The Effect of Nutritional Program on the Health of Woman with Gestational Diabetes and Their outcome at Benha City

Hanan Abd Elwahab El Sayed [1], Doaa Mohamed sobhy El Sayed [2], Ahlam Elahmdy mohamed [3]

[1] *Community Health Nursing, Benha University, Benha, Egypt*

Abstract:

Gestational diabetes mellitus (GDM) is considered a major cause of prenatal morbidity and mortality. It could be reduced by carbohydrate restriction or a low glycaemic diet. Nutritional therapy is widely considered as an integral part of the treatment. *The aim of the study was* to evaluate the effect of nutritional program on health of women with gestational diabetes and their outcome at Benha City. A quasi-experimental design was utilized for the study. The study was conducted at obstetrics and gynecology outpatient clinics in university and teaching hospitals at Benha city. *A Purposive sample* of 60 gestational diabetic women who are newly diagnosed and in the second trimester of pregnancy; *Three tools* of data collection were used include 1) a structured interviewing questionnaire to collect data about socio demographic characteristics of the women, medical and obstetric history, Risk factors among the women, knowledge and practice of women regarding gestational diabetes mellitus. 2) An observation sheet to assess mother and fetus conditions after delivery.3) pregnant women medical health records *The study results* showed the mean age of women was 35.5±3.4 and 20% of them were obese before pregnancy while 10% of them had history of abortion. After implementation of the nutritional program significant increase of women's knowledge and improvement of health status was noticed . *The study concluded* that the nutritional program bring about significance difference between women's nutritional knowledge, practice and decreased health risks for women and their outcome. *The study recommended* that this program should be provided in other settings. Dietary plan for gestational diabetic women   should be implemented in all obstetric clinics.

Keywords: Nutritional Program, Gestational diabetes, Health of woman, Outcome

I.   Introduction

Gestational diabetes mellitus (GDM) is glucose intolerance identified in the first time during pregnancy. [1] It is considered a major cause of prenatal morbidity and mortality as well as associated with a high risk of immediate and late adverse outcomes for mothers and their offspring. [2]

It complicates 4% of all pregnancies each year. The prevalence ranges from 1 to 14% of pregnancies. It represents nearly 90% of all pregnancies complicated by diabetes and is more likely to occur among Native American, Hispanic, African and American Asian populations than in Caucasians. [3] The prevalence of gestational diabetes mellitus in Bahrain 13.5% ranged from 20% in the United Arab Emirates (UAE) to 5% in Iran, and high prevalence rate of (12.5% to17%) were observed in Saudi Arabia. [4]

The pancreas is unable to meet the increasing insulin demands; the outcome is glucose intolerance resulting in hyperglycemia as pregnancy developed women become insulin resistant due to the increased production of certain placental hormones which are necessary to shunt nutrients to the growing fetus [5]. Approximately 2% to 3% of all women who don't begin pregnancy with diabetes become diabetic during pregnancy, usually at the midpoint of pregnancy when insulin resistant become most noticeable. [6]

Gestational diabetes occur even when no risk factors or symptoms are present, so women at high risk for gestational diabetes mellitus are often screened at their initial prenatal visit and then are screened later at 24 to 28 weeks of gestational.[7] Risk factors include maternal age over 25 years, obesity, family history of type 2 diabetes, hydramnios, un explained still birth, miscarriage, having an infant with congenital anomalies and an obstetric history women who had an infant weighing more than 4500g [8] . Fetal complications include hypoglycemia, delayed lung maturation, macrosomia,

birth injury, hyperbilirubinemia, polycythemia, , diabetes, hypertensions, obesity, shoulder dystocia and cardiovascular diseases.[9] There is an association between GDM and the development of type 2 diabetes mellitus in the mother later in life and offspring overweight and obesity. [10]

The overall incidence of congenital anomalies among infants of women with gestational diabetes is higher than in the general population (4% to11% vs. 2% to 3%). [11] Mother with gestational diabetes exposed to preeclampsia, gestational hypertension, urinary tract infection, still birth and non-elective caesarean delivery. If maternal blood glucose level is kept within normal ranges, complications are less likely to occur. [12] Screening and control of hyperglycemia during pregnancy have been proven to improve the outcomes for pregnancies complicated with diabetes .The most recognized diagnostic test for GDM is the oral glucose tolerance test (OGTT) usually performed between 24–28 weeks gestation.[13,14]

Prenatal morbidity and mortality can be prevented and well controlled through appropriate medical care and self management. A study among high risk individuals showed that life style interventions, such as improved diet and exercise with oral glycemic agents reduced the incidence of diabetes from 58% to 31% three year period. [15] Nutrition interventions for GDM should emphasize overall healthy food choices and cooking practices that can be continued postpartum and may help prevent later diabetes, obesity, cardiovascular disease, and cancer. [16]

The nursing role to manage gestational diabetes is usually by providing healthy well balanced eating plan for women and taking into consideration carbohydrate intake and physical activity. If women are unable to manage gestational diabetes with diet and activity alone, the nurse should direct them for medication or insulin is needed. [17] Dietary modification is the mainstay of treatment for gestational diabetes mellitus. The use of low glycaemic index diet will be effective in reducing postprandial glucose responses in women with GDM as women should be placed on a standard diabetic diet. [18] So this program will provide comprehensive support and nutritional education to gestational diabetic women and assist in improving pregnancy outcome for women. As it was done by the aim to evaluate the effect of nutritional program on women with gestational diabetes mellitus to improve their health and outcome.

1.2. Significance of the study
The quoted prevalence of GDM ranged from 1 to 14%. [19] In Egypt, gestational diabetes occurs at rate of 3.5% with definite maternal and fetal morbidities, 21% develop urinary tract infection, 14% may require caesarean section, 7% preeclampsia, starvation, ketosis and post partum hemorrhage.[20,21] The women who were obese before conception and developed gestational diabetes were at greater risk to give birth to infant with central nervous system defects. [22] It was estimated that 70-90% of women diagnosed with GDM could achieve targeted glycaemic goals with lifestyle modification and nutrition therapy alone. [17, 23] so the researcher carried out this study hoping improvement for women health and their outcome after implementation of the program.

1.3. Aim of the study:
The aim of this study was to evaluate the effect of nutritional program on health of women with gestational diabetes and their outcome through:
- Assessing women nutritional knowledge and practice according their needs
- Developing and implementing nutritional program according to women' needs.
- Evaluating the effect of nutritional program on women health and their baby.

1.4. Research hypothesis

1-The nutritional program will have positive effect on knowledge and practice of women with gestational diabetes regarding their health.

2- The pregnant women with gestational diabetes will have a healthy impact on their pregnancy outcome after the implementation of the nutritional program.

II. Subjects and Methods

2.1. Research design: A quasi experimental design was used to test the study hypothesis.

2.2. Setting: The study was conducted at obstetrics and gynecology outpatient clinics in university and teaching hospitals at Benha city. The two previous hospitals are considered major and large institutions which providing care to all population at Benha and its attachments area.

2.3. Sample type and criteria:

Purposive sample of 60 women who were newly diagnosed with gestational diabetes, free from any chronic disease, in the second trimester of pregnancy and agreed to participate in the study but women with type 1 or type 2 diabetes melitus were excluded from the study.

2.4. Sample Size

According to Benha teaching hospital and university hospital statistical centres, 2011, flow rate of women with gestational diabetes were 600 women at the end of year 2011. Ten percent of flow rate (60 women) was selected with considering dropout during study.

2.5. Tools of data collection: Three tools were used to conduct the study:

2.5.1. **First tool:** Structured interviewing questionnaire was developed by the researchers in Arabic language after reviewing of related literature. [24,25,26] It involved four main parts:

Part I: Socio demographic data of the pregnant women such as; age, educational qualification, income, occupation and residence.

- Medical and obstetric history of the women such as; gravidity, antenatal follow up, inter-pregnancy interval, body mass index and blood sugar and also risk factors among the studied women

Part II: Knowledge and practice the women regarding GDM. This part was used before and after implementation of the programe (pre/ post-test format). , It consisted of (3) sections;

Section (1) general knowledge regarding GDM, It included eleven open ended questions which include; definition, risk factors, signs and symptoms of GDM, complication for women and fetus, treatment of GDM, sites of insulin injection, signs of hypoglycemia, normal blood sugar , importance of exercise and preventive measures GDM.

Section (2) knowledge regarding GDM nutrition during pregnancy, it consisted of (9) items such as; (meaning of balanced diet, sources of carbohydrates, protein , high fiber foods, special considerations for meals, practical tips to decrease fat, amount of fluids for GDM, restricted fluids for GDM and component of best breakfast)

Section (3) practice of women regarding GDM, it consisted of four main items;

Diet as the type, amount, and distribution of carbohydrate, fluids............etc

Blood sugar test, Insulin injection, Physical activity

Scoring system of knowledge:

The answers were classified into 3 categories (2) degrees for correct answer (1) degree for incomplete answer and (0) for incorrect or don't know answer. the woman was considered to have good level if the score was ≥60%, average level if the score was 50- < 60% and poor level if <50%.

Scoring system of practices:

The scoring system for practices ranged from 2 to 0 as follows, each statement took (2) score if done correctly, (1) score if done incorrectly and (0) if not done.

2.5.2. Second tool: An observation sheet:-

It was developed, to assess mother and fetus conditions after delivery such as, delivery at <37 weeks, type of delivery , shoulder dystocia or birth injury , intensive neonatal care, clinical neonatal hypoglycaemia , neonatal hyperbilirubinaemia ,over birth weight , maternal hyperglycaemia and hemorrhage during intra-natal , post-natal period.

2.5.3. Third tool:

Medical record from outpatient clinics was used to obtain data about blood sugar levels, weight, and height, to compare blood sugar levels for identifying the improvement in mother conditions and to calculate Body Mass Index. [27] The scoring and interpretation for BMI before pregnancy was calculated by dividing pre pregnancy weight in kilograms (Kg) by the square of height in meters (m2).

- − BMI: < 18.5 (underweight)
- − BMI: 18.5 -24.9 (normal weight)
- − BMI: 25-29.9   (over weight)
- − BMI: ≥ 30= obesity (cut off point for obesity).

2.5.3. Tools validity:

The tools were reviewed for content validity by a jury of five experts in the field of community health nursing to ascertain relevance and completeness using Cronach's coefficient alpha as it was (0.8).

2.5.4. Tools Reliability:

Reliability of tools was tested by using Cronbach's Alpha coefficient test, which revealed that the tools consisted of relatively homogenous items as showed by the moderate to high reliability of each tool. The Cronach's Alpha coefficient test was 0.85.

2.6. Ethical considerations:

Before data collection, the women were informed about the purpose of the study. They were given an opportunity to refuse or to participate in the study. Also they were assured that, their information would remain confidential and used only for the research purpose.

2.7. Pilot study:

A pilot study was carried out on 10% of the sample (6) pregnant women to assess the tools clarity and objectivity as well as estimation of the time needed to fill the questionnaire. The participants involved in the pilot were excluded from the study sample.

2.8. Field work: (intervention construction)

A written official approval to conduct this study was obtained from the Dean of faculty nursing to two directors of Benha University and teaching hospitals. Other written official letter was taken and delivered to the director of obstetrics outpatient clinics, in order to obtain their agreement to conduct the study after explaining its purpose. The study was carried out through four main phases: assessment, planning, implementation, and evaluation. These phases were carried out from beginning of January 2011 to the end of October 2012, covering along a period of 8 months. The previous mentioned setting was visited by the researchers two days/week (Sunday and Thursday) from 9.00 am to 12.00 pm according to the schedule of obstetrics outpatient clinics.

2.8.1. Assessment phase:

The researchers interviewed the pregnant women after reviewing her medical record, ensure of her health status, explained the aim of the study, and asked for participation. Upon consent to participate, each pregnant woman was interviewed to assess general characteristics, knowledge and practice regarding GDM. Average time for the completion of interviewing questionnaire was (20-25 minutes). A number of interviewed women / week ranged from 4-5 women. The questionnaire is filled by the researcher during waiting time of the women during their antenatal visits.

2.8.2. Planning phase:

The program was constructed by the researchers in the form of printed Arabic booklet based on the actual results that obtained from pre program assessment using the interviewing questionnaire and needs of mothers, which aimed to satisfy the studied mothers' deficit knowledge and practice regarding nutrition of gestational diabetic women. Power Point presentation about GDM was prepared in simple Arabic language to suit the women level of understanding. The general objective of the program was to evaluate the effect of nutritional program on health condition of women with GDM and their outcome. It include definition, risk factors, signs and symptoms of GDM, complication for women and fetus, treatment of GDM, Sites of insulin injection, signs of hypoglycemia, normal blood sugar and importance of exercise and preventive measures of GDM. Meal plan for balanced diet, sources of carbohydrates, protein, high fiber foods, special considerations for meals, practical tips to decrease fat, amount of fluids for GDM and restricted fluids for GDM.

2.8.3. Implementation phase

The program was implemented in (8) scheduled sessions; 3 sessions for theoretical content and 5 for practical content and were implemented in a private rooms at outpatient clinics. During each session group of (5-10) participants were attended for about 30mintues. The researcher & participants met every two weeks until delivery and once after delivery. Each participant was advised to bring their record of blood glucose level at the last session. Teaching materials such as, pictures, handout, posters that helped in covering the program content was used by the researcher. At the beginning of the first session an orientation to the program and its aims took place. Feedback was given in the beginning of each session about the previous one. Different teaching strategies were used such as lectures, group discussions, critical thinking and problem solving, concept mapping and demonstrations /re-demonstrations. Suitable teaching media were used, included an educational booklet that was distributed to all nurses in the first day of the educational intervention as well as audio-visual aids (data show presentation) and real objects used for practical sessions such as syringes and insulin therapy etc.

2.8.4. Evaluation phase

After the implementation of the program, the post test was done to the studied women' knowledge and practice by the same formal of the pre-test to evaluate the effectiveness of the implemented program, this was done immediately after the program. Also observation sheet to assess mother and baby conditions after delivery were used.

2.9. Statistical analysis:

Data analysis was performed using Statistical Package for Social Sciences (SPSS version 20) Descriptive statistics were applied (e.g., frequency, percentages, mean, and standard deviation). Test of significance (paired t test, Fisher's Exact Test and chi-square test) was applied to test the study hypothesis. A statistically significant difference was considered at p-value $\leq$ .05, and a highly statistically significant difference was considered at p-value $\leq$ .001, while the p-value >.05 indicates non-significant results.

III. Results

Table (1) represents socio-demographic characteristics of the studied subjects. It was clear that 43.3% of the women were aged from 30-<35 years, with a mean age 35.5±3.4 years. Regarding women' educational qualification, 33.3% of them were illiterate. 46.7% of women reported insufficient monthly income. Furthermore, 61.7% of them were housewives. As regards their income, In addition, 66.7% of the women were rural areas residence.

Table (2) displays that, 90.0% of the pregnant women were multi gravida. Furthermore, 80.0% of them reported regular antenatal follow up. Moreover, 61.1% of the women had 1-3years regarding inter-pregnancy interval. In addition, the average blood sugar in the initial visit was 243.91±54.31 mg/dl.

Fig. (1) Illustrates that, 41.7% of women were overweight but 15.0% were under weight**.**

Table (3) shows the risk factors among women with GDM. 60% of studied women had previous neonatal death, 53.3% of women had still birth and 50% had family history of type 2 diabetes while 18.3% of the women had previous abortion.

Table (4) displays that there were highly statistically significant differences (P<.001) before and after the nutritional program in relation to women' knowledge about GDM include definition, Risk factors, signs and symptoms of GDM, Complication for women and fetus, Treatment of GDM, Sites of insulin injection, Signs of hypoglycemia, Normal blood sugar and importance of exercise and Preventive measures GDM

Table (5) reflects that, there were highly statistically significant differences (P<.001) before and after implementation of the nutritional program in relation to nutrition regarding GDM pre/post nutritional program.

Table (6) displays that, there were highly statistically significant differences (P<.001) before and after program in relation to women' practices about GDM that include diet, blood sugar test, insulin injection and physical activity.

Table (7) displays women according to their condition and out come after delivery clarifies that, 16.7% of women under study were primary caesarean delivery, while women who had haemorrhage during intra-natal, post-natal period, Shoulder dystocia or birth injury and clinical neonatal hypoglycaemia were 1.6% each respectively.

Table (1) Distribution of the study subjects according to their socio-demographic characteristics. (n = 60)

Characteristics	No	%
Age		
- 20<30	16	26.7
- 30<35	26	43.3
- ≤ 35	18	30.0
Mean ± SD	35.5±3.4	
Educational qualification		
- Illiterate	20	33.3
- Primary or preparatory education	15	25.0
- Secondary education	19	31.7
- University education	6	10.0
Income		
- Insufficient	23	38.3
- Sufficient	9	15.0
- Sufficient and save	28	46.7
Occupation		
- Housewife	37	61.7
- Work	23	38.3
Residence		
- Rural	40	66.7
- Urban	20	33.3

Table (2) Distribution of medical and obstetric history among the studied group (n = 60)

Characteristics	No	%
Gravidity		
- Multi gravida	54	90.0
- Prim gravida	6	10.0
Antenatal follow up		
- Regular	12	20.0
- Irregular	48	80.0
Inter-pregnancy interval (n= 54)		
- < 1year	10	18.5
- 1-3years	33	61.1
- >3 years	11	20.4
Blood sugar		
Mean ± SD	243.91± 54.31	
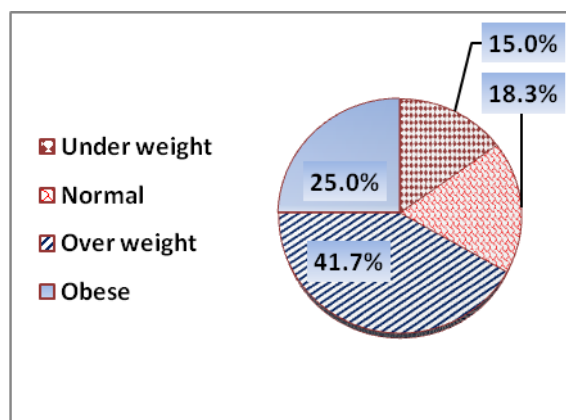
Fig. (1) Body mass index among the studied group (n = 60).

Table (3): Risk factors among the studied group (n = 60).

Items	No	%
Previous history of GDM	20	33.3
Still birth	32	53.3
Neonatal death	36	60.0
History of macrosomia	18	30.0
Polyhydromnious	24	40.0
Abortion	11	18.3
family history of type 2 diabetes	30	50.0

**All items are mutually exclusive

Table (4): Women knowledge regarding gestational diabetes mellitus pre/post nutritional program (n= 60).

Items	Pre-program			Post- program			FET/χ2	P value
	Correct answer	Incomplete answer	Don't know	Correct answer	Incomplete answer	Don't know		
	%	%	%	%	%	%		
Definition of GDM	8.3	60.0	31.7	90.0	10.0	0.0	55. 0	<.001**
Risk factors	1.7	48.3	50.0	88.3	11.7	0.0	59. 0	<.001**
Signs symptoms for GDM	3.3	20.0	76.7	88.3	11.7	0.0	58.0	<.001**
Complications for the	1.7	30.0	68.3	71.7	18.3	10.0	38. 3	

Items	Pre-program Correct	Incomplete	Don't know	Post-program Correct	Incomplete	Don't know	FET/χ2	P value
women								<.001**
Complications for the fetus	13.3	46.7	40.0	60.0	26.7	13.0	20. 5	<.001**
Treatment &insulin therapy	11.7	31.7	56.7	76.7	18.3	5.0	23.1	<.001**
Sites of insulin injection	13.3	38.3	48.3	68.3	20.0	11.7	26.7	<.001**
Signs of hypoglycemia	3.3	30.0	66.7	78.3	21.7	0.0	48. 0	<.001**
Normal blood Sugar	6.7	5.0	88.3	83.3	10.0	6.7	51. 0	<.001**
Importance of exercise	31.7	31.7	36.7	85.0	15.0	0.0	41. 0	<.001**
Preventive measures	16.7	40.0	31.7	60.0	33.3	6.7	28.9	<.001**

FET = Fisher's Exact Test   ** Highly statistically significant difference at P ≤ .001

Table (5): Women' knowledge regarding GDM nutrition pre/post nutritional program (n = 60)

Items	Pre-program Correct answer %	Incomplete answer %	Don't know %	Post- program Correct answer %	Incomplete answer %	Don't know %	FET/χ2	P value
Meaning of balanced diet	30.0	45.0	25.0	91.7	8.3	0.0	40.0	<.001**
Sources of carbohydrates	16.7	55.0	28.3	68.3	23..3	8.3	16.0	<.001**
Source of fruits that contain carbohydrates	16.7	70. 0	13.3	88.3	11.7	0.0	37.7	<.001**
Sources of protein	6.7	40..0	53.3	81.7	15.0	3.3	43.3	<.001**
Importance of vegetables	5.0	55. 0	40.0	83.3	8.3	8.3	36.8	<.001**
Importance of balanced diet	5.0	41.7	53.3	88.3	5.0	6.7	46.3	<.001**
High fiber foods	5.0	23. 3	71.7	75.0	25..0	0.0	52.0	<.001**
Special considerations for meals	1.7	30.0	68.3	95.0	5.0	0.0	59.0	<.001**
practical tips to decrease fat	3.3	26.7	70.0	83.3	16.7	0.0	53.0	<.001**
Amount of fluids for GDM	1.7	28. 3	70.0	78.3	16.7	5.0	44.3	<.001**
Restricted fluids for GDM	5.0	30.0	65.0	91.7	8.3	0.0	53.0	<.001**
Component of best break fast	3.3	6.7	90.0	55.0	38..3	6.7	52.0	<.001**
foods that contain sugar	11.7	50.0	38.3	65.0	35.0	0.0	45. 9	<.001**

FET = Fisher's Exact Test   ** Highly statistically significant difference at P ≤ .001

Table (6): Mean practice scores of the study subjects before and after educational intervention regarding GDM (n = 60).

Study period / Items	Maximum score	Pre-program Mean ± SD	Post- program Mean ± SD	Paired (t) test	P Value
- Diet	14	8.62± 2.03	11.09±1.39	19.18	<.001**
- Blood sugar test	10	6.84±1.31	9.79±1.52	10.96	<.001**
- Insulin injection	9	5.23±1.24	7.65±1.34	21.19	<.001**
- Physical activity	7	3.75±2.86	6.60±2.60	12.61	<.001**
- Total practices score	40	15.44±9.22	35.13±7.34	47.54	<.001**

** Highly statistically significant difference at P ≤ .001

Table (7): Distribution of the studied sample according to abnormal condition and out come after delivery (n = 29).

Items	No	%
Delivery at <37 weeks	2	3.3
Primary caesarean delivery	10	16.7
Shoulder dystocia or birth injury	1	1.6
Intensive neonatal care	3	5.0
Neonatal death	2	3.3
Clinical neonatal hypoglycaemia	1	1.6
Neonatal hyperbilirubinaemia	3	5.0
Over weight baby	4	6.7
Maternal hyperglycaemia	2	3.3
Hemorrhage during intra-natal , post-natal period	1	1.6

** Highly statistically significant difference at P ≤ .001

IV. Discussion

Gestational diabetes mellitus (GDM) is the most common medical complications of pregnancy. GDM carries risks for the mother and neonate that continuously increased as a function of maternal glycemia at 24–28 weeks. Diagnosing and treating GDM can reduce prenatal complications, but only a small fraction of pregnancies benefit. Nutritional management is the cornerstone of treatment. [28, 29] .The study was conducted to evaluate the effect of nutritional program on health of women with gestational diabetes and their outcome. As revealed from the current study. The sample consists of sixty women with gestational diabetes, nearly half of them were over the age of thirty. This was congruent with **Azar & Marym,** [30]**.** Who found that more than two thirds of pregnant women affected by gestational diabetes were over age of thirty years. Also, go in line with **Alsultan et al.** [31]**.** In his study of clinical epidemiology of gestational diabetes in Kuwait who found that nearly half of the sample was more than forty years old also **Reece,** [9] found that the incidence of gestational diabetes mellitus has been found to 7-10 times higher among pregnant women older than 24 years old than among those younger than 24 years old. As regarding to educational level, one third of the sample was illiterate and this was incongruent with **Abd elhady,** [32] who found that more than half of the sample was illiterate and this reflected that educational level isn't a factor to cause gestational diabetes mellitus.

As regarding medical and obstetric history table (2), more than three quarters of the sample their follow up during pregnancy was irregular and this was supported by **Waldron,** [33] who found that the majority of the sample carless for follow up which increase the risk for complication. Also, the study mentioned that majority of the sample was multi Para this go in line with **Elshair et al.** [34] in his study in Gaza strip who found that majority of pregnant women was multi-para. In addition, the present study cleared that, the average blood sugar value for the study sample was (243.91± 54.31) that reflected hyperglycaemia. This was congruent with what was found by **Abdel hady,** [32] that the value for uncontrolled GDM was (254 .4± 64.7).

The present study results indicated that body mass index (BMI) before pregnancy was more than two thirds of the sample for overweight & obese women, this was supported by **Kitz miller et al.** [15] who found that almost one third of women with gestational diabetes mellitus had body mass index (BMI) greater than 30 prior to pregnancy and almost eight percent were obese. Also, **Orshan,** [8] stated that obesity is a risk factor for GDM.

As regard risk factors among participants, the findings revealed that more than half of women had previous neonatal deaths, and stillbirth, also, half of them had family history of type 2 diabetes, and

more than one-third had previous abortion. This was supported by **Al sultan, etal,** [31] who found that prevalence of risk factors as past history of gestational diabetes mellitus in previous pregnancy, family history of diabetes mellitus in first degree relative, abortion, macrosomia and still births was represented by more than half of the sample respectively. Also this is supported by **American diabetes association** [7] which stated that women at low risk for gestational diabetes mellitus who have the following characteristics, less than 25 years of age, normal body weight, no first degree relative with diabetes mellitus, not a member of an ethnic group, and no history of poor obstetric outcome.

According to research hypotheses No.1: nutritional program will have positive effect on knowledge and practice of pregnant women regarding gestational diabetes mellitus. *First,* the current study results confirmed that there was positive statistical significant improvement in women's knowledge regarding gestational diabetes mellitus post test than pre test. This was in agreement with **Murphy, et al.** [35] who found that , after counselling a significant improvement in knowledge was noted .Also, **American College of Obstetricians and Gynecologists,** [36] stated that all women with GDM should receive dietary counselling at the time of diagnosis to attain the desired level of glycemic control; provide adequate weight gain, which contributes to maternal and fetal well-being; and prevent the development of ketosis.

Regarding women' knowledge about GDM nutrition, the study approved that, there was highly statistical significant difference pre and post nutritional program implementation with improvement in knowledge scores regarding GDM nutrition post program. This was congruent with **Elshair et al.** [34] who found that there was a significant improvement regarding the correct answers of pregnant women in the study group post test regarding knowledge of normal blood sugar value, diet, treatment and antenatal care. This also supported by **Moura, et al.** [37] Who found that more than half of studied women had limited knowledge regarding maternal and fetal risks pre intervention which improved after intervention.

Second, this study pointed out to positive statistical significant improvement in relation to women' practices about GDM that include diet, blood sugar test, insulin injection and physical activity, this in agreement with **Waldron ,**[33] who found that there was a statistical significant difference was set in P-value of 0.00 and the mean test scores improved overall in women's knowledge post test and increase one's behaviour about gestational diabetes mellitus care and dietary choices as seen in the Hispanic pregnant women of this study. It also was congruent with **Reader, et al.** [38] who found that the effect of applying nutrition practice guide lines indicated less insulin use at diabetes clinic sites in the nutrition practice guidelines groups and these reflected nutrition care and knowledge being provided by registered dieticians in diabetes clinics prior to this study because outcomes at these clinics were not impacted.

The results also supported the second hypothesis that the nutritional program will have healthy impact on the majority of the women's outcome. As shown, women who had haemorrhage during intra-natal, post-natal period, Shoulder dystocia or birth injury and clinical neonatal hypoglycaemia were asmall percentages. In the same line **clapp ,** [39] who stated that diet and physical activity altered the increase in insulin resistance especially during mid and late pregnancy. Also, **London, et al.** [40] reported that dietary intervention, in combination with insulin therapy as needed, reduces the risk of fetal macrosomia, preeclampsia, and serious perinatal complications. Moreover, **Metzger et al.** [41] who said that results from the HAPO study provide useful insight into the frequency of perinatal complications in women with mild to moderate GDM in the absence of treatment and dietary practices as revealed statistically significant increases in 10 different adverse perinatal outcomes in women in the absence of treatment and dietary practices. Therefore, to enhance women knowledge

and practice about GDM, more attention should be made on nutritional intervention to increase the awareness and practice of women.

V -Conclusion

The study concluded that the nutritional program of women about gestational diabetes mellitus had improved their knowledge, practice and health of the baby post nutritional program implementation also the associated health problems among women and pregnancy outcomes were decreased and a health improvement was noticed.

VI -Recommendations:

According to the results of the current study, the following recommendations are suggested:

1- Nutritional programs should be provided in other settings.
2- Dietary plans for gestational diabetic women should be available in all obstetric clinics
3- Further studies regarding the effect of nutrition on gestational diabetic women is needed.

References

[1]   American Diabetes Association. Diagnosis and classification of diabetes mellitus. *Diabetes Care* , 2012; 35 (1): S64–S71.

[2]   Landon, M.B., Mele, L., Spong, C.Y., Carpenter, M.W., Ramin, S.M., et al. The relationship between maternal glycemia and perinatal outcome. Obstet Gynecol., 2011; 117: 218-224.

[3]   Makgoba, M., Savvidou, M.D., Steer, P.J., an analysis of the interrelationship between maternal age, body mass index and racial origin in the development of gestational diabetes mellitus. BJOG, 2012; 119: 276-282.

[4]   Hossein,A., & Nezhad, R ., prevalence of gestational diabetes mellitus and pregnancy outcomes in Iranian women, Taiwan J obstetric gynecology, 2007;46 (3):p.41.

[5]   American diabetes association, position statement: standard of medical care in Diabetes care, 2007; 30 (1): 4-41.

[6]   Pillitteri, A., maternal and child health nursing, care of the child bearing & child rearing family, Lippincott Williams & wilking com., 5th ed., 2007 ; p.378

[7]   American diabetes association , Diagnosis and classification of diabetes mellitus, Diabetes care, 2006; 29(1):543-548.

[8]   Orshan, S. A., Maternity newborn & women's health nursing ,1st, ed, Lippincott Williams & wilkins comp. London ,2008; p. 11.

[9]   Reece E.A., the fetal and maternal complications of gestational diabetes mellitus, Journal of maternal ,fetal and neonatal medicine, 2010 ; 23 (3):199-203

[10]   Shin, Y., Kim. J., Lucinda England, J., Sharma, A., & Njoroge ,T., Gestational Diabetes Mellitus and Risk of Childhood Overweight and Obesity in Offspring: A Systematic Review, Experimental Diabetes Research, 2011; pp.1-9

[11]   Lowdermilk, P.I., & lerry, s., maternity &women's health care. 9th ed., Mosby Elsevier comp., china, 2007 ; p22'839.

[12]   Metzger, B.E., Lowe, L.P., Dyer, A.R., et al., HAPO Study Cooperative Research Group. Hyperglycemia and adverse pregnancy outcomes. N Engl J Med., 2008;358:1991–2002

[13] Farrar, D., Duley, L., Lawlor, D.A., Different strategies for diagnosing gestational diabetes to improve maternal and infant health, Cochrane Database Syst Rev., 2011; 5 (10)

[14] Wahabi , H.A., Alzeidan, R.A., Bawazeer, G.A., Alansari, L.A., & Esmaeil, S.A., "Preconception care for diabetic women for improving maternal and fetal outcomes: a systematic review and meta-analysis," BMC Pregnancy and Childbirth, 2010 Oct 14;10:63.

[15] Kitzmiller, J.L., Buchanan, T.A, kjosS,combs, C., & Retner, R.E., Preconception care of diabetes, congenital malformation diabetes care, 2007; 30(2):14-40

[16] Reader, D.M., Medical Nutrition Therapy and Lifestyle Interventions, Diabetes Care, 2007; 30(2) :S188–S193

[17] Magon, N., Seshiah, V., Gestational diabetes mellitus: Non-insulin management. Indian J Endocrinol Metab , 2011; 15: 284-293.

[18] Menato,G.BOS,signorille,A,Gallo,M,Cortinol,Poala,&CB,Mossobriom. (2008):Current management of gestational diabetes mellitus , expert review of obstetric & Gynecology;3:1

[19] Grant, S.M., Wolever, T.M., O'Connor, D.L., Nisenbaum, R., Josse, R.G., Effect of a low glycaemic index diet on blood glucose in women with gestational hyperglycaemia. Diabetes Res Clin Pract., 2012; 91: 15-22

[20] American diabetes association, Gestational diabetes mellitus, 2012; Diabetes care, 27(1): S88-S90.

[21] Radwan , M., & Gadalah,S., Epidemiology diabetes mellitus in Egypt, the Egyptian Journal of community medicine, 2002; 20(1): 89-93.

[22] Anderson, J.,Waller, D.,canfield,M., Shaw,G., Watkins,M., &Werler, M., maternal obesity, Gestational diabetes and current nervous system birth defects, epidemiology,2005; 16(1): 87-92.

[23] Lee-Parritz, A. , Contemporary management of gestational diabetes. Curr Opin Endocrinol Diabetes Obes 2011; 18: 395-400.

[24] Kim, S.Y., England, J.L., Sharma, JA., Njoroge, T., Gestational Diabetes Mellitus and Risk of Childhood Overweight and Obesity in Offspring: A Systematic Review. Exp Diabetes Res., 2011: 1–9

[25] Kim,C., Gestational diabetes: risks, management, and treatment options, International Journal of Women's Health, 2010:2 339–351

[26] Cheung, K.W., Wong, S.F., Gestational Diabetes Mellitus Update and Review of Literature. Reproductive Sys Sexual Disord ., 2011;5(2) : 2-6.

[27] World Health Organization, Global Database on Body Mass Index: BMI Classification, 2015, http://apps.who.int/bmi/index .jsp?introPage=intro 3.html.

[28] Metzger, B. E. et al. International association of diabetes and pregnancy study groups recommendations on the diagnosis and classification of hyperglycemia in pregnancy. Diabetes Care 33, 676–682 (2010).

[29]   Buchanan, T., Xiang, A., and Page, K., Gestational diabetes mellitus: risks and management during and after pregnancy, Endocrinology, 2012; 8,639-649.

[30]   Azar, A., & marym , N., maternal age as a risk factor for pregnancy outcomes: department of midwifery sari branch. Iran, 2011; (2), pp 264.

[31]   Al sultan, F. A., Anan, GH. D. &Ahmed, S.A.,Clinical Epidemiology of Gestational Diabetes in Kuwait, 2004 ;36(3):195-198.

[32]   Abdelhady, R.M.(2002): blood glucose level in high risk new born infants of high risk diabetic pregnancy, doctorate degree, Benha faculty of nursing, zagazig university, 150.

[33]   Waldron, D.M. (2011): Improvement in nutrition knowledge and retention about gestational diabetes mellitus among Hispanic pregnant women, master of dietics administration in nutrition, dietetics & food sciences, testate university. 32'33.

[34]   Elshair, A., Shenouda, M., & Elkader, S., gestational diabetes in UNRWA health clinics in gaza strip : Impact of educational program new York Science Journal,2012; (12): 66-72.

[35]   Murphy, A., Guilar, A., &Donat, D., nutrition education for women with newly diagnosed gestational diabetes mellitus, small group vs. Individual counseling, Canadian Journal of diabetes, 2004;28(2):1-5.

[36]   American College of Obstetricians and Gynecologists (ACOG) Committee on Practice Bulletins-Obstetrics. Practice Bulletin No. 137: Gestational diabetes mellitus. Obstet Gynecol 2012;122:406-16

[37]   Moura, E.R.F., Evangelista ,D.R.,& Damasceno, A.K.C. ,the knowledge of women with diabetes mellitus regarding preconception care & maternal- fetal risks. Rev.esc. enferm. Usp ., 2012; 46(1): p. 1'2

[38]   Reader, D.M., spllet. P., & Gunderson, E., Impact of gestational diabetes mellitus nutrition practice guidelines implemented by registered dieticians on pregnancy outcomes. Jam diet assoc, 2006; 106: 1426 –1433

[39]   Clapp, J.F., Effects of Diet and Exercise on Insulin Resistance during Pregnancy. Metabolic Syndrome and Related Disorders, 2006; 4, 84-90.

[40]   Landon, M.B., Spong, C.Y., Thom, E., et al. A multicenter, randomized trial of treatment for mild gestational diabetes. N Engl J Med, 2009; 361:1339-48.

[41]   Metzger, B., E., et al. International association of diabetes and pregnancy study groups recommendations on the diagnosis and classification of hyperglycemia in pregnancy. Diabetes Care, 2010; 33, 676–682.