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High Risk Obese Pregnancy: Nutritional Program on Maternal Health for Controlling Obesity

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ABSTRACT

Background: The incidence of maternal obesity (BMI>30kg/m²) at the start of pregnancy has been rising over the last world. Obesity during pregnancy represents an important preventable risk factor for adverse pregnancy outcomes and is associated with negative long-term health outcomes for both mothers and off springs. **Aim:** The aim of this study was to evaluate the effect of a nutritional program on maternal health for controlling obesity. **Design:** A quasi-experimental design was used. **Setting:** The study was conducted in two MCH centers, MCH of north Giza and MCH of El-Moneab. **Sampling:** Purposive samples of 100 obese pregnant women were included; attended MCH centers for their first visit. Those women were divided randomly into 50 women for study group; those chosen randomly and received the nutritional program; and 50 women for the control group; who did not receive the program, with, inclusion criteria; pregnant, obese (BMI ≥ 30 kg/m²) and in the first trimester of pregnancy. Exclusion criteria included severe complications of pregnancy and sever co–morbidities not enabling the women to follow the program. **Tools** for data collection three tools were used. 1) An interviewing questionnaire which includes five parts; socio-demographic characteristics, obstetric history and medical history, obese pregnant women's knowledge, obese pregnant women's lifestyle practices, and daily intake of various food groups and types. 2) Physical assessment to record initial and follow –up weight assessment of the pregnant women. 3) Pregnancy outcomes records including maternal and neonatal outcomes. **Results:** The study showed that, obese pregnant women's knowledge of dietary and healthy practices life style issues is low, as well as their practices towards diet, exercises, and rest. Their dietary practice during pregnancy is inadequate. **Conclusion:** The study answered the research hypothesis stating that nutritional program will improve the health of maternal obesity and their newborn without complications, the nutrition program was effective in improving their dietary and healthy lifestyle knowledge and practices. This is associated with significant improvement in lowering body weight throughout follow-up visits during pregnancy, in addition, the nutrition program led to better maternal outcomes as lower rates difficult labor with fetal distress. Fetal outcomes are also improved in terms of better Apgar scores and less need for NICU admissions. **Recommendations:** The developed nutritional program should be made available at similar MCH centers, and the maternal nurses should use it in educating attendant obese pregnant women.

Key words: Maternal obesity, Pregnancy, Nutritional Program, Maternal Health.

Introduction

High-risk pregnancy is broadly defined as one in which the mother, fetus or newborn will be at increased risk for morbidity or mortality before or after delivery **(American College of Obstetricians and Gynecologists, 2010).**

Obesity was regarded as a pathological condition that is characterized by an accumulation of much fat than optimal body function, whereas over weight is an increase of the body weight above the some arbitrary standard in relation to a person's height. On the other hand, persons who are greatly overweight are also over fat conditions almost always appearing together. Obesity occurs when the energy intake from food and drink consumption is greater than energy expenditure through the body's metabolism and physical activity over a prolonged period, resulting in the accumulation of excess fat **(Powers, 2012).**

Maternal obesity, defined as a Body Mass Index (BMI) of 30 kg/m² or more at the first antenatal consultation, can increase health risks for both the mother and child during and after pregnancy. For mothers these risks can include gestational diabetes, high blood pressure and depression. Fetal risks include macrosomia, congenital anomalies and stillbirths. Maternal obesity has also been linked to low breastfeeding rates, adverse childhood cardiovascular and respiratory outcomes and childhood obesity **(Heslehurst et al., 2012).**

The number of obese women worldwide is approximately 300 million obese adults, more than 1 billion are overweight and a further 115 million suffer related problems ranging from premature death to reduce overall quality of life, 35% of all mothers who died were obese, representing a disproportionate number of death associated with obesity in childbearing women, while in Egypt 70% of adult women were overweight **(WHO, 2012).**

The maternal obesity can be classified as primary or secondary. Primary obesity is the result of caloric intake that exceeds the body's metabolic rate under normal conditions. Secondary obesity, such as hypothyroidism, hypogonadism and hypercortisolism, are important diagnostic consideration, the vast majority of obese women have idiopathy **(Leaf, 2011).**

Maternal obesity constitutes a serious health risk for mother and fetus, the impact of which increases with the degree of obesity. A non-balanced diet during pregnancy contributes not only to abnormal fetal development and subsequently increased neonatal morbidity and mortality but also to increased morbidity during childhood, adolescence and adulthood (developmental origins of adult disease). A systematic effort for weight reduction is imperative in order to avoid transmitting obesity from generation to generation. Achieving this goal will most likely result in a sharp decrease in fetal and neonatal morbidity and mortality and will improve the outcome of offspring and of future pregnancies **(Sirimi & Goulis., 2010)**.

Interventions in obese pregnancy women, to manage weight, result in a significant reduction in weight gain in pregnancy. Dietary interventions are the most effective type of intervention in pregnancy in reducing gestational weight gain and the risks of preeclampsia, gestational hypertension and shoulder dystocia, since weight loss during pregnancy is not recommended, interventions during pregnancy focus on helping women gain the proper amount of weight based on their pre pregnancy weight status. Health professionals must use their knowledge for care of obese woman during and after gestation and be an advisor for supporting the healthy behaviors of the obese woman **(Thangaratinam et al., 2012; Siega-Riz & Gray, 2013).**

The goals of diet control are to provide adequate calories and nutrition for obese pregnant women to maintain appropriate

maternal weight gain and fetus to maintain a normal growth rate **(Cheng et al., 2013)**.

Community health nurses (CHN) play a critical role in maintaining and improving well-being and maternal health of women at risk for obesity. The community health nurse has an important health promotion role through provision of health education activities, which are targeted at the whole obese pregnant women through consultation and antenatal classes. Thy CHN can educate the pregnant women with obesity about the importance of regular follow-up, and diet as prescribed, routinely measuring body mass index (BMI) and counseling patients on healthy eating and activity are critically important ways that pediatricians and primary care providers can help prevent obesity **(El-Lassy, 2010).**

Significance of the study

Obesity of the pregnant women is one of the major health problems encountering health of the mothers. In Egypt, the prevalence of obesity is 30.8% among rural women, 49.1% among urban women and the prevalence rates of fetal complications were 14.6% for obese women in the form of early miscarriage, 16.5% of obese women were diabetics, and 34.5% had chronic hypertension **(WHO, 2010).**

Obesity has become an important public health globally. Being obese in reproductive period causes many problems related to both the baby and the pregnant woman. The risks associated with needs to be focus of public attention. Woman must first be aware of their body health and impacts of weight on this. Then, after perception of their status they need to be given the consultation regarding their knowledge level, attitudes about their nutrition, breast feeding, preconception measures to be taken for their pre and postpartum health. In this review the researchers intended to recognize the effects of nutritional program for improving the obesity on maternal health. So, there is a great need to conduct such type of research, which might assist such obese pregnant women to safely and effectively manage this problem.

Aim of the study:

This study aims to evaluate the effect of nutritional program on maternal health for controlling obesity through:

1. Assessing obese pregnant women's knowledge about obesity during pregnancy.
2. Assessing obese pregnant women's practices related to their nutritional lifestyle to determine their needs.
3. Designing and implementing a nutritional program according to obese pregnant women's needs.
4. Evaluating the effect of the program on the mother and neonatal health.

Research hypothesis

The nutritional program will improve the health of obese pregnant women and their newborns without complications.

I. Technical design

Study design:

A quasi-experimental design was used to conduct this study.

Setting:

The study was conducted in two MCH centers, affiliated to the Ministry of Health, they presented all preventive and curative health care services, the total number of MCH_S in El Giza Governorate at the level of urban health centers (18), rural health units

(5), the offices of health (15) and maternal and child care centers (4) in El Giza governorate; and the researchers have chosen two of them for the study, the MCH center of north Giza and MCH center of El–Moneab in South. These centers are considered to have the highest attendance of pregnant women.

Sampling:

The sample of the study was purposive; it included 100 obese pregnant women with a BMI between 30.0 and 39.9 kg/m^2. They were recruited at their initial MCH visit. Those women were divided randomly into two equal groups, 50 women for study group; those chosen randomly and received the nutritional program; and 50 women for the control group; who did not receive the program. They were chosen according to the following inclusion criteria; pregnant, obese (BMI $\geq$ 30 kg/m^2) and in the first trimester of pregnancy. BMI was calculated based on weight and height measured at the women's first antenatal appointment at 10–16 weeks of gestation. Exclusion criteria were severe complications of pregnancy and severe co–morbidities not enabling the women to follow the program.

Tools of data collection:

Three different tools were used for data collection.

Tool I: An interview questionnaire, developed by the researchers based on literature review, and written in simple clear Arabic language, it consisted of five parts as the following:

Part I: presents socio-demographic characteristics of obese pregnant women. It included data about age, educational level, occupation, family income, and Body Mass Index at initial antenatal visit.

Part II: ideals with obstetric and medical history from record analysis, such as; gravidity, parity, previous abortions, number of living children, history of previous deliveries, previous labor problems, obesity classes, chronic diseases, previous surgery, medication during current pregnancy, and start of ante natal care visit.

Part III: is devoted to the obese pregnant woman's knowledge to assess her satisfactory level before and after implementation of the nutritional program. It included multiple choice questions as well as close and open–ended questions covering areas such as; meaning of obesity, causes, complications and prevention, and about diet such as; balanced diet, food groups, food compositions, dietary disorders, and exercise **(Allender & Spradley, 2011).** (Pre/post program)

Scoring system: For knowledge items, the correct answers were predetermined according to literature review, a correct response was scored 1 and the incorrect one was scored zero. For each area of knowledge, the scores of the items were summed–up and the total divided by the number of the items, giving a mean score for the part. These scores were converted into a percent score, and means and standard deviations were computed, woman's knowledge was considered satisfactory if the percent score was 50% or more and unsatisfactory if less than 50%.

Part IV: Focused on obese pregnant women's lifestyle practices towards dietary practices, exercises, and rest during pregnancy, as they reported. This scale was modified from **Karen et al. (2013),** it consisted of 16 statements on a 3-point Likert scale: always, sometimes and never (Pre/post program)

Scoring system: For lifestyle practice items, each response has 3 levels of answers: "always", "sometimes", and "never", were scored 3, 2, and 1 respectively. The scores of the items were summed–up and the total divided by the number of the items, giving a mean score. These scores were converted into

a percent score. The lifestyle practices were considered positive if the percent score was 60% or more and negative if less than 60%.

Part V: Daily intake of various food groups and types, this consisted of a list of all food groups with related food items. The women were asked about the frequency of daily intake of each item, it includes cereals, carbohydrates, vegetables/fruits, proteins, dairies, fat, salt, caffeine, soda, and juice **(USDANAL, 2014).** (Pre/post program)

Scoring system: For each group, the daily frequencies of the items were summed–up and the means and standard deviations were calculated. Moreover, the intakes of major groups were compared to the corresponding recommended daily allowances.

Tool II: Physical assessment:

This tool was designed by the researchers and used to record the initial and follow –up weight assessments of the pregnant woman.

Tool III: Pregnancy outcomes:

Designed by the researchers, this tool includes mode of labor, maternal complications as fetal distress, cephalopelvic disproportion, stillbirth, cervical dystocia, abnormal uterine contraction, retained placenta, perineal lacerations, and postpartum hemorrhage, as well as neonatal outcomes such as; Apgar scores, birth weight, needed resuscitation, needed NICU admission, still birth and neonatal death.

Content validity and reliability of tools:

In order to test validity and reliability of the research instruments; validation of data collection tools was done by 5 of the faculty staff nursing experts from the community, obstetrics, and dietitian specialties. The required modifications were carried out accordingly. Then, test–retest reliability was applied. The tools proved to be strongly reliable.

II. Operational design:

Preparatory phase:

A review of the current and past available literature, covering the various aspects of the problem, using textbooks, articles, magazines and internet search was done, to assist in the development of data collection tools and the preparation of the nutritional program.

Ethical considerations:

All the women's rights were secured; each one was informed about nature of expected outcomes of the study. They were assured that all data will be treated confidentially and information will be used only for the research purpose and for their benefits, and each study subject was allowed enough time throughout the study. They were also informed about their right to withdraw at any time without giving any reason.

Pilot study:

A pilot study was done before the actual study whereby 10 obese pregnant women with characteristics similar to the study participants were interviewed, to test content clarity and consistency of the tools. The participants included in the pilot study were excluded from the main study. Then, modifications were accordingly made on the study tools in order to be more applicable and the necessary changes were fulfilled by correction, omission or addition of items, until the final shape of the tools was reached. As well, any mistake was corrected immediately before recording and was then entered in the data base. The pilot study also allowed assessment of the reliability of the lifestyle scale used in the data collection tool.

This was done through measuring its internal consistency; which proved to be good with a Cronbach, alpha coefficient 0.60.

Field work:

For work organization, the researchers allocated 4 days every month for collection of data from women at MCH centers. The study was carried out from 9.00 a.m. to 12.00 noon until data had been completed from obese pregnant women. The study was conducted over a period of one year from beginning of May 2013 to beginning of May 2014. The work was carried out through assessment, planning, implementation, and evaluation phases. First, the assessment phase (preparatory phase) was done; the program implementation and evaluation were carried out. Each study subject was interviewed and assessed individually using the study tools. The program was carried out in 13 sessions for knowledge and practices including time for discussion.

Program development:

Nutritional program development included 5 phases:

Phase I: Preparatory phase:

During this phase, a review of related literature was done in order to prepare the data collection tools. Once the preliminary forms were ready, they were presented to a panel of experts in nursing and medical nutrition for face and content validation. They revised the forms for clarity, relevance, and comprehensiveness.

Phase II: Assessment phase:

After securing official permissions, the researchers started to recruit women according to eligibility criteria. The researchers introduced themselves to the obese pregnant women of the study and control groups, explained to them the aim of the study, its importance and procedures to be performed to them during the study. After getting women's consent for participation in the study, they were assigned to either the study group who will have the nutritional program, or the control group who will receive only the routine care of the MCH center. Women were interviewed using the answers of the pre-test questions as well as questionnaire form, and were examined using the physical assessment sheet. The time needed for filling in the forms varied from 30-40 minutes. The obtained data were considered as baseline or pre-program data**.**

Phase III: Designing and planning phase:

The obtained data were analyzed in order to identify the information needs of the studied women. This served as the base for the nutritional program, in addition to related literature. The program was designed for all grades of obesity in pregnancy to be applied in the antenatal care unit in MCH centers**.**

Phase IV: Implementation phase:

The designed nutritional program was implemented to recruited women who were divided in small groups according to their degree of obesity and gestational age. It was administered in thirteen sessions (6 theories & 7 practices).The duration of each session ranged between 60 and 90 minutes.

The sessions focused on the relation between energy intake and energy expenditure based on the active and healthy food pyramid for pregnant women, and recommendations for a healthy and balanced diet, theoretical insights applied to the women's own lifestyle and eating habits using their 7- day food diary were discussed; exercises in reading food labels, methods for increasing their level of physical activity were discussed.

Principles of this nutritional program for obese pregnant women were based on the degree of obesity and gestational age. This

method has been shown to be effective in diet and exercise advices in obese pregnant women.

Nutritional program focused on developing, exploring, and resolving problems about making changes, without undue pressure. After every session, the women were asked to identify behaviors needed to change and to set small stepwise goals from their own intention to achieve a healthy behavior.

Personal barriers to behavioral change were explored and as much as possible positive verbal reinforcement was given to increase each pregnant woman's self-confidence and self-efficacy. Although the main focus was on nutritional advices and physical activities, worries and personal questions concerning their pregnancy were also addressed.

The start was with an orientation session to acquaint women with the program objectives and procedures. Training included theoretical as well as applied parts. The nutritional program was implemented. Nutritional program was carried out to the study group only.

Women in both groups were followed monthly to assess the progress of pregnancy, and their weight. This was done till the time of delivery, where the last part of the physical assessment sheet was used to record the mode of delivery, complications, and postpartum hemorrhage, as well as the maternal and fetal outcomes.

By the end of each session a summary was made, and time was allocated for questions and answers, and a plan for next session was presented. The researchers adjusted with the pregnant woman a day for the next session according to follow up time of each pregnant woman. Except for the last session, a termination of sessions through feedback was done.

The nutritional program covered the following topics:

- Anatomy and physiology of pregnancy.
- Embryo cycle.
- High risk pregnancy.
- Maternal obesity (meaning of obesity, normal and abnormal weight during pregnancy).
- Gestational weight gain of obese pregnant women
- Nutrition, nutrition requirements & healthy eating during pregnancy.
- Lifestyle in obese pregnant women.
- Daily physical activity.
- Antenatal care.
- Guidelines to promote appropriated weight gain and healthy lifestyle in overweight and obese pregnant women.
- Complications associated with maternal pregnancy overweight and obesity.

The sessions included the following parts:

Session I: Promotion of pregnant obese women's knowledge about, anatomy and physiology of pregnancy, physiological changes during pregnancy, physical, psychosocial, and behavioral changes that usually occur as the mother adapt to pregnancy, posture and body mechanics, rest and relaxation, personal hygiene, activity and exercise, and safety, and pregnancy complications,

Session II: includes pregnant obese women's knowledge about, high risk pregnancy, risk factors for a high-risk pregnancy, prenatal care for high-risk pregnancy, weight gain during pregnancy, obesity meaning, causes, complications and prevention, gestational weight gain recommendations to optimize outcomes for the woman and the infant. Body mass index, recommended rates of weight gain in the second and third trimesters recognizing onset of complications, appropriate weight gain patterns, demonstrate knowledge of initial and follow-up visits during pregnancy.

Session III: Promotion of pregnant maternal practices related to their nutritional lifestyle about diet such as; balanced diet, food groups, food composition, food frequency intake, and dietary disorders, nutrition requirements and healthy eating during pregnancy.

Session IV: Promoting of pregnant maternal practices related to nutrition as maternal and fetal nutrition, recommended maternal weight gain during pregnancy, recommended level of intake of energy sources, protein, and key vitamins and minerals during pregnancy, examples of the food sources that provide the nutrients required for optimal maternal nutrition during pregnancy, role of nutrition supplements during pregnancy, nutritional risk factors during pregnancy; the dietary needs of adolescent and mature pregnant women. Recommendations for a healthy and balanced diet were based on the official National Dietary Recommendations.

Session V: Management practices for obese pregnant women's common problems e.g., nutrition as drinking fluids and juices, eating foods containing vitamin "C", eating fresh vegetables and fruits, small intake of carbohydrates, fatty foods, and proteins, avoiding salty and spicy foods, moderate intake of sugars, small frequent meals during the day, having cooked food, and half cooked foods, and avoiding eating manufactured foods.

Session VI: Lifestyle in obese pregnant women as daily physical activity, rest and exercises as managing time, arrangement of the work, doing one work at a time, using body mechanisms, using suitable tools while cleaning the house, keeping on taking periods of rest and relaxation, and doing breathing exercises, rest, and activity and exercise.

Nutritional program Booklet:

An illustrated booklet aiming at providing accurate knowledge and practices related to obesity during pregnancy, including all contents of the nutritional program was designed and offered to the obese pregnant women as an educational reference during nutritional program implementation and as self-learning reference after nutritional program implementation.

Teaching methods:

Methods used in teaching the program content included the following: formats, lectures, discussion, demonstration, redemonstration, role play, and presentation and group discussions.

Teaching aids:

Suitable teaching aids were specially prepared for the program application as; colored posters, laptop CD, handouts and the booklet.

Phase V: Evaluation phase:

The knowledge and practices related to maternal obesity during pregnancy were evaluated through post–test using the same data collection forms. The change in food intake frequency was reassessed at the second and third trimesters. The changes in body weight were recorded monthly till the time of delivery for the study and control

groups, these evaluations were done to women of both groups.

III. Administrative Design:

Official permissions were obtained from the Ministry of Health (MOH) to conduct the study in the selected settings. This was done through letters addressed from the Dean of the Faculty of Nursing at Ain Shams University. As well, permissions were secured from the directors of two MCH centers based on official letters from the MOH. The researchers met with them and explained the aim and process of the study to obtain their cooperation in data collection.

Phase VI: Statistical Design:

Data entry and statistical analysis were done using the statistical package for social sciences (SPSS), version 16.0. Data were presented using descriptive statistics in the form of frequencies and percentages for qualitative variables, and means and standard deviations, and median for quantitative variables. Cronbach alpha coefficient was calculated to assess the reliability of the developed practice scale through its internal consistency. Quantitative continuous data were compared using the nonparametric Mann-Whitney test. Qualitative categorical variables were compared using Chi-square test(x^2). Whenever the expected values in one or more of cells than 2x2 tables was less than 5, Fisher exact test was used instead. In larger than 2x2 cross-tables, no test could be applied whenever the expected value in 10% or more of the cells was less than 5. Statistically significant difference was considered at $P \leq 0.05$ and highly statistically significant difference at $P \leq 0.001$.

Results:

Table (1) shows that the study and control groups of obese pregnant women had homogeneous socio-demographic characteristics with insignificant differences found between the two the groups. The mean age of the study group and the control group were 33.2±3.6 and 32.5±3.1 years respectively. As for the level of education, 36.0% and 40.0% respectively, were having basic education. Regarding occupation, 78.0% and 74.0% respectively, were housewives. 86.0% and 84.0% in the study and control groups respectively, had insufficient income, 54.0% and 50.0% respectively, were having class 2 obesity. Meanwhile, No statistically significant differences between the two groups were evident.

Table (2) displays obese pregnant women's obstetric history in the study and control groups, the mean gravidity is 3.3±1.3 and 3.2±1.3 respectively. The difference between the two groups was not statistically significant (X^2=0.32, P=0.85). Related to parity, the mean parity was 1.8±1.0 and 1.7±1.1 respectively in the study and control groups respectively, with no statistically significant difference (X^2 =2.14 P=0.54).

Regarding to previous abortions, 56.0% and 44.0% of women in the study and control groups respectively, had a history of abortion. The difference between both groups was not statistically significant. According to the number of living children, the same table showed that the mean is 1.4±1.0 and 1.3±0.9 in the study and control groups respectively.

Also table (2) shows the history of previous deliveries in the study and control groups, 74.0% and 68.0%, had caesarean section respectively. Related to previous labor problems, 64% and 62% were obstructed labor in the study and control groups respectively, with no statistically significant differences between groups.

The same table shows medical history, all those in study and control groups had a history of obesity before and during current pregnancy. On the other hand, 34.0% and 54,0%, had tried weight loss before current

pregnancy in study and control groups respectively, 56.0% and 36.0% were class 2 obesity, also 34.9% and 33.3%, had hypertension in the study and control groups respectively. Meanwhile, the prevalence of diabetes was significantly higher among women in the control group (P=0.02), whereas 8.9% and 41.9% respectively, had anemia (P<0.001).

Also table (2) indicates that 84.0 % and 82.0%, were having antenatal care during the current pregnancy at the first trimester in study and control groups respectively. As regards medication intake during current pregnancy, 91.5% and 94.0% respectively were taking medications, 62% and 57.4%, had vitamins and minerals intake in study and control groups respectively, with only difference in the intake of diabetes medications between in the study and control groups. (P=0.06).

Table (3) presents obese pregnant women's knowledge in the study and control groups, pre and post program. The table shows that 80.0%, 92.0%, 86.0% and 88.0%, had satisfactory knowledge for meaning, causes, complications, and prevention of obesity respectively in study group, compared with 14.0%, 28.0%, 34.0%, and 10.0% respectively, in the control group after implementation of the nutritional program. The same table revealed also that, 98.0%, 92.0%, 86.0%, 86.0%, and 86.0 %, had satisfactory knowledge of balanced diet, food groups, food compositions, dietary disorder and practicing exercise respectively among women in study group post program, compared to, 18.0%, 26.0%, 22.0%, 30.0%, and 40.0% respectively, in the control group.

The same table explains the differences in pregnant obese women's knowledge about obesity pre and post program, as they had poor knowledge pre-test, but after the implementation of the nutritional program, their knowledge improved. As well, there were highly statistically significant improvements in all items related to knowledge of pregnant obese women.

Figure (1) illustrates that 14.0% and 16.0%, of obese pregnant women had total satisfactory level of knowledge in all areas of knowledge in both study and control groups respectively, at pre nutritional program. Meanwhile, after program 94% and 36.3% respectively, had satisfactory knowledge, as well as their mean knowledge (35.59±7.342 vs. 59.33±2.731).

Table (4) shows lifestyle practices of obese pregnant women in study and control group, as 8.0% and 4.0% respectively, had adequate lifestyle practices towards diet in pre-program. However, after the program implementation, 84% and 80% respectively of women in study group had adequate lifestyle practices for diet and exercise compared with 6.0% and 2.0% respectively in control group, highly statistically significant differences were observed between both groups in all areas of practices (P=<0.001).

Figure (2) illustrates that 4.0% and 0.0% had positive life style practices pre-program in study and control groups respectively, while, post program, 88% and 8% had positive life style practices, in the study and control groups respectively.

Table (5) shows that pre program, the daily mean intake of carbohydrates was higher among women in the study compared with those in control group (P=0.001). The mean frequency of juice intake was higher in the control group with statistically significant difference between both groups (P=0.001). At post program, the table demonstrates statistically significant differences between the two groups in all items of food intake. Thus, women in the study group had higher intake of dairies (p < 0.001) and vegetables and fruits (P=0.002). On the other hand, women in the control group had higher intake of carbohydrates (P=0.001), salt (P<0.001), caffeine (P<0.001), and juices (P<0.001).

Figure (3) shows that the mean weights in the first and last follow up visits among the study group were 93.7±14.9 kg and 99.0±22.0 kg respectively. There was a highly statistically significant difference between the two groups (X^2=19.96, P<0.001).

Table (6) shows the maternal outcomes of obese pregnant women during labor in the study and control groups, as 64.0% in study group and 20.0% in control group had normal vaginal delivery, with highly statistically significant difference found between the two groups (p=<0.001), As for complications during labor, 4.0% in study group and 40.0% in control group, had fetal distress, with highly statistically significant difference (P=<0.001); as well for abnormal uterine contractions (P<0.001), perineal lacerations (P=0.004), and postpartum hemorrhage (P=0.001).

Table (7) reveals fetal outcomes regarding physical assessment in the study and control groups. The table shows better Apgar scores at the first minute p < 0.001 and fifth minute (p= 0.01) in study group. Meanwhile, 90.0% in the control group needed NICU admission compared to 26.0% of the study group; there was a highly statistically significant difference between both groups (p < 0.001). As for the birth weight, 86.0% and 24.0% in study and control groups respectively, had birth weight 2.500g- 4 kg, with a highly statistically significant difference between the two groups (p< 0.001).

Table (1): Distribution of obese pregnant women in study and control groups according to their socio-demographic characteristics (n=100).

Items	Groups				X^2	P-value
	Study (n=50)		Control (n=50)			
	No	%	No	%		
Age: Mean ± SD	33. 2±3. 6		32. 5±3. 1		0.22	0.64
Education:						
Illiterate	6	12.0	5	10.0	--	--
Read/write	15	30.0	15	30.0		
Basic	18	36.0	20	40.0		
Secondary	9	18.0	9	18.0		
University	2	4.0	1	2.0		
Occupation:						
Housewife	39	78.0	37	74.0	0.22	0.64
Working	11	22.0	13	26.0		
Income:					0.08	0.78
Insufficient	43	86.0	42	84.0		
Sufficient	7	14.0	8	16.0		
Body Mass Index (BMI) at initial antenatal care visit					0.18	0.67
Class 1	17	34.0	15	30.0		
Class 2	27	54.0	25	50.0		
Class 3	6	12.0	10	20.0		
Mean ± SD	35.9 ± 2.3		36.6 ± 2.9			

(--) Test result not valid

Table (2): Distribution of obese pregnant women in study and control groups according to their obstetric history, previous deliveries & medical history (n=100).

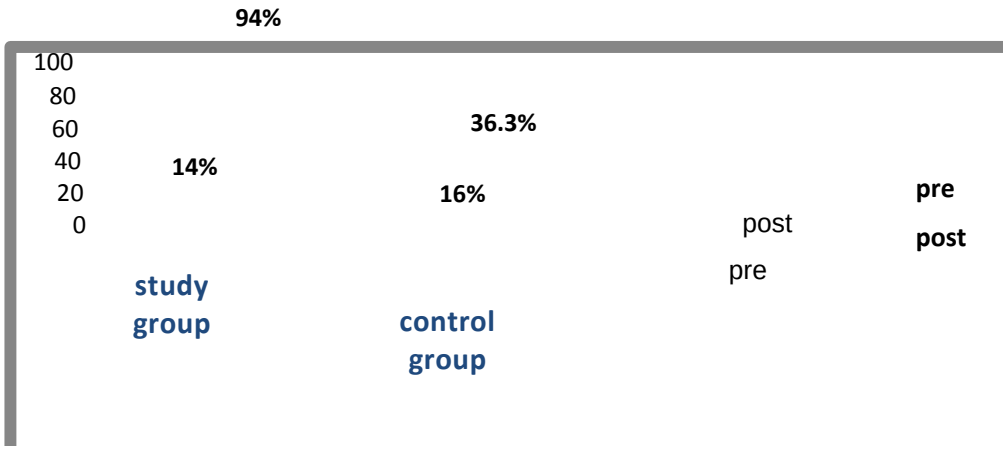
Items	Study (n=50)		Control (n=50)		X^2	P-value
	No	%	No	%		
Gravidity (mean ± SD)	3.3±1.3		3.2±1.3		0.32	0.85
Parity(Mean ± SD)	1.8 ± 1.0		1.7 ± 1.1		2.14	0.54
Previous abortions	28	56.0	22	44.0	1.44	0.23
Number of living children (Mean ± SD)	1.4 ± 1.0		1.3 ± 0.9		0.81	0.67
History of previous deliveries:						
Pre-term labor	24	48.0	24	48.0	0.00	1.00
Cesarean section	37	74.0	34	68.0	0.44	0.51
Episiotomy	5	10.0	7	14.0	0.38	0.54
Forceps	3	6.0	4	8.0	Fisher	1.00
Previous labor problems:						
Obstructed labor	32	64.0	31	62.0	0.04	0.84
Premature membranes rupture	8	16.0	13	26.0	1.51	0.22
Perineal tear	4	8.0	6	12.0	0.44	0.50
Stillbirth	8	16.0	11	22.0	0.58	0.44
Postpartum hemorrhage	3	6.0	1	2.0	Fisher	0.62
Postpartum pyrexia	6	12.0	6	12.0	0.00	1.00
History of obesity before current pregnancy	50	100.0	50	100.0	0.00	1.00
During current pregnancy	50	100.0	50	100.0	0.00	1.00
Tried weight loss	17	34.0	26	54.0	4.06	0.04*
Obesity classes 1	14	28.0	21	42.0		
2	28	56.0	18	36.0	4.05	0.13
3	8	16.0	11	22.0		
Chronic diseases:						
Hypertension	15	34.9	15	33.3	0.02	0.88
Gestational diabetes	13	30.2	16	35.6	0.28	0.60
Diabetes	5	11.6	15	33.3	5.90	0.02*
Cardiac	1	2.0	4	8.0	Fisher	0.36
Renal	5	10.0	15	33.3	5.90	0.02*
Anemia	4	8.9	18	41.9	12.75	<0.001*
Thyroid	0	0.0	1	2.2	Fisher	1.00
Had previous surgery	19	38.0	31	62.0	5.76	0.02*
Medication during current pregnancy:	43	91.5	47	94.0	Fisher	0.71
Hypertension	15	34.9	15	34.9	5. 90	0.88
Diabetes	13	26.0	22	44.0	3. 56	0.06*
Antibiotics	6	12.0	9	18.0	0.71	0.40
Vitamins & minerals	31	62.0	27	57.4	0.21	0.65
Start of ante natal care visit						
1st trimester	42	84.0	41	82.0	0.07	0.79
2nd trimester	8	16.0	9	18.0		

(*) Statistically significant at P<0.05 (*) Not mutually exclusive answers

Table (3): Distribution of obese pregnant women according to their satisfactory level of knowledge in the study and control groups, pre/post program (n=100)

Items	Study Group (n=50)				Control Group (n=50)				P-value	
	Pre		Post		Pre		Post			
	N	%	N	%	N	%	N	%	X^2	P-value
Meaning of obesity	9	18.0	40	80.0	7	14.0	7	14.0	0.36	<0.001*
Causes	13	26.0	46	92.0	14	28.0	14	28.0	0.23	<0.001*
Complications	18	36.0	43	86.0	13	26.0	17	34.0	0.42	<0.001*
Prevention	9	18.0	44	88.0	5	10.0	5	10.0	0.25	<0.001*
Diet:										
Balanced diet	10	20.0	49	98.0	9	18.0	9	18.0	0.08	<0.001*
Food groups	9	18.0	46	92.0	14	28.0	13	26.0	0.23	<0.001*
Food compositions	9	18.0	43	86.0	8	16.0	11	22.0	0.79	<0.001*
Dietary disorder	13	26.0	43	86.0	15	30.0	15	30.0	0.14	<0.001*
Exercise	9	18.0	43	86.0	20	40.0	20	40.0	0.84	<0.001*

(*) highly statistically significant



Mean knowledge (35.59±7.342 vs. 59.33±2.731)

Figure (1): Total satisfactory level of knowledge of obese pregnant women in the study and control groups, pre / post program (n=100).

Table (4): Distribution of obese pregnant women according to their positive lifestyle practices through asking questions about diet, exercises and rest in study and control groups pre/post program (n=100).

Items	Study (n=50)				Control (n=50)				P-value	
	Pre		Post		Pre		Post			
	No	%	No	%	No	%	No	%	X^2	P-value
Diet	4	8.0	42	84.0	2	4.0	3	6.0	0.68	<0.001*
Exercises	9	18.0	40	80.0	1	2.0	1	2.0	0.36	<0.001*
Rest	4	8.0	35	70.0	5	10.0	9	18.0	0.25	<0.001*

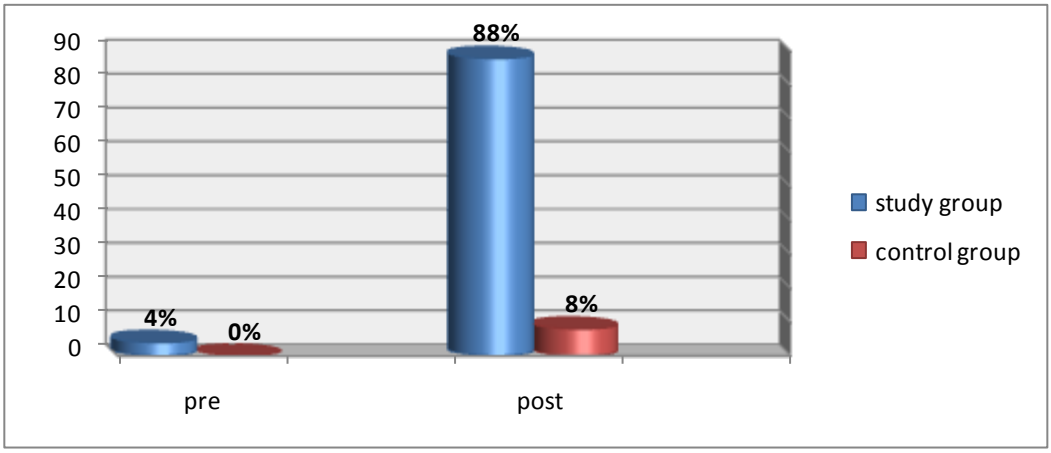
(*) highly statistically significant at P<0.001

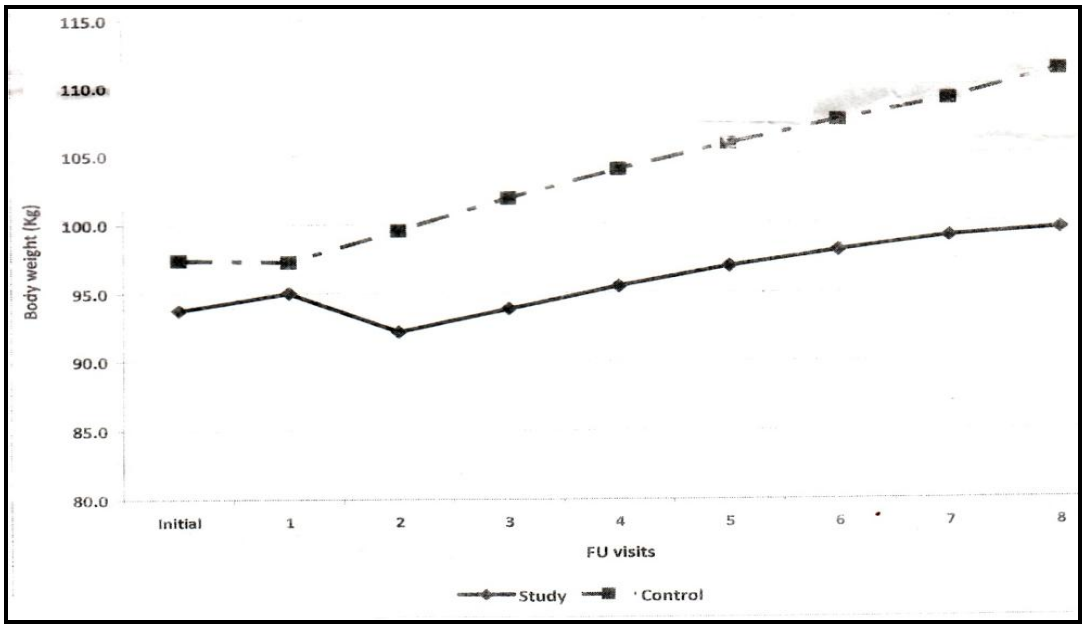
Figure (2): Distribution of obese pregnant women according to their positive life style practices in study and control groups, pre/post program (n=100).

Table (5): Distribution of Mean+SD of obese pregnant women according daily intake of various food groups and types in the study and control groups, pre/post program (n=100)

Daily Intake	Group				Mann Whitney Test	P-value
	Study (n=50)		Control (n=50)			
	Mean±SD		Mean±SD			
	Pre	Post	Pre	Post		
Cereals	5.2±0.9	4.3±1.5	5.7±1.7	3.7±0.0	2.18	0.01*
Carbohydrates	8.6±1.6	5.5±1.0	4.5±2.7	10.7+0.7	2.05	<0.001*
Vegetables/fruits	1.4±0.8	4.9±1.7	1.4±0.9	2.4±1.4	0.17	0.002*
Proteins	3.9±1.1	3.8±1.2	3.8±1.1	5.7+ 1.9	1.53	0.07
Dairies	2.5±1.3	5.7±1.7	2.7±1.6	4.7±1.1	0.14	<0.001*
Fat	4.3±2.7	2.3±1.9	4.0±2.1	6.2±0.9	0.01	0.35
Salt	3.9±1.1	2.6±0.8	3.2±1.0	4.2±1.7	8.81	<0.001*
Caffeine	1.9±0.6	2.3±1.2	2.1±1.0	3.4±0.9	1.32	<0.001*
Soda	0.4±0.2	0.5±0.6	0.5±0.6	0.9±0.8	0.17	0.11
Juice	0.1±0.6	0.7±0.6	0.3±0.8	2.1±0.5	59.38	<0.001

(*) Statistically significant at P<0.05





(X^2=19.96, P<0.001).

Figure (3): Changes in body weight among obese pregnant women in the study and control groups throughout pregnancy pre/post program (n=100).

Table (6): Distribution of obese pregnant women according to their maternal outcomes during labor in the study and control groups (n=100).

Maternal Outcomes	Group				X^2 test	P-value
	Study (n=50)		Control (n=50)			
	No.	%	No.	%		
Mode of labor:						
Normal vaginal + episiotomy	32	64.0	10	20.0	36.97	<0.001*
Cesarean	18	36.0	40	80.0		
Complications:						
Fetal distress	2	4.0	20	40.0	18. 88	<0.001*
Cephalopelvic disproportion	0	0.0	1	2. 3	Fisher	0.49
Stillbirth	0	0.0	3	6.0	--	
Cervical dystocia	0	0.0	4	8.0	Fisher	0.12
Abnormal uterine contraction	0	0.0	14	28.0	16.28	<0.001*
Retained placenta	0	0.0	5	10.0	Fisher	0.24
Perineal lacerations	2	4.0	10	20.0	8. 31	0.004*
Postpartum hemorrhage	2	4.0	15	30.0	11.98	0.001*

(*) Statistically significant at P<0.05 (--) Test result not valid

Table (7): Distribution of fetal outcomes according to their physical assessment. in the study an control groups (n=100).

Items of Fetal Outcomes	Group				X^2 test	P-value
	Study (n=50)		Control (n=50)			
	No	%	No	%		
Apgar score (1 min.)						
<7	3	6.0	23	46.9	21.42	<0.001*
7+	47	94.0	26	53.1		
Apgar score (5 min.)						
<8	2	4.0	10	20.0	6.25	0.01*
8+	48	96.0	39	79.6		
Birth weight (kg):						
< 2.500 g	3	6.0	18	36. 0	5.80	0.06
2.500g - 4 kg	43	86.0	12	24.0	40.04	<0.001
4+ kg	4	8.0	20	40 .0	1.02	0.31
Mean + SD	3.0±0.5		2.9+0.8		H	
Needed resuscitation	3	6.0	8	16.0	2.55	0.11
Needed NICU admission	13	26.0	45	90.0	42.04	<0.001*
Stillbirth	0	0.0	1	2.0	Fisher	1.00
Neonatal death	1	2.0	3	6.0	Fisher	0.62

(*) Statistically significant at P<0.05 (H) Mann- Whitney test

Discussion

Obesity is a pandemic issue, with a higher prevalence in females. Obesity in pregnancy, defined as a Body Mass Index (BMI) of 30 kg/m^2 or more at the first antenatal visit, is associated with increased risk for health problems including hypertension, diabetes mellitus, thrombo-embolism, miscarriage, congenital anomalies, and neural tube defects. Lifestyle modifications especially regarding nutrition is considered the first line management of obesity and its associated complications. It may be possible to reduce the risk of obesity on pregnancy by healthy nutrition, exercise, and early registration to antenatal care **(El Eraky, 2014).**

Regarding to the socio-demographic characteristics of obese pregnant women, the present study indicated that, the mean age of the study and control groups were 33.2±3.6 and 32.5±3.1 years respectively. No statistical significant difference was found between the two groups of obese pregnant women **(Table 1)**. This is in disagreement with **Aşcı and Rathfisch (2015),** whose study on the effect of lifestyle interventions of pregnant women on their dietary habits, lifestyle behaviors, and weight gain, found that the mean age of the study and control groups were 24.3±4.22 and 24.28±4.15 years respectively. This result was in agreement with that of a study carried out by **Atef (2014),** which revealed that 37.5% of pregnant women affected by obesity were over age, with a mean age of thirty years, which indicated that obesity and age increased the risk during pregnancy.

Also, no statistically significant difference was observed between the two groups regarding socio-demographic baseline characteristics in terms of age, education, occupation, income, BMI, according to the data obtained in the beginning of the study **(Table 1).**

As regards women's level of education, the present study revealed that more than one third of the study group and two fifth of control group had basic education level with a very low percentage who was university education, As for women's occupation' results revealed that more than three quarter

of women in the study group were housewives compared to slightly less than three quarter in control group. Moreover, the majority of women had insufficient income in both groups **(Table 1).** These results are reversed by **Kavle et al. (2014)**, whose study on cultural beliefs and perceptions of maternal diet and weight gain during pregnancy and postpartum family planning in Egypt mentioned that, 50% of the study sample was secondary education and 90% of them were not working. From the researchers' point of view, women not working tended to be fatter than working ones. As well, lower level of maternal education is associated with higher maternal obesity.

Regarding BMI at initial antenatal care visit, more than half and half of study and control groups respectively, were having class 2 obesity, with no statistically significant difference evident between the two groups. In 2010, the **Centre for Maternal and Child Enquiries (CMAC) (2010)** estimated that about 38,478 women with a body mass index (BMI) >35 (class 11 & 111 obesity) give birth in the UK every year. As well, **Leonie et al. (2010)** found in their study that women's BMI, was as follows: 20.2% were overweight, 11.8% obese, and 1.7% morbidly obese. From the researchers point of view increasing BMI was associated with increasing maternal age, parity and poorer levels of education.

As regards obese pregnant women's obstetric history, the present study findings revealed that, there were no statistically significant differences between the two groups regarding the mean gravidity and parity **(Table 2).** In this regard, **Rochon (2006)** found that higher gravity and parity are among the risk factors of obesity during pregnancy. As well, the **MOH (2010),** in its child survival project, reported that maternal obesity multiparas (Para 3 or more) are definitely more liable to complications during pregnancy and delivery.

Considering previous abortions, the present study results revealed that more than half in study group and less than half in control group had previous abortions **(Table 2).** No statistically significant difference was found between both groups. This funding is in agreement with **Gumei (2012),** who stated that abortion, of all obese maternal mortality in Egypt, represents 31.9% of all maternal deaths, where abortion accounts for 4.5% of all obese maternal deaths. From the same point of view, **Hahn (2006)** stated that obesity during pregnancy posed a significantly higher risk of abortion. The results of this study may be due to that previous abortion is one of the documented complications of obesity during pregnancy; also obesity may also lead to a poor pregnancy outcome, such as sudden and unexplained intrauterine death.

A recent UK study found that increasing levels of overweight and obesity leads to greater risks of gestational diabetes, hypertensive disorders of pregnancy, caesarean section, macrosomnia (baby weighing more than 4kg at birth) and neonatal unit admission. Women with severe obesity were at risk of additional adverse outcomes, including stillbirth, a longer postnatal stay, and wound problems following caesarean section (**Scott-Pillai et al., 2013).**

Regarding history of obesity of previous deliveries, the present study results showed that slightly less than three quarter and more than two third in the study and control group respectively had previous caesarean section **(Table 2).** No statistically significant difference was detected between them. This funding is in agreement with that of a study, in Brazil, by **Silva et al. (2014),** which stated that the rates of caesarean section are increased more than four-fold among obese pregnant women. Moreover, **Hernandez et al. (2014),** study reported that caesarean section was more among obese pregnant women, which may predispose them to more

complications. This may be due to the fact that increased incidence of CS is in association with elevated BMI.

On the other hand, this study funding revealed that less than two third in the study and control groups had obstructed labor **(Table 2).** This finding is congruent with that of a study of **The New England Journal of Medicine (2013),** which revealed that majority of their obese pregnant women in study sample had obstructed labor. On the same line, **Osmanagaoglu (2013)** reported that obese pregnant woman have high incidence of obstructed labor and this indicated the necessity of follow up antenatal care about weight gain and the danger of obesity during pregnancy.

As regards women's medical history, the present study results clarified that all of them in the study and control groups had a history of obesity before and during pregnancy, with more than half of the study sample, and more than one third in the control group had grad 2 obesity, and the difference between the two groups was not statistically significant (**Table 2)**. In the same line, **Ramadan (2013)** found that the incidence of obesity varied from 2 % to 33.5% during pregnancy. From the point view of researchers a woman who is overweight before becoming pregnant is two to three times more likely to be also overweight or obese during pregnancy.

Regarding chronic diseases, this study results indicated that more than one third in study and an equal percentage of control groups had hypertension **(Table 2).** This result is incongruent with **Lois (2013)**, who revealed that the percentage of chronic diseases in previous pregnancy between 16 – 18 % from the total sample of the study, with hypertension was 16.5%, the results was also congruent with that of **Azar and Nooritajer (2012),** who conducted their study in Iran and fund that hypertension was 11.3 % in previous pregnancy of the obese pregnant women. The occurrence of hypertension among obese pregnant women might be due to increase blood volume and increase perfusion of excess adipose tissue and lean body mass or due to increased salt intake accompanying the increased food consumption.

The present study funding also showed that less than one third in the study group as compared with slightly more than one third in control group had gestational diabetes. More than tenth of the study group compared with one third of the control group had diabetes, with statistically significant difference between the two groups **(Table 2).** In congruence with this funding, **Hassanien (2010)**, in a similar study, found that gestational diabetes to be higher in obese pregnant women 8.69%, and diabetes was 3.04% higher with the obese pregnant women. In the same line, **Comtois (2013)** stated that increasing maternal body mass index was more predictive of the development of gestational diabetes. In the same context, **Susan (2007)** reported that risk of developing gestational diabetes (GDM) is about two, four, and eight times higher among overweight, obese, and severely obese women, respectively, compared with normal-weight pregnant women. This might be due to the high maternal weight associated with a substantially higher risk of GDM.

The current study results showed that a minority of the study group and slightly more than two fifth of control group had anemia, with highly statistically significant differences found between two groups. This finding is in agreement with **Gross (2010)**, who found that anemia was present in 28% of Mexican obese pregnant women. On the other hand, **El –Desouqi (2012)** clarifed that anemia occurs in the low BMI pregnant women more than in the obese pregnant women. The results of this study may be due to lack of knowledge about diet rich in iron, quality, quantity of diet and poor nutritional habits.

Regarding medication taken during current pregnancy, the present study results showed that relatively high percentages of the study and control groups had received medication, less than two third of them had vitamins and minerals in the two groups, and slightly more than one third with equal percent in study and control groups had anti-hypertension drugs, considering gestational diabetes drugs, slightly more than quarter and more than two fifth in the study and control groups respectively, were taken medication. These findings are in agreement with those of **Villamor et al. (2011)**, in USA, who similarly detected that maternal obesity was positively associated with anti-hypertension, gestational diabetes and anti anemia drugs. The associations were linearly to the amount of weight change. The medication may be used during pregnancy if it is prescribed by physicians. The results are also congruent with **The National Diabetes Fact Sheet (2011);** which reported that the percentage of diabetic medication among obese pregnant women was 58%, oral medication only 16%, without treatment.

This finding is in agreement with that of **Olefsky (2010),** which indicated that there was a strong association between obesity and hypertension even before pregnancy. In the same line, **Doherty et al. (2012),** in Australia, investigated the influence of maternal BMI before pregnancy and weight gain during pregnancy and demonstrated that in the obese before pregnancy group, the risks of hypertension, and gestational diabetes were significantly elevated compared with maternal normal weight. The occurrence of hypertension among obese pregnant women might be due to increased blood volume and increased perfusion of excess adipose tissue and lean body mass.

Regarding assessment of women for starting antenatal care visits, the present study finding revealed that, the majority of women in both groups of the present study had antenatal care (ANC) during current pregnancy, mostly since the first trimester and at earlier weeks of gestation **(Table 2).** These findings are in agreement with **Davis and Sherer (2012),** who found that most of pregnant women had regular ante-natal care visits and started their initial visit in first trimester. However, **Beischer (2013)** reported that many women arrive too late to the antenatal care visit. From the researchers point of view this result might be attributed to the recruitment process of the study which started early during the first trimester, that encouraged women to have their ANC early. This is quite recommended since ANC is an important means for early detection and anticipation of any risks that may jeopardize the health of the mother and the fetus.

Regarding obese pregnant women's satisfactory level of knowledge pre and post nutritional program implementation, the current study results of the post-test revealed improvement in knowledge of meaning of obesity, causes, complications of obesity during pregnancy, prevention and diet in the study group who attended the nutritional program sessions compared with pre-test results of the study group and the results of pre and post tests of the control group, as well the knowledge' levels of obese pregnant women in the study group regarding obesity, balanced diet, food groups, food compositions, dietary disorders and exercises of pregnant women showed significant improvement. Results revealed that p-value was considered highly statistically significant and most of the study group had satisfactory knowledge when compared with the control group in the post-test and with those in the pre-test as well **(Table 3 & Figure 1)**. This finding is in agreement with that of **Schaefer-Graf (2013),** which revealed that nutrition program either by individual basis or group sessions affected and made subjects modified their knowledge and started to change to healthy habits.

The previous finding is also in agreement with that of a study conducted in

Washington by the **Center for Disease Control and Prevention (2013),** guideline for health education and risk reduction activities, to evaluate the impact of an educational program for obesity, where the results revealed that there were significant differences between the two groups in knowledge at pre-test. At the end of the study, the intervention group had significantly higher knowledge scores than the pre-test of the intervention and for the pre-test for the control group. **The African Journal of Pharmacy and Pharmacology (2011)** revealed that maternal obesity health education sessions can be performed in MCH centers, and women are ready to attend such education and the results showed improvement in their knowledge about obesity, complications, and nutritional practices. This study finding could be due to that the women during pregnancy, received advice from various sources in the community. Nutrition education within the program support and promote the pregnant women trust and value the advice, focusing their effort on the behavioral outcomes that have more potential to improve their health.

Regarding obese pregnant women lifestyle practices about diet, exercises and rest in pre and post tests in the study and control groups, **(Table 4, and Figure 2).** This study results showed improvement in post test in the study group compared with the pre test in the study and control groups, all of them revealed statistically significant differences, this means that obese pregnant women had gained knowledge and changed their practices to improve and protect their health. In a similar study carried out by **Dodd et al. (2010),** who have tested the effectiveness of an intervention program for promoting healthy diet and physical activity during pregnancy, in the LIMIT randomized trial, overweight and obese pregnant women were assigned to receive either dietary and lifestyle advice – a comprehensive program involving a combination of dietary, physical activity and behavioral strategies – or standard care. In the authors' analysis of maternal outcomes, those in the intervention group had improvements in their diet over the study period, such as increased fruit and vegetable consumption and reduced energy intake from saturated fats, as well as higher levels of physical activity than those who were receiving standard care. From the researcher point of view an increase in post nutritional program adequate lifestyle practices among the study group might be gained due to more knowledge leading to better improvement of women lifestyle practices, and not just attending the program, which is quite plausible, given the effect of knowledge on practice, also balanced diet and physical exercises during, and if possible before pregnancy are strongly recommended. Social trends which support thus pregnant women are counseled to exercise on a daily basis at a moderate degree (i.e. walking, swimming, aerobics) for 30 or more minutes. Nevertheless, activities that present a high risk of falls or abdominal injury as well as intense exercises must be avoided. Furthermore, overweight and obese women should be encouraged to abandon sedentary lifestyle. Pregnancy is also the ideal time for changes in lifestyle, such giving up harmful habits. The mother should be encouraged and motivated to consider this effort as both an investment in the maintenance of her own health as well as in that of her baby.

Regarding regular exercise, the present study result revealed that there was improvement in post test in study group compared with the control group. This finding is congruent with **Abd El Hamid (2010),** who stated that physical activity for obese pregnant women especially if done on a regular exercise promotes fat oxidation in muscle as well as post exercise oxygen consumption and the level of physical activity seems to affect food intake is accompanied by a trend to select a diet with a higher carbohydrate to fat ratio. Thus, **Poston (2014)**, who mentioned that two reports from the LIMIT randomized controlled trial of more than 2,000 overweight and obese women showed how a lifestyle program in

Australian women changes dietary and physical activity behaviors without any evidence of harm to the health of the newborn infant and with some suggestions of benefit. Also, these findings were supported by **Alexander and Larosa (2011)** who mentioned that, breathing exercise which improves ventilation and used as relaxation technique, consequently decreases anxiety during pregnancy and it helps in deceasing pain during contraction caused by hypoxia of the myometrium. In the same context, **Becker (2012)** reported that, the incidence of spontaneous vaginal birth was higher in exercising women than non exercising ones (P<0.01).

Regarding daily intake of various food groups and types, this study results showed that pre program, the daily of carbohydrates intake was higher among women in the study groups compared with those in the control group (P=0.001). The frequency of intake of juice was statistically significantly differently higher in the control group (P=0.01). At the post program, the table demonstrates highly statistically significant differences between the two groups. Thus, women in the study group had higher intake of dairies ($p < 0.001$) and vegetables and fruits (P=0.002). On the other hand, women in the control group had higher intake of carbohydrates (P=0.001), salt (P<0.001), caffeine (P<0.001), and juices (P<0.001) **(Table 5)**. In line with the presence of a nutritional program, pregnant women should be advised to avoid excessive energy intake and excessive weight gain during their pregnancy. However, these results were similar to those of **Aşcı and Rathfisch (2015)**, who reported in their study that, according to pretest measurements, no statistically significant differences were observed between the nutritional data of the two groups ($p > 0.05$). Examining pretest and posttest nutritional data measurements of groups obtained with a 6-month interval, determined that in the 37th week of pregnancy, protein intake ($p = 0.013$), percentage of energy from protein ($p = 0.032$), dietary fiber ($p = 0.044$), calcium ($p = 0.032$), magnesium ($p = 0.024$), iron ($p = 0.027$), zinc ($p = 0.003$), fruit ($p = 0.032$), and vegetable intakes ($p = 0.007$) were significantly higher in the intervention group compared to the control group. There were no significant differences between the other dietary intakes of the control and intervention groups ($p > 0.05$). The lifestyle intervention had only a significant effect on improving protein intake, percentage of energy from protein, calcium, magnesium, iron, zinc, and vegetable intakes ($p < 0.05$). In line with these findings, it was concluded that the lifestyle intervention had a limited effect on improving the dietary habits

In the present study, after implementation of the nutritional program in the study group, significant improvements in their dietary practices were detected, with reduction of intake of carbohydrates, fat, salt, and caffeine, while had trends in increasing vegetables and dairies for the importance of fetus bones and mother. Statistically significant differences between the two groups were found. These findings are in agreement with **Allen (2008),** who found a highly statistically significant difference between pre–post tests through exposure of maternal obesity to the nutritional training program. In the same line, **Gabbe et al. (2012)** stressed that obese pregnant women must have enough knowledge about healthy eating and food groups to prevent further complications. From the researchers' point of view further studies could use the key results presented in this study to help improve intervention effectiveness, for example by providing dietary advice tailored to nutrient needs and motivational advice to promote exercise and activities acceptable to pregnant women.

After intervention of the present study and during follow up, the women in study group demonstrated significant improvement in their dietary life style practices, with

reduction in the frequency of intake food groups with the exception of the vegetables/fruits and dairies had an increasing trend throughout pregnancy. These findings point to the success of the study intervention in improving women's dietary life style practices, which leads to justify the research hypothesis. In agreement with this foregoing study findings, several intervention trials reported similar successes. Similarly, **Dodd et al. (2014),** in a randomized trial in Australia gave evidence of the effectiveness of providing antenatal dietary and lifestyle advice to overweight or obese women on components of maternal diet. Thus, women randomized to lifestyle practice advice demonstrate a significant increase in the number of serving of fruits and vegetables consumed per day, as well as increased consumption of fiber, and reduced percentage energy intake from saturated fats.

Regarding weight gain during pregnancy, the present study results showed that women in the study group had significantly lower body weight through follow up visits for ante natal care compared with the control group. Thus, their weight gain was in the recommended range. However those in the control group continued excessive weight gain throughout their pregnancy **(Figure 3).** These findings were supported by **Aşcı and Rathfisch (2015),** who found that according to the measurement performed in the intervention and control groups in the 37th week of pregnancy, the total mean gestational weight gain (GWG) values were respectively 12.45 ± 5.04 and 12.29 ± 4.80 kg ($p > 0.05$). The GWG values were significantly higher in the intervention group than in the control group (51.1% vs. 28.9 %, x^2 =4.6296 at $p < 0.05$). This could be due to the nutritional program with lifestyle intervention sessions in obese pregnant women that have reduced GWG.

According to the research hypothesis that the nutritional program will improve the health of obese pregnant women and their newborns without complications. This hypothesis was supported, when maternal obesity pregnancy outcomes was evaluated in the present study. Finding indicated that, there was a highly statistically significant difference between the two groups, as less than two third of the study group as compared with one fifth in the control group had delivered normal vaginal with episiotomy and more than one third of the study group compared with majority of the control group had delivered by cesarean section. There was a highly statistically significant differences between two groups (p= <0.001). **(Table 6),** These findings are in agreement with **Davis and Sherer (2012),** who reported that obese women who received nursing intervention and nutritional program had low of expected caesarean section. In the same line, **Badawy (2010)** who reported that, 36% of obese women delivered by cesarean section compared to 18% of non – obese women. In a study done by **Chauhan and Henrichs (2014)**, they mentioned that, the rate of cesarean section increased directly with increasing maternal weight (p< 0.001) and body mass index above 29 kg /m^2 was associated with a three fold to four fold increase in cesarean delivery. This could be due to that increasing BMI was associated with reduced rates of spontaneous and assisted vaginal delivery and increased rates of caesarean section, also obese women have a two- to three fold increase in cesarean delivery rate. Weight management prior to or during pregnancy could help reduce the need for CS.

The present study results revealed that few of obese pregnant women had fetal distress rate in the study group who received nutritional program, while two fifth had fetal distress in control group **(Table 6)**. This finding is in disagreement with **Munch (2012)**, who postulated that no differences were demonstrated between the two groups of obese pregnant women in terms of method of delivery and birth weight. Moreover, the present study emphasized the importance of giving nutritional program for those obese

pregnant women, where a significant difference was observed between the two groups.

In the present study, less than half from control group had Apgar score at first minute < 7 as compared to minority in study group (x^2 = 21.42, p< 0.001), and Apgar score at fifth minute (x^2 = 6.25, p= 0.01). Women in the study group had less NICU admissions. Moreover, the control group had more stillbirth and neonatal death although no statistically significant differences were founded **(Table 7).** This finding was in line with **Rahman (2010),** who found low Apgar score at first minute in the newborn of women who did not receive nursing intervention program and needed NICU admissions after deliveries with no statistically significant difference between the two groups at fivth minute Apgar score. The finding gives another important result of the effectiveness of the study intervention in improving fetal outcomes. On the same context, **Badawy (2010)** reported a significant high Apgar score at first minute (>7) among newborns of the obese women who received antenatal program than obese pregnant women who did not receive antenatal program (x^2 = 6, 60, p< 0.05). While, no difference was found between those who received and who did not receive antenatal care at fifth minute (x^2 = 8.01, p = 0.15). In addition, this finding is congruent with the current study result. **Agha et al. (2014)** could not show a beneficial effect of their intervention on newborn birth weight. According to the research hypothesis of the study, it was supported by its results.

Conclusion

The main study results led to the conclusion that obese pregnant women's knowledge of dietary and healthy practices life style issues is low, as well as their practices towards diet, exercises, and rest. Their dietary practices during pregnancy are inadequate. The nutrition program was effective in improving their dietary and healthy lifestyle knowledge and practices. This is associated with significant improvement in lowering body weight throughout follow-up visits during pregnancy. In addition, the nutrition program led to better maternal outcomes as lower rates of difficult labor with fetal distress, abnormal uterine contractions, perineal lacerations, and postpartum hemorrhage. Fetal outcomes are also improved in terms of better Apgar scores and less need for NICU admissions.

Recommendations

Based on the study findings, the following recommendations are proposed:

- The developed nutritional program should be made available at similar MCH centers, and the maternal nurses should use it in educating attendant obese pregnant women.
- The nurse working in MCH should work hand in hand with dietitians to help in counseling obese pregnant women, and in teaching them how to prepare a balanced diet with suitable number of calories and essential food groups and vitamins.
- Obese pregnant women need early educational program during the first weeks of gestation to avoid excessive weight gain through balanced diet and healthy lifestyle habits such as physical exercises.
- Screening programs should be applied in particular to pregnant obese women who are at greater risks of developing pregnancy associated complications such as pregnancy induced hypertension and diabetes.
- Further intervention trials in obese pregnancy should consider the habitual

dietary and lifestyle habits of their subjects and assess motivation and readiness to change. This may enhance compliance to interventions and generate improved outcomes that could significantly benefit the health of both mother and offspring.

- Public health awareness, increase public awareness of the importance of preconception health behaviors and preconception care services by using information and tools appropriate across various ages; literacy, including health literacy; and cultural/linguistic contexts.

- Training program for nurses to be well prepared to provide instructions and training for obese pregnant women.

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