Effect of nutritional health education on awareness of pregnant women attending maternal and child health care centers and private clinics in Sharkia Governorate-Egypt

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Abstract: Nutritional health education is expected to have an obvious benefit on awareness of pregnant women especially when designed after studying their nutritional habits and usual intake. **Aim & Objectives:** This research was done to study nutritional habits of pregnant women, to assess their knowledge and attitude regarding healthy nutrition and to apply a health education intervention and measure its effect. **Methods:** The study was conducted in two phases in 2013 - 2015, the 1st phase was a cross- sectional study included 350 females got by multistage random sampling technique from public and private facilities in rural and urban areas. Their sociodemographic and nutritional data were got by a semi structured questionnaire which included 24 hour recall of intake of the main categories of food. Out of the first phase participants, 130 women shared in 2nd ″intervention phase″, they were randomized to intervention and control groups (65 women each)with no significant difference in age or socioeconomic status and a structured questionnaire was used to assess their knowledge and attitude before and after the intervention. Intervention was two health education sessions with use of posters and distribution of booklets. **Results:** The results revealed that most of our sample in public and private health care facility in rural and urban areas had 3-4 meals⁄day with irregular time and take extra food between meals, only 53.6 % of MCH attendants got protein in previous day. In the 2nd phase the pre intervention level of knowledge and attitude was defective in both intervention and control groups with no significant difference while post intervention highly significant difference was detected between the two groups. Also, self matching paired pre -post test analysis of the intervention group revealed a highly significant improvement in knowledge and attitude with 86.2% satisfactory change in total knowledge and 76.92% satisfactory change in total attitude**. Conclusion:** this study revealed a state of inadequate knowledge and attitude towards healthy nutrition among pregnant females and health education program can lead to significant improvement in them in different types of antenatal care facilities in rural and urban areas pointing to the importance of generalized adoption of such programs.

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1. Introduction

The type of food taken by women during pregnancy influences fetal development, maternal health and wellbeing **(Olson and Strawderman, 2003)**. The recommended pattern is to take 5 meals or more at regular times with no extra foods in between to provide a stable level of glucose for the foetus and avoid excessive weight gain **(Nteff, 2013)**

The intake of balanced diet containing the main categories of food is essential for the health of pregnant females and for healthy development of their fetus to avoid perinatal deaths, neural tube defects, anaemia and many other problems **(Wilson, 2014)**. Normal weight gain should be slow and gradual ranging from 15 to 35 pounds during the pregnancy **(American Pregnancy Association, 2014).**

Underweight and low gestational weight gain women have a high risk of having low birth weight infant, preterm births and premature rupture of membrane **(Masho *et al.,* 2013 and Fujiwara *et al.,* 2014).**

Obesity and excessive gestational weight gain during pregnancy are associated with an increased risk of gestational diabetes, preeclampsia, difficult labor, post term delivery, fetal adiposity, fetal neural tube defect, heart defects and other abnormalities **(Young and Woodmansee, 2002 & Watkins *et al.,* 2003).**

Nutritional health education programs for pregnant women have been mounted over the years in developed countries, leading to maximization of health of pregnant females and their children, In Egypt, such programs as a component of antenatal care are still underperformed and their effect is understudied. Antenatal care is got not only in governmental MCH but also in private sector which is usually understudied in academic research in spite of its considerable weight **(Mohamed, 2014)**. So, this study was carried out in both sectors in Sharkia governorate which is the 3rd Egyptian governorate in population size after Cairo and

Giza governorates. Sharkia has rural and urban areas **(DHS, 2014)**.

Objectives: 1-To study nutritional habits and usual intake of pregnant women. 2- To assess knowledge and attitude towards healthy nutrition. 3- To apply a health education intervention about healthy nutritional requirement during pregnancy and measure its effect.

2. Subjects and Methods

Study design and sampling:

This study was carried out during 2013-2015 in two phases:1st phase:cross- sectional study included 350 women, 2nd phase: an interventional study included 130 women out of the 1st phase participants. The study was conducted at 4 places selected by multistage random sampli0ong technique to represent variable opportunities of antenatal care in Sharkia. The sample of the 1st phase has been got by a systematic random sampling from attendants the 4 randomly selected places with proportional allocation [Urban private (129), rural private (38), Urban public (96), rural public (87)].

For the 2nd phase (intervention study):

The calculated sample size for the second phase was 130 women who were got randomly from participants of the 1st phase and randomized to intervention and control group by random number generation of EPI INFO Version 6.

Inclusion criteria were pregnant women attending these places in 1st and 2nd trimester of any social class and any educational level and agreed to give informed consent.

Data collection and scoring: It was done through two phases:

- **Phase 1:**

studying nutritional habits and usual dietary intake of pregnant women through: A validated semi structured Arabic Questionnaire that covers the Socio-demographic characteristics of studied group **(El-Gilany *et al.,* 2012),** and questions about pregnant nutritional habits and 24 hours recall of main categories of food (**Wilson, 2014**).

Phase II:

Assessment of the change in knowledge and attitude after intervention through the following stages:

A- Pre intervention questionnaire which was testing the knowledge about healthy foods, importance of intake of calcium, iron, folic acid and supplementations and knowledge about anaemia with pregnancy. Also, the questionnaire included questions to measure the attitude towards importance of healthy nutrition.

B- The intervention was health education program implemented over one month. It was composed of two health education sessions for each female with use of boosters and distribution of a colored booklet including healthy dietary recommendation with illustrating pictures.

C- Post intervention: reassessment of knowledge and attitude of the same pregnant women towards healthy diet was done after 2 months of intervention by the same pre intervention questionnaire.

D- Measuring the effect of health education program about healthy nutrition was achieved by comparing the score of intervention and control groups and by comparing the pre and post intervention scores of the intervention group.

*scoring of knowledge and attitude:

Scoring system for knowledge questions with many correct choices was done by giving one point for each correct answers, questions with yes, don't know and no answers were scored as 2, 1 and Zero respectively, questions with likert scale were scored as not important=0, important to some extent=1, important=2, very important=3.

Percent of total score for each item and for total knowledge was calculated using the following equation

summation of score achieved by each women x100.

maximum possible score for each women x number of women

percent of change in knowledge and attitude was calculated for each participants using the following equation:

(post intervention score- pre intervention score)x100

pre intervention score

The change in knowledge and attitude was considered as satisfactory when > 70 % while ≤70% was considered unsatisfactory (**Fallah *et al.,* 2013).**

Statistical analysis:

- The collected data were coded and analyzed using a data base software program, Statistical Package for Social Science version 19 (SPSS).
- Qualitative data were represented as frequencies and percents, Chi square and Fisher's Exact test were used to detect relation between different variable. Independent t- test, Mann-Whitney was used for quantitative data to detect difference between 2 different groups. Paired t test was used to detect difference in the same group before and after intervention.
- The results were considered statistically significant when the significant probability was less than or equal to ($p \leq 0.05$)**.**

Ethical consideration

1- Ethical approval of the study was obtained from the institution review board (IRB) of the faculty of medicine- Zagazig University before starting the study.

2- The local authority of the included health care facilities were informed about the nature and steps of the study and the required permission were got.

3-The study participants were informed about the nature and the purpose of the study and verbal consent were taken, they were not exposed to any harm or risk and their data were kept confidential.

3. Results

(A) Results of assessment nutritional health status

This study included 350 participants distributed as (183) pregnant women attending public Maternal and child health care centers and (167) women attending private clinics. Regarding the distribution of the same 350 participants by area where health facility is present, (125) were in rural area and (225) were in urban area.

The study showed that about one half of our sample attending public MCH were below 20 years and the majority of them were with low socioeconomic status, while in private facility about one half were of (20-35) years old and most of them were moderate socioeconomic status. with highly significant difference between two groups. Similar difference was found on comparing customers by area where health care facility is present (rural versus urban areas) respectively **(Table 1)**.

On analyzing nutritional habits, this study revealed that most of our sample in public and private health care facility, in rural and urban areas had 3-4 meals/ day with irregular time and take extra food between meals, with significant difference between public and private groups in all dietary habits while in number of meals only when comparing rural versus urban areas, **(Table2).** Regarding 24 hours recall of intake different categories of food, this study showed that only 53.6 % of MCH attendants got protein in previous day compared to 91.6% in private clinics attendants with highly significant difference. also significantly less consumption of vegetables, milk and dairy products and juices among public MCH customers. On comparing rural versus urban areas' customers, significantly less milk and dairy products intake in rural area **(Table3)**.

(B) Results of the intervention stage

One hundred thirty (130) pregnant women entered the intervention stage, (65) of them in intervention group and (65) in control group. The two groups were matched with no significant difference in the age, socioeconomic status, type of facility or area where it is present **(Table 4)**.

Pre intervention assessment of the level of knowledge and attitude showed low level with no significant difference between intervention and control group in any knowledge item or in the attitude **(Table 5).** Post intervention, highly significant higher scores of intervention versus control group were achieved in all items of knowledge and attitude towards healthy nutrition during pregnancy **(Table 5)**.

Also, this study showed highly significant improvement in the mean of difference between pre intervention and post intervention scores of knowledge and attitude about healthy nutrition in the intervention group with 77.6 % and 96.9 % of intervention group having satisfactory knowledge and attitude after the intervention respectively **(Table 6).**

The highest improvement of the % of total score occurred in the knowledge about importance of folic acid from 33.5% to 68% followed by knowledge about importance of calcium from 65.4% to 91.2% then general knowledge about healthy diet from 66% to 82.6% **(Table 6).**

Percent of participants with satisfactory change (more than 70% improvement) in knowledge and in attitude were 86.2% and 76.9% respectively **(Fig.1,2).**

Table (1): Age, socioeconomic distribution of pregnant females attending Public MCH versus private health care facility and rural versus urban areas customers. (Total N=350)

Variable	MCH (public) (N=183)		Private (N=167)		Rural (N=125)		Urban (N=225)	
*Age/(y)	No	%	No	%	No	%	No	%
< 20 -	90	49.2	48	28.7	55	44.0	83	36.9
-20 -	61	33.3	77	46.1	33	26.4	105	46.7
>35-	32	17.5	42	25.1	37	29.6	37	16.4
P-value	<0.001*				<0.001*			
*Socioeconomic status								
Low-	137	74.90	23	13.78	88	70.4	72	32.0
-Moderate	43	23.49	86	51.49	32	25.6	97	43.1
-High	3	1.61	58	34.73	5	4.0	56	24.9
p-value	<0.001*				<0.001*			

*significant difference

Table (2): comparing pregnant women attending public (MCH) versus private clinics and attending rural versus urban health care as regard some important nutritional habits (N=350).

Variable	MCH(public) (N=183)		Private (N=167)		Rural (N=125)		Urban (N=225)	
*Number of meals taken per day	No	%	NO	%	No	%	No	%
-<3 meals	36	19.7	37	22.2	15	12.0	58	25.8
-3-4 meals	131	71.6	92	55.1	105	84.0	118	52.4
-≥5 meals	16	8.7	38	22.8	5	4.0	49	21.8
p-value	0.001*				<0.001*			
*Time of meals intake per day								
Irregular	119	65.0	127	76.0	82	65.6	164	72.9
regular	64	35.0	40	24.0	43	34.4	61	27.1
p-value	0.02*				1.53			
*Extra foods taking between meals No	46	25.1	64	38.3	41	32.8	69	30.7
Yes	137	74.9	103	61.7	84	67.2	156	69.3
p-value	0.008*				0.68			

Significant difference*

Table (3): comparing pregnant women attending public (MCH) versus private clinics and attending rural versus urban health care as regard daily intake categories of food.

Variable	MCH(Public) (N=183)		Private (N=167)		Rural (N=125)		Urban (N=225)	
Daily intake of cereals	No	%	No	%	No	%	No	%
P-value	183	100.0	167	100.0	125	100.0	225	100.0
Daily intake of vegetables	148	80.9	153	91.6	109	87.2	192	85.3
P-value	0.004*				0.63			
Daily intake of fruits	143	78.1	137	.082	77	61.6	134	59.6
P-value	0.36				0.70			
Daily intake of protein	98	53.6	153	91.6	88	70.4	163	72.4
P-value	<0.001*				0.68			
Daily intake of milk and dairy product	129	70.5	156	93.4	87	69.6	198	88.0
p-value	<0.001*				<0.001*			
Juices Daily intake of juice	113	61.7	122	73.1	76	60.8	159	70.7
p-value	0.02*				0.06			

*significant difference; *Intervention phase

Table (4): Age, socioeconomic characteristics, type of health care facility and area where health care is present of intervention and control group.

Variable	Intervention N(65)		Control N(65)		χ2 test	*P*-value
*Age/(y)	No	%	No	%		
-< 20	26	40	27	41.5	.039	0.98
-20-	25	38.5	24	36.9		
>35 -	14	21.5	14	21.5		
*Socioeconomic status						
-Low	29	44.6	30	46.2	.037	0.98
-Moderate	25	38.5	24	36.9		
-High	11	16.9	11	16.9		
* Type of health care facility						
- Public (MCH)	34	52.3	34	52.3	.000	1.000
- private	31	47.7	31	47.7		
* area where health care						
- rural	23	35.4	23	35.4	.000	1.000
- Urban	42	64.6	42	64.6		

Table (5): Mean and SD of knowledge and attitude about healthy nutrition in Pre and post intervention test to detect effect of health education among studied groups (intervention and control) (N=130):

Variable	Intervention (N=65)	% of total score	Control (N=65)	% of total score	*P*-value
* General knowledge about healthy foods MS=10	Mean ± SD		Mean ± SD		
Pretest	6.6 ± 2.1	66.0%	6.38 ± 2.04	63.8%	0.55
Posttest	8.26 ± 1.36	82.6%	6.58 ± 1.91	65.84%	<0.001*
* Knowledge about importance of calcium intake MS=7					
Pretest	4.58 ± 1.46	65.4%	4.3± 1.55	61.5%	0.29
Posttest	6.41 ±.78	91.2%	4.47± 1.54	63.9%	<0.001*
* Knowledge about importance of iron intake MS=9 pretest	5.4 ± 2.17	60.0%	4.9 ± 2.32	54.8%	0.24
posttest	6.23 ± 2.05	69.6%	5.09 ± 2.22	56.58%	0.003*
* Knowledge about effect of anemia MS=13 pretest	10.1±2.9	77.75%	9.33 ± 3.2	71.8%	0.15
posttest	10.60 ± 2.33	81.5%	9.33 ± 3.20	71.8%	0.011*
* Knowledge about importance of folic acid intake MS=5 pretest	1.67±1.4	33.5%	1.64± 1.4	32.9%	0.85
posttest	3.40 ± 1.01	68.0%	1.81 ± 1.42	36.3%	<0.001*
* Knowledge about importance of supplementation MS=9					
Pretest	7.2±1.58	80.0%	6.8±1.9	75.72%	0.22
posttest	7.81 ± 1.39	86.6%	7.07 ± 1.55	78.6%	0.005*
*Total knowledge about healthy nutrition MTS=54					
pretest	36±8.78	66.7%	33.8±9.44	62.6%	0.17
posttest	41.93±6.53	77.7%	34.55±8.77	63.9%	<0.001*
* Attitude towards healthy nutrition MS=12					
pretest	10.9± 1.3	91.1%	10.5 ±1.8	87.43%	0.11
Posttest	11.63 ±.85	96.9%	10.64 ± 1.52	88.7%	<0.001*

significant difference ; * MS = Maximum score; MTS= Maximum total score

Table (6): Comparison the mean and SD of knowledge and attitude pre-intervention versus post - intervention in the intervention group(Total=65).

Variable	Pre-intervention (N=65)	Post-intervention	Paired t-test	*P*-value
	Mean ± SD %of total score	Mean ± SD %of total score		
▪ General knowledge about healthy foods MS=10	6.6± 2.1 66.0%	8.26± 1.36 82.6%	7.88	<0.001*
▪ Knowledge about importance of calcium intake MS=7	4.58±1.46 65.4%	6.41±.78 91.2%	9.24	<0.001*
▪ Knowledge about importance of iron intake MS=9	5.4± 2.17 60.0%	6.23± 2.05 69.6%	3.77	<0.001*
▪ Knowledge about effect of anemia MS=13	10.1± 2.9 77.75%	10.33± 2.33 81.5%	3.11	0.003*
▪ Knowledge about importance of folic acid intake MS=5	1.67± 1.4 33.5%	3.4±1.01 68.0%	11.28	<0.001*
▪ Knowledge about importance of supplementation MS=9	7.2± 1.5 80.0%	7.81 ±1.39 86.6%	2.99	0.004*
▪ Total knowledge about healthy nutrition MTS=54	36±8.78 66.7%	41.93±6.53 77.7%	11.47	<0.001*
▪ Attitude towards healthy nutrition MS=12	10.95± 1.32 91.1%	11.63±.85 96.9%	5.28	<0.001*

*MS=Maximum score; *MTS= Maximum total score *significant difference

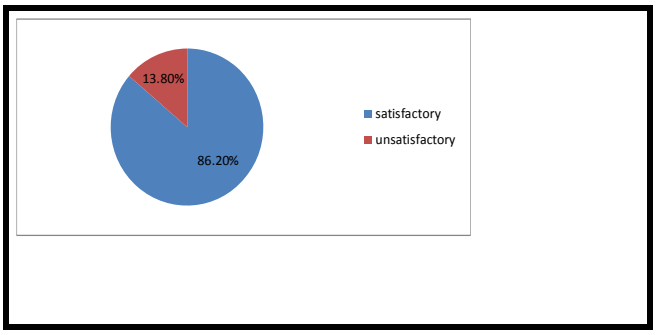

Fig. (1):Percent of satisfactory and unsatisfactory change in total knowledge among intervention group post intervention (N=65)

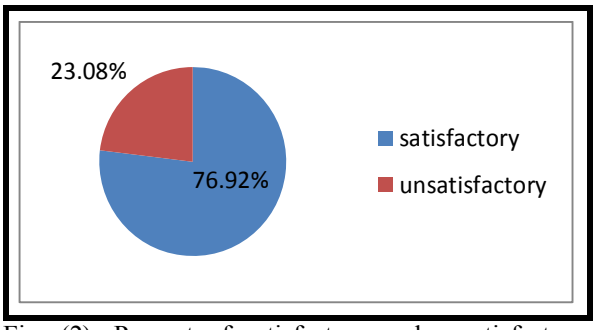

Fig. (2): Percent of satisfactory and unsatisfactory change in total attitude among intervention group post intervention (N=65)

4. Discussion

In this study we were concerned with pregnant women customers attending public and private health care facilities in rural and urban areas regarding their sociodemographic composition, nutritional habits, knowledge and attitude towards healthy nutrition during pregnancy and effect of health education program on their knowledge and attitude.

Studying the age and socioeconomic distribution of pregnant females in the 4 included health care facility revealed different composition by type of facility (public or private) and area where facility is present (rural or urban) proving the importance of including the 4 selected components to get a representation of pregnant female of Sharkia governorate which is the 3rd Egyptian governorate in population number after Cairo and Giza **(DHS, 2014).**

Most participants in private and in urban health care facilities were in age of 20-35year and of moderate socioeconomic status while in public MCH and in rural areas, considerably high proportion were from age group less than 20 years and low socioeconomic status. This is due to the tendency to earlier marriage in participants of lower socioeconomic status while more interest in completing graduation and having work before marriage among moderate and high socioeconomic class **(Vijayalaximi and Kadaptti, 2011**).

Regarding the nutritional habits, more than 90% of pregnant women attending Public MCH and among rural facilities customers and about 80% of attendants of private clinics and among urban health care customers take (3-4) meals or even less than 3 meals per day while only slightly more than 20% of attendants of private clinics and in facilities in urban area consume five or more meals per day as recommended for the pregnant female **(IOM, 2009)**. This results agree with **Abd - Elmouty (2009)** who found that most of his studied sample ate 3 meals per day with percent 66.7%. Also our results agree with **Vijayalaximi and Kadaptti (2011**)who found that among women attending governmental hospitals in urban and rural areas 90% and76% respectively consume 3 meals per day.

The regularity of meal time is absent in about two thirds of our participants with significantly more irregularity among private clinic customers in contrast to **Abd - Elmouty (2009)** who found that more than one half of pregnant women had their meals at regular times. The explanation for changing the time of eating from one day to another among our participants is that most of them wait their husbands to share the meals with.

Extra- foods between meals (snacks taking) was found in considerable proportion of our participants, significantly more in public health care facility when compare by type of facility (public or private) but did not significantly differ when compared by area where facility is present(rural or urban areas). This is in agreement with **Koryo- Debrah *et al.* (2012) and Sholeye *et al.* (2014)** who found that no significant difference between rural and urban areas as regard snacks taking. Oppositely, **Gao *et al.* (2014)** found significantly more consumption of foods between meals in urban area compared to rural area.

Collective evaluation of nutritional habits among our participants pointed to poor practice and real need for nutritional educational programs.

As regard the daily intake of different categories of food as guided by my pyramid and healthy eating plate, most of pregnant women attending public MCH and private clinics don't eat all categories daily and there was significant difference between the two groups except in cereals and fruits**.** This agrees with **Al-Tell *et al.* (2010), Vijayalaximi and Kadaptti (2011**) **and Madhavi and Singh (2011)** who found no sufficient intake of macro and micro nutrients.

As regard the daily intake of different categories of my pyramid and healthy eating plate in rural and urban areas, there were significant difference as regard daily intake of milk and dairy products with increase consumption among pregnant women in urban area.

This may be due to more health awareness and higher economic ability to buy different foods among urban facility's customers.

In agreement with our findings, **Gao *et al.* (2013)** found Significant difference in food group consumption in the categories of cow's milk.

On the other hand, our findings were in contrast to **Sholeye *et al.* (2014)** who found that no significant difference between rural and urban areas as regard macronutrient and micronutrient intake.

Section (B) Intervention stage

No significant difference between intervention and control group, in age, socioeconomic status, type or area of health care facility. This controls confounding factors**.**

In our study, the intervention led to highly significant difference between study and control group in all items of knowledge and in total knowledge and attitude about healthy nutrition while there had been no significant difference between them before the intervention denoting the effect of our health education program and this is in agreement with **Abd - Elmouty (2009), Al-Tell *et al.* (2010) and Mohamed (2014**) who also found highly significant difference in all items of knowledge and this reflect the importance of health education and its effect on the awareness of the pregnant females and consequently on pregnancy outcome.

the present study revealed highly significant difference between pre and post intervention as regard all items (General knowledge about healthy foods - knowledge about intake of calcium, of iron, of folic acid and of supplementations - Knowledge about effect of anemia- attitude towards healthy nutrition). This improvement is due to the effectiveness of our health education program, the very low pre intervention level of knowledge and attitude incriminate the lack of preventive health services in health care facilities. The knowledge about folic acid importance was as low as 33.6% of total score.

These findings are going with **Al-Tell *et al.* (2010)**as they found that post nutrition intervention results among pregnant women indicated an improvement in their level of perceptions with significant difference between intervention &control group. Also our results are in agreement with **Fallah *et al.* (2013)** as they found improvement in awareness level of pregnant women who received at least two educational sessions on healthy nutrition. Our study showed that percent of participants with satisfactory change (more than 70% improvement) in knowledge and in attitude were 86.2% and 76.9% respectively. In agreement with **Al-Tell *et al.* (2010) and Mohamed (2014**) who showed that most of intervention group had satisfactory knowledge and positive attitude after intervention and this reflects the importance of such interventions and their effects.

Conclusion and Recommendations

In conclusions, bad nutritional habits and inadequacy of knowledge and attitude towards many items related to healthy nutrition during pregnancy was found among our sample. A well designed health education program leads to significant improvement of knowledge and attitude pointing to the importance of generalized adoption of such programs in all antenatal settings.

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References

1. Abd - Elmouty, SM. (2009): The impact of educational program for anaemic pregnant women on their pregnancy outcome in rural area Dakahlia Governorate, MD Thesis submitted to the faculty of nursing Mansoura university,(pp.58-92).
2. Al-Tell, MA; Soliman, NM; EL-Guindi, FK. and EL-Nana, H. (2010): Effect of nutritional interventions on anemic pregnant women's health using health promotion model, in Palestinian Governomental primary health care center, Balata, Ras -Elein, Habs- Aldam and alwasta clinic, Medical Journal of cairouniversity.net,78 (2): 109-118. www.medicaljournalofcairouniversity.com.
3. Amer, SA. (2009): Gestational weight gain and pregnancy outcome, Master Thesis in community department, faculty of medicine, zagazig University,(pp.70-94).
4. American Pregnancy Association (2014): Diet During Pregnancy United States Department of Agriculture. Health & Nutrition Information for Pregnant & Breastfeeding Women Accessed 10/17/2014. The Cleveland Clinic Foundation. Available at: http://www.medicalnewstoday.com/articles/273451.php?page=2.
5. DHS. (2014): Egyptian Demographic health survey final report, Ministry of health and populations, accessed at: may 14, 2015. Available at: dhsprogram.com/publications/publication-fr302-dhs-final-reports.
6. El-Gilany, A; El-wehady, A. and El-Wasify, M. (2012): Updating and Validation of socioeconomic status scale for health research in Egypt, Eastern Mediterranean Health Journal, 18(9):962: 8.

7. Fallah, F; Pourabbas, A; Delpisheh, A; Veisani, Y. and Shadnoush, M. (2013): Effects of nutrition education on levels of nutritional awareness of pregnant women in Western Iran.Women Int J Endocrinaol Metab; 11(3)175-8.
8. Fujiwara, K; Aoki, S; Kurasawa, K; Okuda, M; Takahashi, T. and Hirahara, F. (2014): "Associations of maternal pre-pregnancy underweight with small-for-gestational age and spontaneous preterm birth, and optimal gestational weight gain in Japanese women." J Obstet Gynaecol Res; 40(4): 988-94.
9. Gao, H; Caroline, KS; Scherbaum, V; Biesalski, H; Hormann, E. and Bellows, AC.(2013): Dietary Intake and Food Habits of Pregnant Women Residing in Urban and Rural Areas of Deyang City, Sichuan Province, China Nutrients, 5: 2933-54.
10. Institute of Medicine (IOM) and National Research Council (NRC) (2009): Weight Gain during Pregnancy: Reexamining the Guidelines. Washington, DC, the National Academies Press. 173-262. https://iom.nationalacademies.org/.
11. Koryo- Debrah, A; Nti,CA. and Adanu, R. (2012): Dietary practice and nutrient intake of pregnant women Accra, Ghana, Curr. Res. J. Biol. Sci, 4 (4):358-65.
12. Masho, SW; Bishop, DL. and Munn, M. (2013): "Pre-pregnancy BMI and weight gain: where is the tipping point for preterm birth?" BMC Pregnancy Childbirth, 13(1): 120.
13. Mohamed, MM. (2014): Weight gain restriction for pregnant women Attending family health care in the 1st District in El Obour City (An intervention study), Master Thesis in family medicine, faculty of Medicine, Zagazig University (pp.95-109).
14. Nteff, GM. (2013): The Impact of Education on Recommended Weight Gain and Selected Prenatal Outcomes in Low Income Pregnant Women, Research in Obstetrics and Gynecology, 2(3): 13-27.
15. Olson, CM. and Strawderman, MS. (2003): Modifiable behavioral factors in a biopsychosocial model predict inadequate and excessive gestational weight gain. Journal of the American Dietetic Association;103(1):48–54.
16. Sholeye, OO; Badejo, CA. and Jeminusi, OA. (2014): Dietary habits of pregnant women in Ogun East Senatorial Zone, Ogun state, Nigeria, A comparative study, International Journal of nutrition and metabolism, 6(4): 42-46.
17. Vijayalaximi, AHM. and Kadaptti, M.(2011): A comparative study on nutritional status of selected pregnant women 1(1): 1-4.
18. Watkins, ML; Rasmussen, SA. and Honein, MA. (2003): Maternal obesity and risk for birth defects. Pediatrics; 111:1152–58.
19. Wilson, DR. (2014): Nutrition in pregnancy, Establish healthy eating plan and Childbirth: Food for Thought, international Journal of health education, 29(3):4-10.
20. Young, TK. and Woodmansee, B. *(2002*): Factors that are associated with cesarean delivery in large private practice: The importance of pregnancy body mass index and weight gain, American Journal of Obstetrics and Gynecology,187:312-8.

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