized controlled trial to prevent excessive weight gain in pregnant women. *International journal of obesity.* 26(11): 1494.
- 30- Phelan S., Phipps M. G., Abrams B., Darroch F., Schaffner, A., & Wing, R. R. (2011); Randomized trial of a behavioral intervention to prevent excessive gestational weight gain: The Fit for Delivery Study. *The American journal of clinical nutrition,* 93(4), 772-779.
- 31- Stang, J., & Huffman, L. G. (2016); Position of the academy of nutrition and dietetics: obesity, reproduction, and pregnancy outcomes. *Journal of the Academy of Nutrition and Dietetics,* 116(4), 677-691.
- 32- Vincze L., Rollo M., Hutchesson M., Hauck Y., MacDonald-Wicks L., Wood L., et al. (2019); Interventions including a nutrition component aimed at managing gestational weight gain or postpartum weight retention: a systematic review and meta-analysis. *JBIC database of systematic reviews and implementation reports.* 17(3); 297-364.

### How to Cite

Soliman AM, Hassan A, Fahmy HH, Abdelsalam AE. Effect of Nutritional Education Intervention on Knowledge, Attitude and Practice of Pregnant Women towards Dietary Habits, Physical Activity and Optimal Gestational Weight Gain. *ZUMJ* 2021; 27 (577-588):. Doi: 10.21608/zumj.2019.13936.1270