- ***Basic Research***

Adherence to Nutritional Therapy on Pregnancy Outcomes for Effect of Pregnant Women with Gestational Diabetes

Rania Abouzaid Embaby[1], Rehab Sabri Fawzi Mohammed[2], Asmaa Morgan Farahat Khatap[3*]

[1]Lecturer of Maternal and Newborn Health Nursing, Faculty of Nursing, Cairo University, [2,3]Lecturer of Obstetrics and Gynecologic Nursing, Faculty of Nursing Suez Canal University
Corresponding author email: moazkhatab@nursing.suez.edu.eg

Abstract

Background: Pregnancy complications and maternal cardiometabolic issues later in life are associated with gestational diabetes mellitus (GDM). A nutritional therapy diet is a crucial part in managing GDM. **Aim**: To evaluate the effect of adherence to nutritional therapy on pregnancy outcomes among pregnant women with gestational diabetes. **Design**: a quasi-experimental approach. **Sample**: A purposive sample of 140 women with GDM was chosen. **Tools**: 1st Tool: Demographic & Obstetric Data Collection, 2nd Tool: Dietary Intake & Adherence Assessment Tools, 3rd Tool: Dietary Compliance Tracking Data (Compliance Checklist) and the 4th Tool: Pregnancy Outcome Assessment Tools. **Results**: Sociodemographic characteristics were similar across both groups. At baseline, no significant differences were observed between the two groups concerning dietary patterns, lifestyle, and medical history. However, by the fourth antenatal visit, the studied group showed significant improvements in dietary adherence and reduced maternal and fetal complications. The study group demonstrated significantly lower fasting and random blood sugar levels compared to the control group (p=0.001). Furthermore, the studied group had fewer complications such as recurrent monilial infections, preterm labor, and CS deliveries, along with improved fetal outcomes, including a reduction in neonatal hypoglycemia and respiratory distress syndrome (RDS). **In conclusion**, GDM women, who adhered to the nutritional therapy program, had lower adverse effect on her pregnancy outcome.

Recommendations: Integrate nutritional counseling sessions into routine antenatal care for women diagnosed with GDM.

Keywords: GDM - nutritional therapy -pregnancy outcome.

Introduction

Gestational diabetes mellitus (GDM) is a pregnancy-induced glucose intolerance that typically manifests between weeks 24 and 28, though it can happen earlier or later. A1GDM and A2GDM are the two forms of GDM that are discussed. One type of gestational diabetes that is managed with diet rather than medication is called food-controlled gestational diabetes, or A1GDM. In contrast, A2GDM is a kind of gestational diabetes that requires medication to properly regulate blood sugar levels (Rodriguez & Mahdy, 2021).

Gestational diabetes mellitus (GDM) prevalence varies widely by region, with rates ranging from 1% to 31% worldwide. A 75 g oral glucose tolerance test (OGTT) should be administered between weeks 24 and 28 of pregnancy to all pregnant women without diabetes, according to the International Association of Diabetes and Pregnancy Study Group (IADPSG). GDM is identified when plasma glucose levels are above 92 mg/dL during fasting, 180 mg/dL during one hour, or 153 mg/dL during two hours (Wang et al., 2022). According to Adoyo and Kombe (2020), there are differences in parameters including age, ethnicity, obesity, screening techniques, diagnostic criteria, and Westernized lifestyles, which make it difficult to determine the true incidence of GDM worldwide.

Every year, more than 17% of expectant mothers receive a diagnosis of gestational diabetes (GD), according to the International Diabetes Federation (IDF). The Middle East and North Africa (27.6%) and Southeast Asia (20.8%) have the highest prevalence, whereas Europe (7.8%) and North America and the Caribbean (7.1%) have the lowest rates. The incidence of GD is 14% in sub-Saharan Africa and varies from 8.4% to 24.5% in the Middle East and North Africa. While both high- and low-income countries are affected by GD, 90% of GD cases globally are thought to occur in low-income countries (Wang et al., 2021; Druye et al., 2024).

A recent meta-analysis of 103 publications including 1,826,454 pregnant women tested risk factors for gestational diabetes. Even though HIV status, history of congenital anomaly, and abortion did not affect GDM ($P > 0:05$), the following factors increased the risk of GDM: pregnancy overweight or obesity, maternal age under 25, family history of diabetes (FHD), history of GDM, macrosomia, stillbirth, premature delivery, and pre-gestational smoking ($P<0.05$) (Zhang et al., 2021).

The health of the mother and the fetus is seriously jeopardized when GDM is present. Recent studies show that 50.4% of pregnant women develop type 2 diabetes within 23 years after receiving a GDM diagnosis and 5.7% develop type 1 diabetes within 5 to 7 years (IDF,2022). Abortion, preterm labor, hydramnios, infections, hypertension brought on by pregnancy, and inexplicable fetal deaths are examples of maternal problems as a result of GDM. Additionally, neural tube malformations, heart abnormalities, macrosomia, and fetal starvation can all be signs of fetal problems (Hussain et al., 2020: Druye et al., 2024).

Early detection and appropriate treatment are key to improving pregnancy outcomes and preventing maternal and neonatal morbidity for women with gestational diabetes. Preventing maternal hyperglycemia or hypoglycemia mostly involves keeping glucose levels within the suggested glycemic reference range. Therefore, two kinds of treatment were used: one that focused on lifestyle modification and the other that combined it with therapeutic management. The most important part, or foundation, of managing GDM is altering one's lifestyle. Nutritional therapy, exercise, and self-glucose monitoring are all components of GDM management (American Diabetes Association (ADA), 2024)

Nutrition therapy is the only care strategy that can be used with any woman diagnosed with GDM. Finding therapeutically effective components that reduce the need for medical therapy in this expanding community of women is crucial, even though the ideal approach to dietary therapy is still elusive and may demand for a customized strategy. Additionally, mothers who are overweight or obese may benefit from flexible, affordable choices that are helpful for GDM, as they frequently share a milder metabolic profile and give birth to the most large-for-gestational-age (LGA) newborns (Shery et al., 2021). The traditional strategy of reducing carbs at the expense of boosting energy from fat sources might not be the best one. Rather, it appears to be more advantageous to consume nutrition therapy that permit greater intake of complex, low-to-medium glycemic index carbohydrates and sufficient fiber through increased consumption of fruits and vegetables (Kapur., Kapur, & Hod, 2021).

It is commonly known that dietary changes are beneficial for individuals with GDM. Fetal growth may be influenced by general improvements in women's health and nutrition both before and throughout pregnancy. According to clinical research, MNT helps individuals with GDM maintain glucose homeostasis during pregnancy, enhances insulin sensitivity, and lowers the risk of pregnancy problems. To minimize oxidative damage and prevent excessive oxidative stress and inflammation in the placenta, MNT lowers the formation of reactive oxygen species (ROS) in an unborn fetus. Additionally, MNT can lower the incidence of maternal metabolic diseases including postpartum hypertension, and ameliorate neonatal excessive birth weight (Vasile et al., 2021: Wei et al.,2024)

A study involving 410 pregnant women was carried out Between December 2020 and December 2022, at Yangzhou Maternal and Child Health Hospital and Northern Jiangsu People's Hospital in Jiangsu Province. The study aimed to investigate the effects of personalized nutrition interventions on pregnancy weight gain (PWG), glucolipid metabolism, and lactation in women with gestational diabetes mellitus (GDM). The results indicated that customized nutrition interventions were effective in reducing PWG, improving glucolipid metabolism, and promoting early breastfeeding among pregnant women with GDM, all of which require clinical attention (Luo et al., 2023). As a result, the present study seeks to examine the impact of adherence to nutritional therapy on pregnancy outcomes in women with GDM.

Significance of the study

Gestational diabetes mellitus (GDM) is a common pregnancy complication, and its impact on both maternal and fetal health can be profound, affecting short- and long-term outcomes. By focusing on the effects of adherence to nutritional therapy in managing GDM, In Egypt, there is scattered research regarding the GDM management, and the main concern of some research available was related to risk factors or incidence, or awareness of GDM.

This study, conducted at the Obstetrics and Gynecology Hospital's antenatal clinic, which was affiliated to Suez Canal University Hospitals in Ismailia City, holds significant value for multiple reasons, especially in the context of maternal and fetal health. This research addresses a critical gap in understanding how dietary interventions influence pregnancy outcomes.

Operational definition of nutritional therapy for GDM: consumption of low-to-medium glycemic index carbohydrates and sufficient intake of fiber.

Aim of the study

The study aims to evaluate the effect of adherence to nutritional therapy on pregnancy outcomes among pregnant women with gestational diabetes.

Objectives:

- Determine the impact of diet on glycemic control during pregnancy.
- Determine the impact of dietary compliance on maternal complications.
- Determine the impact of dietary compliance on fetal health, and neonatal outcomes.

Research Hypothesis:

GDM women, who will adhere to nutrition therapy program, will have lower adverse effects on their pregnancy outcome than those who do not.

Subjects and Methods

Design:

The current study used a quasi-experimental approach, which consists of two groups; study and control groups.

Setting:

The study was carried out in the antenatal clinic which provides care for pregnant women diagnosed with gestational diabetes at Suez Canal University Hospitals.

Sample:

A purposive sample of (140) pregnant women were recruited. Inclusion criteria were All primiparas and multiparous women diagnosed as GDM at 24-30 weeks of gestation, any age and with different educational level were enrolled in the study. While pre-gestational diabetes type 1 or type 2 were excluded. 70 women in the control group received the standard care of the hospital, while the other (70) women in the studied group received the designed booklet about nutrition therapy diet during pregnancy.

Tools for Data collection. Four tools were developed by the researcher to prepare a thorough review of the literature.

1st Tool: Demographic & Obstetric Data Collection: It was conducted via face-to-face interviews self-administered surveys or interviewer-assisted (for illiterate participants). It was used to collect socio-demographic data, medical history, and dietary habits and consists of four parts:

Part I: Personal Characteristics: Age, education, residence.

Part II: Medical & Obstetric History: Gravidity, parity, family history of diabetes, hypertension, or cardiac disease…. etc.

Part III: Dietary Pattern: Number of meals, skipped meals, soda, and dessert consumption.

2nd Tool: Dietary Intake & Adherence Assessment Tools:

Clinical Measurements: was used for measuring the actual effect of intervention. It included both objective and biochemical tools as Anthropometric Measurements and Blood Glucose Monitoring.

Anthropometric Measurements (Objective Tool)

Weight & BMI (Body Mass Index): Measured at recruitment and bi-weekly.

Maternal Weight Gain: Tracked using a standardized digital weighing scale.

Blood Glucose Monitoring (Biochemical Tool)

Fasting Blood Sugar (FBS) & Random Blood Sugar (RBS): Collected at baseline, every 2 weeks, and at the final assessment. It assessed using glucometers in clinics or hospital laboratories.

3rd Tool: Dietary Compliance Tracking Data (Compliance Checklist):

It was developed by the researcher and divided into Four parts:

Part I: Food Diary/Meal Log (Self-Reported): Women report all foods and beverages consumed in the past 24 hours to evaluate adherence to nutritional therapy. Then Reviewed bi-weekly by the research team to monitor consistency.

Part II: Food Frequency Questionnaire (FFQ); Assesses how often certain food groups are consumed. It included categories of foods high/low in carbohydrates, proteins, and fats. To evaluate long-term dietary compliance and food preferences.

Part III: Food Diary/Meal Log (Self-Reported): Participants will maintain a daily food log recording all meals, snacks, and beverages and assess self-reported adherence to dietary recommendations. It reviewed bi-weekly by the research team to monitor consistency.

Part IV: Dietary Compliance Checklist (Researcher-Assessed): Researcher-developed checklist to track participants' adherence to prescribed meal plans and portion sizes. It was conducted bi-weekly during follow-up visits. Scores adherence as high, moderate, or low based on dietary intake patterns.

4th Tool: Pregnancy Outcome Assessment Tools:

Maternal Outcomes were obtained from Hospital Records & Interviews. It included Mode of delivery (vaginal vs. cesarean section), Pregnancy complications (preeclampsia, preterm labor, polyhydramnios) and postpartum blood sugar levels to assess diabetes risk after delivery.

Neonatal Outcomes were gotten from the Newborn Records & NICU Data as birth weight (low birth weight, macrosomia), APGAR score at 1 and 5 minutes, Neonatal hypoglycemia or respiratory distress syndrome and NICU admission and reasons for hospitalization.

Tool Validity

A panel of three knowledgeable academics with expertise in maternity nursing evaluated Tools 1, 3, and 4. In order to ascertain whether the items on the instrument accurately reflect the content within the relevant domain, the researcher asked the experts to match each aim with its corresponding items and assess the items' relevancy to the objectives' covered content. content validity in nursing and health research was scored of 0.78 .

Pilot Study

A pilot study was conducted on 10% of pregnant primigravida and multipara women to test clarity, applicability, and feasibility, and to estimate the needed time to complete each tool. Necessary modifications were made to the data collection tools. Approximately one and a half hours were needed on average to complete the study group's tools (10 minutes for sociodemographic, 20 minutes for assessment and follow-up, 15 to 20 minutes per session to provide detailed information about GDM and counseling regarding low glycemic index diet, and the final 10 minutes for intrapartum and postpartum assessment. However, ten minutes were required for the control group's sociodemographic, About a quarter of an hour for assessment and follow-up, and ten minutes for intrapartum and postpartum care.

Ethical considerations

The participants were informed by the researcher that their data was secret, free from compromising care delivered and they had their right for withdrawing at any time they want with out any rationale. Then the researcher got a written consent from each pregnant woman who accept to participate in this study. On May 28, 2024, the study was approved by the Suez Canal University Faculty of Nursing's Ethical Committee.

Procedure

The study was conducted from June to December 2024. An official permission was obtained from Suez Canal university hospitals and the manager of Gynecology& obstetrical department. It was carried out in the antenatal clinic ‘outpatient’. The study conducted through four phases: preparation, asessment, implementation and follow-up and evaluation phase.

1. **Preparation Phase:**

Patient Guidance Booklet: was developed by researchers from different updated resources to include:

- An introduction to gestational diabetes mellitus (GDM), covering risk factors, signs, symptoms, and potential complications during pregnancy, childbirth, and the postpartum period.
- Nutritional therapy: its significance for maternal and neonatal health, detailed components, and simplified explanations of suitable foods for breakfast, lunch, and dinner, along with examples of main meals and snacks.
- The importance and types of recommended exercises.

The role of breastfeeding in reducing post-delivery complications for both mother and neonate.

2. **Assessment Phase (Data Collection):**
   - Baseline Assessment: Conducted at 24 weeks of gestation over approximately two months.
   - Participant Recruitment: Pregnant women diagnosed with GDM between 24 and 28 weeks of gestation were recruited from antenatal clinics based on specific inclusion and exclusion criteria.
   - Informed Consent: Obtained written informed consent from all participants.
   - Data Collection Tools: Employed standardized tools for baseline data collection before intervention.
3. **Implementation of Nutritional Therapy (Intervention, Weeks 24- 34)**

Nutritional Counseling Sessions: Conducted bi-weekly, both individually and in groups, focusing on:

- Meal planning, portion control, carbohydrate counting, and food label reading.
- Education on glycemic index, meal timing, and the importance of fiber-rich foods.

Personalized Diet Plan: Tailored based on individual caloric needs, body mass index (BMI), and blood glucose levels, emphasizing:

- Low-glycemic index foods.
- A balanced intake of carbohydrates, proteins, and healthy fats.
- Recommendation of three main meals and two snacks per day.

4. Follow-up Monitoring (Every Two Weeks):

Dietary Compliance Monitoring: Participants maintained food diaries to track adherence, supplemented by:

- Regular phone calls and reminders to encourage compliance.
- Home visits, when feasible, for additional support.

Clinical Monitoring (Weeks 24–34): At each follow-up, measurements included:

- Fasting blood sugar levels.
- Random blood sugar levels.
- BMI assessments.
- Tracking of maternal weight gain throughout pregnancy.

5. Evaluation (Outcome Monitoring):

Recorded any pregnancy complications (e.g., preeclampsia, preterm labor, preterm premature rupture of membranes [PPROM], cesarean section) and neonatal outcomes (e.g., NICU admission, neonatal hypoglycemia, stillbirth, respiratory distress syndrome) using standardized assessment tools.

Control Group received routine prenatal care or standard care: Participants received standard antenatal care without structured nutritional intervention and no additional dietary counseling beyond routine medical advice.

Results

Table (1) According to their sociodemographic data, both the study and control groups revealed homogeneity, as shown in Table 1. Women in the study group had an average age of 31.19± 5.46, while those in the control group had an average age of 31.55± 6.14. In terms of educational attainment, 35.7 percent of the women in the study group were illiterate, whereas 28.5% of the women in the control group were similar. 80% of the women in the study group and 71.4% of the women in the control group, on the other hand, lived in cities.

Table (2) Regarding the medical family history table (2) illustrated that 72.8% of women in the study group compared to 78.6% of women in the control group have a family history of chronic diabetes mellitus. While 14.3%, 7.1 %respectively of women in the study and control groups have a family history of chronic hypertension disease. Moreover, a minority of the sample complain of cardiac and renal disease with no statistically significant differences between both groups.

Table (3) revealed that fifty-seven point one of the women in the study group and 77.2% of women in the control group were grand multigravida. While (28.6% &15.7% respectively) of women in the study and control group were multigravida with no statistically significant differences between both groups (X2 = 11 p-value =0.189). Furthermore, sixty-two-point eight percent of women in the study group and 42.9% of women in the control groups didn't have missed pregnancy (abortion). While 28.6% of women in the study group & 50% in the control group had frequent abortions from (1 to3 times). Qui square revealed statistically significant differences between both groups ((X2 = 1 p value=0.021).

Table (4) revealed that almost of the women in both groups consumed two to three meals per day (44.3%&44.3%, 50%&48.6% respectively) in the study and control group and the student t-test revealed no statistical difference between women in both groups (X2 =3 p value=0.072). However, 34.3% of women in the study group and 45.7% of women in the control group escaped one meal intake /week, the student t test showed no statistical difference between women in both groups (X2 =2 p value=0.092).

Meanwhile, fifty-seven-point one percent of women in the study groups and 68.6% of women in the control group consumed dessert for two to three time per week. In relation to soda water intake 57.1% of women in both groups did not drink soda water with no statistically significant difference between both groups (X2 =2 p value=0.729).

Table (5) revealed that 57.1%, and 71.4% respectively of women in the study group followed dietary instructions in the 1st,2nd breakfast in 3rd session, in the fourth antenatal visit they followed the instruction by 100%. Meanwhile 57.1% of them did not follow instructions regarding snakes in between breakfast and lunch with the previous two days. As regard to 1st&2nd day lunch 42.9% &51.4% not follow dietary instructions respectively, while in the fourth antenatal visit they follow the instruction by 100%. Regarding the diner in the 3rd follow up 60%&71.4% follow dietary respectively in the first- and second-day dinner, while in the fourth antenatal visit, they follow the instruction by 100%.

According to **Table (6)**, there were no statistically significant differences between the study and control groups regarding FBS at the first antenatal visit; however, the mean random blood sugar for each group was above the normal range during the first antenatal visit, indicating a highly statistical difference between the two groups (t-test = -2.186, p = 0.030); at the fourth antenatal visit, the study group's RBS was 131.36±39.70, compared to 169.66±63.91 in the control group; a highly statistically significant difference was found between the two groups in terms of their BMI and weight gain during pregnancy at the first and fourth antenatal visits.

Table (7) revealed the study group had a higher percentage of normal vaginal deliveries (21.43%) compared to the control group (12.86%). Conversely, cesarean sections were more prevalent in the control group (87.14%) than in the study group (64.29%). Additionally, vaginal deliveries with episiotomy occurred exclusively in the study group (14.28%), with no cases reported in the control group.

In terms of maternal and fetal complications during pregnancy, labor, and the first 24 hours after delivery, table (8) revealed a highly statistically significant difference between the two groups concerning recurrent monilial infection, PPROM, decreased fetal movement count, and RDS (p-value < 0.01 to 0.002). However, there were no statistically significant differences in IUGR, IUFD, preterm labor, obstructed labor, preeclampsia, or antepartum hemorrhage (P value >0.05). Table 3 showed that there was no statistically significant difference in postpartum bleeding between the two groups regarding postpartum consequences for the women. Newborn hypoglycemia, RDS grade 1, and NICUE were among the newborn problems during the

postpartum period that showed a highly statistically significant difference between the two groups.

Table (1): Distribution of the women in both groups according to their personal characteristics (N=140)

Items	Study group		Control group		X^2	p-value
	N=70	%	N=70	%		
Age						
-20	25	35.73	26	37.14	24.90	0.705
-30	45	64.27	44	62.86		
Mean ± SD	31.19± 5.46		31.55± 6.14			
	T test -0.379					
Educational level						
Can't read and write	25	35.73	20	28.57	3.55	0.616
read and write	10	14.28	12	17.14		
Preparatory school	15	21.42	18	25.72		
Secondary school	20	28.57	20	28.57		
Residence						
Urban	56	80	50	71.43	0.13	0.712
Rural	14	20	20	28.57		

X^2 Chi square test, p-value <0.05

Table (2). Distribution of the women in both groups according to their family history N=140

Items	Study group (n=70)		Control group (n=70)		X2	p-value
	No	%	No	%		
Diabetes mellitus disease	**517.1%**	**72.8**	**55**	**8.67**	**1**	**0.473**
Hypertension disease	**10**	**14.3**	**5**	**7.1**	**1**	**0.621**
Cardiac disease	**7**	**10**	**6**	**8.6**	**2**	**0.512**
Renal disease	**2**	**92.**	**4**	**75.**	**1**	**0.405**

X^2 Chi square test, p-value <0.05

Table (3). Distribution of the women in the study and control group in relation to their previous obstetric profile N=140

Items	Study group (n = 70)		Control group (n = 70)		X2	p-value
	No	%	No	%		
Gravity						
Primigravida	10	14.3	5	7.1	11	.189
Multigravida	20	28.6	11	15.7		
Grand multigravida	40	57.1	54	77.2		
Abortion						
No	44	62.8	30	42.9	1	0.021
1-3	20	28.6	35	50		
More than 3	6	8.6	5	7.1		

X^2 Chi square test, p-value <0.05

Table (4) Distribution of the women in relation to their baseline data about dietary pattern among study and control group N=140

Items	Study group (n = 70)		Control group (n = 70)		X2	p-value
	No	%	No	%		
Number of meals						
One meal	8	11.4	1	1.4	3	0.072
Two meals	31	44.3	35	50		
Three meals	31	44.3	34	48.6		
Number of escaped meals						
Rare	31	44.3	28	40	2	0.092
one/week	24	34.3	32	45.7		
2-3/week	15	21.4	10	14.3		
Dissert /week						
Rare	10	14.3	10	13.3	2	0.519
One/week	20	28.6	12	17.1		
2-3/week	40	57.1	48	68.6		
Soda water/day						
Rare	40	57.1	40	57.1	2	0.729
Two time	23	32.9	23	32.9		
Three or more	7	10	7	10		

X^2 Chi square test, p-value <0.05

Figure (1): Types of Food Consumption For Both Groups

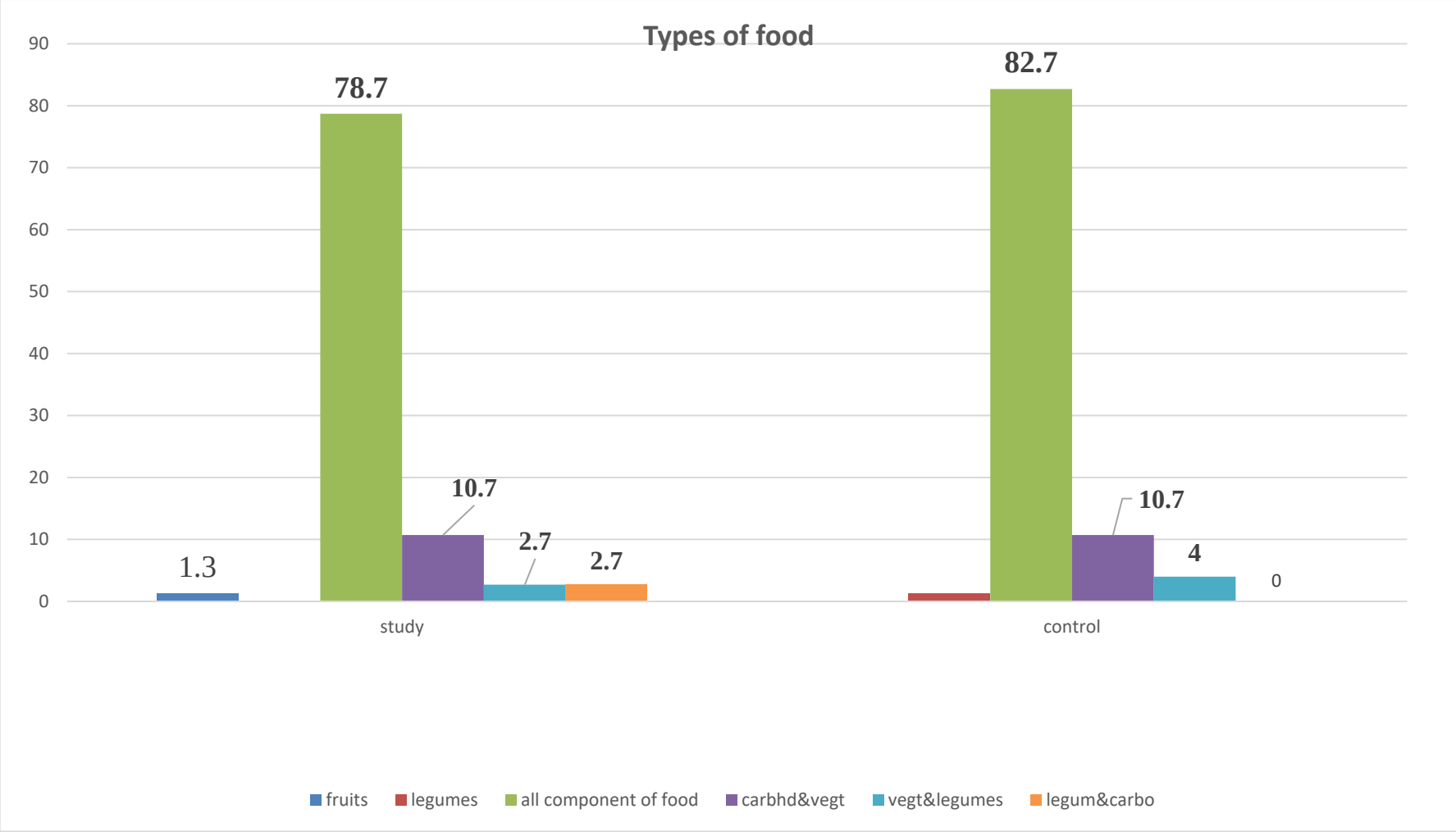

Figure (1) illustrated that seventy-eight-point seven percent of women in the study group and 82.7 % in the control group eaten all types of food. Student t test revealed no statistically significant differences between both groups (X2 =7 p value=0.421).

Table (5) Disruptions of women in the study group in relation to dietary compliance

Items	Study group N=70 3rd dietary follow up				Study group N=70 4th dietary follow up			
	Follow		Un follow		Follow		Un follow	
	N	%	N	%	N	%	N	%
1st day breakfast	40	57.1	30	42.9	70	100	0	0
2nd day breakfast	50	71.4	20	28.6	70	100	0	0
1st day snake	30	42.9	40	57.1	67	95.7	3	4.3
2nd day snake	30	42.9	40	57.1	67	95.7	3	4.3
1st day launch	40	57.1	30	42.9	70	100	0	0
2nd day launch	34	48.6	36	51.4	70	100	0	0
1st day snake	22	31.4	48	68.6	70	100	0	0
2nd day snake	21	30	49	70	68	97.1	2	2.9
1st day dinner	42	60	28	40	70	100	0	0
2nd day dinner	50	71.4	20	28.6	70	100	0	0
1st day snake	20	28.6	50	71.4	63	90	7	10
2nd day snake	20	28.6	50	71.4	62	88.6	8	11.4

Table (6). Mean of fasting blood sugar, random blood sugar, body mass index and weight gain among women within groups by number of antenatal visit (N=140)

Antenatal visit in 24wks of GA	Initial visit				T test	P Value	4th antenatal visit in 34wks of GA				T test	P Value
	Study group N=70		Control group N=70				Study group N=70		Control group N=70			
	Mean	SD	Mean	SD			Mean	SD	Mean	SD		
FBS	125.56	115.91	115.75	21.26	0.654	0.514	95.69	19.45	113.86	34.43	-3.732	0.001*
RBS	160.20	28.65	169.71	35.46	-2.18	0.030*	131.36	39.70	169.66	63.91	-3.994	0.001*
BMI	35.22	6.82	34.28	5.59	0.92	0.359	34.83	8.76	35.04	7.01	0.231	0.143
Weight gain	90.02	19.26	90.81	15.55	0.269	0.137	92.68	18.98	94.17	15.62	0.533	0.219

Table (7) Disruptions of women in the study group and control groups in relation to mode of delivery.

Mode of delivery	Study group N=70		Control group N=70		X2	p-value
	N	%	N	%		
NVD	**15**	**21.43**	**9**	**12.86**	**3**	**0.002**
CS	**45**	**64.29**	**61**	**87.14**		
VD with episiotomy	**10**	**14.28**				

Table (8) Disruptions of women and their fetus in both groups in relation to complications occurred during this current pregnancy, labor and postpartum (N=140).

Items	Study group		Control group		X2	p-value
	N=70	%	N=70	%		
Maternal complications during pregnancy, labor and postpartum						
Preeclampsia	20	28.57	31	44.28	0.516	0.360
Recurrent monilial infection	7	10	15	21.42	75.76	0.001*
PPROM	12	17.14	32	45.71	12.86	0.001*
Bleeding	5	7.14	7	10	0.36	0.547
Preterm labor	5	7.14	11	15.71	14.7	11
Obstructed labor	1	1.42	1	1.42	1.3	1
Postpartum bleeding	2	2.85	5	7.14	0.246	1.349
Fetal complications						
Decrease fetal movement count	9	12.85	19	27.14	8.11	0.004*
IUGR	2	2.85	4	5.71	0.694	0.405
IUFD	0	0	2	2.85	2.027	0.155
RDS	10	14.28	4	5.71	2.836	13.3
Neonate complications						
Neonatal hypoglycemia	4	5.71	18	25.71	10.75	0.001*
Newborn RDS grade 1	4	5.71	15	21.42	8.44	0.004*
NICU	7	10	17	24.28	5.140	0.023*
Still birth	0	0	2	2.85	2.205	0.138

Discussion:

The purpose of the discussion was to provide a response to the research hypothesis. The following were the research hypotheses for this study: Pregnancy outcomes were better for GDM women who followed nutritional therapy. The results of this study showed that a nutritional therapy diet improved the health of mothers during pregnancy, labor, and the postpartum period. Blood glucose levels, recurrent monilial infections, PROM, premature labor, and CS were among the highly statistically significant differences between the two groups. IUFD, neonatal hypoglycemia, RDS, and NICU admission were among the highly statistically significant differences between the two groups in terms of fetal and newborn outcomes during pregnancy, labor, and postpartum.

As well as, no statistically significant difference regarding PIH, IUGR, postpartum bleeding and weight gain attained during pregnancy. In spite of, the total weight gain attained by women in the study group were lower than weight gained by the women in the control group (2.18 kg, 3.33kg respectively). This may because of obesity, age, high parity, placental abnormalities all those were independent factor on adverse pregnancy outcome.

The current study agreed with a study conducted in Africa in 2024 to assess the way used by GDM women in management of DM. In line with the findings, the available self-management therapies for GD in Africa were lifestyle adjustment, blood glucose monitoring, insulin injection or not, blood glucose education, intermittent fasting, and foot care. Their knowledge has increased and their pregnancy outcomes have improved as a result of this intervention (Druye et al., 2024).

However, Allehdan et al.'s (2019) systematic review study contrasts with the current study's findings by examining the impact of dietary treatments, including or excluding exercise, and glycemic management on the outcomes of both mothers and newborns in women with gestational diabetes. Included were eight randomized controlled trials with 592 pregnant women and 350 babies. The included trials have varying degrees of bias risk. When compared to dietary therapies alone, they found that women who employed a combination of diet and exercise interventions had lower fasting and postprandial blood glucose levels. The chosen trials found no statistically significant changes in preterm birth, macrosomia, neonatal hypoglycemia, neonatal birth weight, cesarean section, and total weight gain throughout pregnancy between diet plus exercise and diet groups.

These results also are congruent with Mavroeidi et al (2024) to evaluate the effect of the dietary approach of GDM on gestational weight gain and glycemic control. The finding reported that diet enhances insulin sensitivity and improves glycemic control. These positive outcomes may be attributed to direct interactions with insulin and glucose homeostasis or indirect effects through improved body composition and weight management which lead to improved pregnancy outcomes. Alternatively, a systematic review that assesses the efficacious strategies for preventing GDM and its subsequent consequences. They concluded that the incidence of GDM may be decreased by dietary, physical activity, diet plus physical activity, metformin, and myoinositol therapies when compared to control interventions. GDM can be prevented more effectively by group and healthcare facility-based physical activity programs than by individual and community-based ones. Lifestyle treatments may need to take the local context into account because other intervention characteristics (such as the use of e-health) do not affect their efficacy (Takele, et al., 2024).

The findings of the current study are consistent with a systematic review, as 20 studies satisfied the inclusion criteria. Thirteen pregnancy outcomes were compared: Apgar score, large for

gestational age, induction of labor, respiratory distress syndrome, miscarriages, cesarean section, preterm birth, congenital abnormalities, pre-eclampsia, neonatal hypoglycemia, macrosomia, neonatal intensive care unit admission, stillbirth, etc. Compared to gestational diabetes mellitus (GDM), pregestational diabetes is associated with more pregnancy complications. The risks of all types of maternal diabetes are highlighted in this review, along with the need to improve care and inform women about the importance of achieving optimal glycaemic control through appropriate dietary intake, such as nutritional therapy, low-glycemic diets, or the use of dietary and physical activity. Combinations to reduce these risks (Malaza et al., 2022).

These findings also support a study by Lin, Yang, Zhang, and Wei (2020) on the effects of lifestyle intervention sessions that cover self-monitoring of weight gain, regular physical activity, and a balanced, healthy diet in preventing gestational diabetes mellitus and negative maternal outcomes in pregnant women at high risk for the condition. According to their findings, among the 281 women who were part of the study, a lifestyle change was successful in reducing the incidence of GDM women as well as the negative maternal outcomes associated with excessive gestational weight gain, pre-eclampsia, premature membrane rupture, antepartum hemorrhage, and postpartum hemorrhage.

In contrast, Singh, Kujur, and Roy (2020) did a prospective study. This study evaluated the association between poor mother and fetal outcomes and body mass index and gestational weight gain in pregnant women with gestational diabetes. 1813 women were enrolled in the study after meeting the inclusion requirements. The findings clearly showed that women with GDM had increased risks of preeclampsia, preterm births, cesarean sections, macrosomia, intrauterine fetal death, and hospitalizations to the neonatal intensive care unit (NICU). They discovered that GDM women needed to adopt a healthier lifestyle and comply with the recommended weight gain during pregnancy.

This is supported by the findings of two-arm randomized controlled trials. The WeChat-assisted dietary or a combination of dietary and exercise intervention. In pregnant women who were overweight or obese, dietary and activity interventions were successful in lowering the incidence of GDM and excessive weight gain. The rate of spontaneous labor, the incidence of macrosomia, and the occurrence of perinatal problems (such as preterm birth, gestational hypertension, and preeclampsia) did not differ significantly between the groups ($p > 0.05$) (Ding et al., 2021).

Conclusion:

GDM women, who adhered to the nutritional therapy program, had lower adverse effect on her pregnancy outcome. So; the hypothesis was accepted. Also; effective dietary compliance leads to improved glycemic control during pregnancy, thereby reducing the risk of maternal complications such as pre-eclampsia and excessive weight gain. Furthermore, maintaining a balanced diet positively influences fetal health, leading to favorable neonatal outcomes.

Recommendations

1. Integrate nutritional counseling sessions into routine antenatal care for women diagnosed with GDM.
2. The pre-pregnancy phase should likely be the focus of any future nutritional therapy regimen, particularly for high-risk expectant mothers.

References:

1. Takele, W. W., Vesco, K. K., Josefson, J., Redman, L. M., Hannah, W., Bonham, M. P., ... & Lim, S. (2024). Effective interventions in preventing gestational diabetes mellitus: A systematic review and meta-analysis. Communications medicine, 4(1), 75.
2. Adoyo, M., & Kombe, Y. (2020). Gestational Diabetes Mellitus and Associated Health Risk Outcomes in Mothers and Neonates. International Journal of Translational Medical Research and Public Health (2020), Volume 4, Issue 1, 50-55 Available online at www.ijtmrph.org.
3. Ahmed, D. A., EL Toony, L. F., El Kader, A. A., Esmail, A. M., Abass, W. A., & El Khated, H. (2020). Assessment of gestational diabetes in high-risk women attending Assiut University Women's Health Hospital, Egypt. The Egyptian Journal of Internal Medicine, 31(4), 423-430.
4. Allehdan, S. S., Basha, A. S., Asali, F. F., & Tayyem, R. F. (2019). Dietary and exercise interventions and glycemic control and maternal and newborn outcomes in women diagnosed with gestational diabetes: systematic review. Diabetes & Metabolic Syndrome: Clinical Research & Reviews, 13(4), 2775-2784.
5. American Diabetes Association (ADA) (2024): "Management of Diabetes in Pregnancy: Standards of Care in Diabetes. Diabetes Care (2024): 47(Supplement 1): S282–S306. Available at: diabetesjournals.org
6. Ding, B., Gou, B., Guan, H., Wang, J., Bi, Y., & Hong, Z. (2021). WeChat-assisted dietary and exercise intervention for prevention of gestational diabetes mellitus in overweight/obese pregnant women: a two-arm randomized clinical trial. Archives of Gynecology and Obstetrics, 304, 609-618.
7. Druye, A. A., Owusu, G., Yeboa, N. K., Boso, C. M., Berchie, G. O., Nabe, B., ... & Azu, T. D. (2024). Self-management interventions for gestational diabetes in Africa: a scoping review. BMC Pregnancy and Childbirth, 24(1), 549.
8. Hussain T, Das S, Parveen F, Samanta P, Bal M, Yadav VS, et al. Prevalence, risk factors and morbidities of gestational diabetes among pregnant women attending a hospital in an urban area of Bhubaneswar. Odisha J Fam Med Prim care. 2020;9(10):5327–33. https://doi.org/10.4103/jfmpc.jfmpc_869_20.
9. International Diabetes Federation. IDF diabetes atlas. 2022; (August): Available from: https://diabetesatlas.org/atlas-reports/
10. Kapur, K., Kapur, A., & Hod, M. (2021). Nutrition management of gestational diabetes mellitus. Annals of Nutrition and Metabolism, 76(Suppl. 3), 17-29.
11. Li, N.; Yang, Y.; Cui, D.; Li, C.; Ma, R.C.W.; Li, J.; Yang, X.(2021): Effects of lifestyle intervention on long-term risk of diabetes in women with prior gestational diabetes: A systematic review and meta-analysis of randomized controlled trials. Obes. Rev. 22, e13122. [Google Scholar] [CrossRef] [PubMed]
12. Lin, X., Yang, T., Zhang, X., & Wei, W. (2020). Lifestyle intervention to prevent gestational diabetes mellitus and adverse maternal outcomes among pregnant women at high risk for gestational diabetes mellitus. Journal of International Medical Research, 48(12), 0300060520979130.
13. Luo, J. Y., Chen, L. G., Yan, M., Mei, Y. J., Cui, Y. Q., & Jiang, M. (2023). Effect of individualized nutrition interventions on clinical outcomes of pregnant women with gestational diabetes mellitus. World Journal of Diabetes, 14(10), 1524.
14. Malaza, N., Masete, M., Adam, S., Dias, S., Nyawo, T., & Pheiffer, C. (2022). A systematic review to compare adverse pregnancy outcomes in women with pregestational diabetes and gestational diabetes. International journal of environmental research and public health, 19(17), 10846.
15. Mavroeidi, I., Manta, A., Asimakopoulou, A., Syrigos, A., Paschou, S. A., Vlachaki, E., ... & Peppa, M. (2024). The role of the glycemic index and glycemic load in the dietary approach of gestational diabetes mellitus. Nutrients, 16(3), 399.
16. Rodriguez B., Mahdy H.(2021). Gestational Diabetes. Bookshelf ID: NBK545196PMID: 31424780 Last Update: August 25, 2021. (http://creativecommons.org/licenses/by/4.0/).
17. Saad, H., Aziz, A. A., Emad, E., & Gaber, M. (2023). Awareness of gestational diabetes problem among Sohag Governorate women. The Egyptian Journal of Internal Medicine, 35(1), 52.
18. Shery S.; Natasha V.;Shefa S.; Uma R.; Viswanathan M.(2021). Management of Gestational Diabetes Mellitus with Medical Nutrition Therapy. A Comprehensive Review. Journal of Diabetology 12(Suppl 1):p S52-S58, July 2021. | DOI: 10.4103/jod.jod_44_21
19. Singh, A., Kujur, A., & Roy, A. (2020). Body mass index and gestational weight gain in pregnant women with gestational diabetes and its relation with adverse maternal and fetal outcome. International Journal of Reproduction, Contraception, Obstetrics and Gynecology, 9(10), 4256-4262.
20. Vasile F.C., Preda A., Ștefan A.G., Vladu M.I., Forțofoiu M.-C., Clenciu D., Gheorghe I.O., Forțofoiu M., Moța M., Schiattarella A.(2022). An Update of Medical Nutrition Therapy in Gestational Diabetes Mellitus. J. Diabetes Res. 2021;2021:5266919. doi: 10.1155/2021/5266919

21. Wang, H.; Li, N.; Chivese, T.; Werfalli, M.; Sun, H.; Yuen, L.; Hoegfeldt, C.A.; Elise Powe, C.; Immanuel, J.; Karuranga, S. (2022). IDF Diabetes Atlas: Estimation of Global and Regional Gestational Diabetes Mellitus Prevalence for 2021 by International Association of Diabetes in Pregnancy Study Group's Criteria. Diabetes Res. Clin. Pract. 2022, 183, 109050. [Google Scholar] [CrossRef] [PubMed]
22. Wei, X., Zou, H., Zhang, T., Huo, Y., Yang, J., Wang, Z., ... & Zhao, J. (2024). Gestational Diabetes Mellitus: What Can Medical Nutrition Therapy Do?. Nutrients, 16(8), 1217.
23. Zhang, C., Bao, W., Rong, Y., Yang, H., Bowers, K., Yeung, E., & Hu, F. B. (2021). Factors Associated with Gestational Diabetes Mellitus: A Meta-Analysis. International Journal of Endocrinology, 2021, Article ID 9986765.

الملخص العربى

تأثير الالتزام بالعلاج الغذائي على نتائج الحمل للنساء الحوامل المصابات بسكري الحمل

مقدمه

ترتبط مضاعفات الحمل والمشاكل القلبية الأيضية للأم في وقت لاحق من الحياة بسكري الحمل. يعد العلاج الغذائي جزءًا حيويًا في إدارة سكري الحمل.

الهدف: تقييم تأثير العلاج الغذائي على نتائج الحمل للنساء المصابات بسكري الحمل.

التصميم: نهج شبه تجريبي تم اختيار 140امرأة مصابة بسكري الحمل كعينة هادفة.

الأدوات: استخدام أربع أدوات:

الأداة الأولى: جمع البيانات الديموغرافية والتوليدية: أُجريت من خلال مقابلات شخصية، أو استبيانات ذاتية، وتتكون من ثلاثة أجزاء: الجزء الأول: الخصائص الشخصية: العمر، التعليم، مكان الإقامة، الجزء الثاني: التاريخ الطبي والتوليدي: الحمل، عدد مرات الولادة، التاريخ العائلي للإصابة بمرض السكري، ارتفاع ضغط الدم، أو أمراض القلب... إلخ، الجزء الثالث: النمط الغذائي: عدد الوجبات، الوجبات المُتخطاة، استهلاك المشروبات الغازية والحلويات.

الأداة الثانية: أدوات تقييم المدخول الغذائي والالتزام به.

الأداة الثالثة: بيانات تتبع الالتزام الغذائي (قائمة التحقق من الالتزام): طوّرتها الباحثة، وقُسّمت إلى أربعة أجزاء: الجزء الأول: يوميات الطعام/سجل الوجبات، الجزء الثاني: استبيان تكرار تناول الطعام (FFQ)، الجزء الثالث: يوميات الطعام/سجل الوجبات (تقرير ذاتي) ، الجزء الرابع: قائمة التحقق من الالتزام الغذائي (تقييم الباحث).

الأداة الرابعة: أدوات تقييم نتائج الحمل: تم الحصول على نتائج الأمهات ونتائج حديثي الولادة من سجلات المستشفى.

النتائج:

كانت الخصائص الاجتماعية الديموغرافية متشابهة بين المجموعتين .في البداية، لم تُلاحظ اختلافات كبيرة بين المجموعتين من حيث أنماط النظام الغذائي، ونمط الحياة، والتاريخ الطبي .ومع ذلك، بحلول الزيارة الرابعة أثناء الحمل، أظهرت المجموعة التي تلقت التدخل تحسنًا ملحوظًا في الالتزام بالنظام الغذائي وتقليل المضاعفات. الأمومية والجنينية .أظهرت مجموعة الدراسة مستويات سكر الدم الصائم والعشوائي أقل بشكل ملحوظ مقارنة بالمجموعة الضابطة .(p=0.001). علاوة على ذلك، كان لدى المجموعة التي تلقت التدخل مضاعفات أقل مثل العدوى المتكررة بالفطريات، والولادة المبكرة، والولادة القيصرية، مع تحسن في نتائج الجنين بما في ذلك انخفاض في نقص سكر الدم عند الوليد ومتلازمة الضائقة التنفسية (RDS) .

الخلاصه والتوصيات: النساء المصابات بداء السكري أثناء الحمل، اللواتي إلتزمن ببرنامج العلاج الغذائي، كان لديهن تأثير سلبي أقل على نتائج حملهن. لذا، تم قبول الفرضية. يؤدي الالتزام الغذائي الفعال إلى تحسين ضبط نسبة السكر في الدم أثناء الحمل، مما يقلل من خطر حدوث مضاعفات لدى الأم مثل تسمم الحمل وزيادة الوزن المفرطة. علاوة على ذلك، فإن الحفاظ على نظام غذائي متوازن يؤثر إيجابًا على صحة الجنين، مما يؤدي إلى نتائج إيجابية للمواليد الجدد.

التوصيات

1. دمج جلسات الاستشارة الغذائية في الرعاية الروتينية قبل الولادة للنساء المصابات بداء السكري الحملي.

2. من المرجح أن تكون مرحلة ما قبل الحمل محور أي برنامج علاج غذائي مستقبلي، وخاصةً للأمهات الحوامل المعرضات لمخاطر عالية. العلاج الغذائي فعال للنساء المصابات بسكري الحمل لتحسين نتائج الحمل، والولادة، وفترة ما بعد الولادة .تم تقليل معدل العدوى المهبلية المتكررة والولادات القيصرية، ولكن لم يكن له تأثير على كمية الوزن المكتسب خلال الحمل. لذا يوصى بإنشاء جلسات الاستشارة الغذائية في الرعاية الروتينية أثناء الحمل للنساء المصابات بسكري الحمل.