Effect of Planned Physical Activity on Maternal and Neonatal Outcomes among Women with Gestational Diabetes

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Abstract

Background: Gestational diabetes mellitus (GDM) associated with short and long-term complications for mother and her baby. Physical activity interventions may help with glycemic control and improve maternal and infant outcomes. **Aim:** To evaluate the effect of prearranged physical activity on maternal and fetal outcomes for women with gestational diabetes mellitus. **Methods:** Quazi experimental design was conducted at antenatal outpatient clinic of Women Health Hospital, Egypt. The study participants involved a purposive sample of 100 pregnant women who newly diagnosed with GDM in her current pregnancy. Three tools were used to collect the data: Structured interview questionnaire that included three parts, maternal &neonatal follow-up and Global Physical Activity Questionnaire (GPAQ) tool**. Results:** Caesarean section was significant higher (62.0%) among studied women in control group compared to 28.0% in study group, P- value 0.001. Also 96.0% in study group weren't experienced any complication during birth process, compared to 18.0% in control group were experienced diabetic coma during birth process, P- value 0.001. Newborns with macrosomia were (0.00%) in study group, compared to 22.0% in control group, Also there was a highly statistically significant difference between Apgar scores after five minute in the study and control groups (P- value= 0.001). Moreover, 4.0% of newborns in study group suffering from breathing problems compared to 16.0% in control group with statistically significant difference P- value 0.005. **Conclusion:** For gestational diabetic women, scheduled physical activity was effectively on improving maternal and neonatal outcomes. **Recommendation**: planned physical activity should be encouraged to be a basic part of antenatal care for gestational diabetic women.

Key wards: Activity, Diabetes, Effect, Gestational, Maternal, Neonatal Outcomes, Planned, Physical, Women,

Introduction:

Gestational diabetes mellitus (GDM) is a type of glucose intolerance that develops during pregnancy and normally goes away after the baby is born **(Brown et al., 2017).** It is diagnosed during pregnancy that is not clearly type 1 or 2 diabetes. It is diagnosed in the second or third trimester. It is a common medical complication in pregnancy that has been rapidly increasing worldwide **(American Diabetes Association, 2020).**

According to the most recent International Diabetes Federation (IDF) estimates, GDM affects about 14% of pregnancies worldwide, or about 18 million births each year. **(Knowler et al, 2018).** The frequency of GDM (5.1–37.7%) in Arab Gulf countries is among the highest in the world, and it is still on the rise. Egypt, like most other nations, has a wide range of GDM prevalence reports. The frequency of GDM was determined to be 8% in 250 pregnant women who visited a rural family health clinic in Egypt **(Agarwal M., 2020).**

Overweight/obesity, westernized diet and micronutrient deficiencies, advanced maternal age, and a family history of insulin resistance and/or diabetes are all risk factors for GDM **(Natamba et al, 2019).** Diabetes increases the risk for both the mother and the fetus during pregnancy. Spontaneous abortion, fetal abnormalities, preeclampsia, fetal mortality, macrosomia, neonatal hypoglycemia, and neonatal hyperbilirubinemia are all dangers of uncontrolled diabetes in pregnancy. Furthermore, diabetes during pregnancy has been linked to an increased incidence of obesity and type 2 diabetes in offspring. **(Alejandro et al, 2020).** During pregnancy, women with GDM are more likely to develop high blood

pressure or pre-eclampsia, have their labor induced, give birth by caesarean section, and experience perineal trauma. Their children are more likely to be admitted to the neonatal intensive care unit. In addition, they are more likely to develop metabolic syndrome as children and later in life **(Brown et al, 2017).**

For women with GDM, lifestyle changes are the most effective treatment option. Healthy diet, physical activity, and self-monitoring of blood glucose concentrations are the most popular lifestyle modifications used as a major therapeutic method **(Abha et al, 2020).**

Although both a balanced diet and physical activity are commonly recommended to stabilize glucose levels in pregnancy, physical exercise is more acceptable than food advice due to the conventional notion that pregnancy necessitates additional nutrition and attention. The American College of Obstetricians and Gynecologists (ACOG) and the Canadian Society for Exercise Physiology (CSEP) have updated their physical activity guidelines, recommending that pregnant women without contraindications engage in at least 150 minutes of moderate intensity physical activity per week to achieve meaningful health benefits**(ACOG Committee, 2020).**

The first guideline on physical exercise specifically for GDM women, which recommends 30–60 minutes of daily moderate intensity exercise at a frequency of three times per week during pregnancy to curb elevated plasma glucose **(Michelle et al, 2019).** Various studies have found that exercise during pregnancy is beneficial and should be widely implemented in the antenatal population. Furthermore, exercise has been shown to be an effective means of reducing weight gain and improving glucose homeostasis through boosting insulin sensitivity **(Syed et al, 2021).**

The intimate contact between the community and midwives nursing has a lot of potential to influence pregnant women and dramatically improve their health in the fight against pregnancy obesity and GDM. Furthermore, specialists can agree on the safest and most effective suggestions, as there is still debate concerning GDM screening procedures or diagnostic criteria, as well as the best or most effective treatment for this disease **(Laredo-Aguilera et al, 2020)**

Significance of study:

Maternal and neonatal outcomes such as macrosomia, increased caesarean section, hypertension, fetal hyperinsulinemia, preterm labor, shoulder dystocia, birth defects, need for neonatal intensive care unit care, hyperbilirubinemia, and preeclampsia are all linked to gestational diabetes mellitus, but it also increases the risk of long-term problems in the mother and infant **(Nasiri et al, 2020).** However, it is now widely recognized that exercise has numerous benefits for both the fetus and the mother. A reduction in cramps, lower back discomfort, edema, depression, urine incontinence, labor duration, and constipation, as well as the mother's number of caesarean sections, are among the maternal benefits. Physical activity provides several advantages for the fetus, including reduced fat mass, increased stress tolerance, and faster neurobehavioral maturation **(Laredo-Aguilera, et al, 2020).** As a result, the researchers are interested in investigating the impact of planned physical exercise on maternal and fetal outcomes among gestational diabetic women.

Aim of the study:

This study aimed to evaluate the effect of prearranged physical activity on maternal and fetal outcomes for women with gestational diabetes mellitus. And evaluate the effect of program on improving women's physical activity.

Research hypothesis:

Planned physical activity has positive effect on maternal and fetal outcomes for women with gestational diabetes mellitus.

Operational definitions:

Gestational Diabetes: any degree of glucose intolerance with onset or first recognition during pregnancy.

Macrosomia: a birth weight of more than 4,000 g.

Hyperinsulinemia: means that the amount of insulin in the blood is higher than considered normal amongst people without diabetes.

Subjects and Method:

Subjects and methods of this study were displayed into four designs technical, operational, administrative, and statistical.

I) Technical Design:

This covered the study design, setting, study sample, and tools of data collection

Study design:

Quazi experimental design was carried out in this study.

Setting:

The current investigation was carried out at the Women Health Hospital of Assuit University in Egypt's prenatal outpatient clinic. That involved three rooms, one for history taking, the second for pregnant women examination and the third for ultrasonography

Research sample:

The study included a purposive sample of 100 pregnant women (in the second trimester) who had just been diagnosed with GDM during their current pregnancy and were visiting hospitals for standard prenatal checkups. Women with a history of chronic diabetes, as well as those with any other medical conditions or contraindications to physical exercise during pregnancy, were excluded from the study. The sample size was calculated using the Epi info program with a population size of 390 people and a 95 percent confidence coefficient, 10% tolerable error, 50 percent predicted frequency. The sample was divided into two groups study and control group and each group consisting from 50 pregnant women with gestational diabetes.

Tools for data collection:

The following tools were used to obtain data from the participants:

I. **Structured interview questionnaire tool**: The researchers created it after conducting a review of the relevant literature.

   Part1: involved questions related to personal characteristics as age, residence, educational level, duration of marriage and working condition.

   Part 2: included obstetrics and medical history as gravidity, parity, abortion, number of children, type of previous delivery, suffer from chronic diseases, previous gestational diabetes and If yes, how often?

   Part 3: Current pregnancy data: This included duration of current pregnancy/week, onset of gestational diabetic symptoms, how gestational diabetes was diagnosed, use of any Gest. DM medications, weight increase during pregnancy, and follow-up location**(Kumari & Singh, 2019).**

II. **Maternal and neonatal follow up sheet** that involved weeks of gestation during labor, presence of hypertension with diabetes, preeclampsia associated with diabetic pregnancy, type of labor, complications during the birth process, newborns' weight at birth, newborns' heartbeat, newborns' respiration, Apgar scores in the first minute and after five minute, low blood sugar after birth, high blood sugar after birth, congenital defects, breathing problems, jaundice after birth, admission to NICU and occurrence of still birth.

III- Global Physical Activity Questionnaire (GPAQ):

WHO developed the Global Physical Activity Questionnaire to monitor physical activity in countries. It has 16 questions that collect data on physical activity participation in three situations (or domains) as well as sedentary behavior (P1-P16). Workplace activity, travel to and from locations, and recreational activities are the domains **(WHO, 2011)**

GPAQ scoring:

MET values are applied to the time variables according to the intensity (moderate or vigorous) of the activity. Applying MET values to activity levels allows us to calculate total physical activity. The following MET values are used to calculate a person's overall energy expenditure using GPAQ data:

Domain MET value work (moderate MET value = 4.0andvigorous MET value = 8.0), transport cycling and walking (MET value = 4.0) and recreation (moderate MET value = 4.0 and vigorous MET value = 8.0) are the domain MET values. The PA levels in the **GPAQ** scoring system are divided into three group: 1. low (There is some activity reported, but not enough to meet the criteria for categories 2 or 3), 2. Moderate (5 days or more of any combination of walking, moderate-intensity, or vigorous-intensity exercises resulting in a minimum of 600 METs per week1) and 3. high (7 days or more of any mix of walking, moderate- or vigorous-intensity activities totaling at least 3000 METs per week1).

Supportive materials:

The researchers created it after doing a literature review. It was created in the form of a booklet, with simple and clear Arabic language and photos to facilitate training on gestational diabetes and planned physical activity for women with gestational diabetes. The definition, causes, signs, and symptoms of gestational diabetes, how to control gestational diabetes, advice for pregnant women with gestational diabetes, examples of exercises done during pregnancy such as walking, swimming, kegal exercise, yoga, and Aerobics, and signs and symptoms of hypoglycemia were all covered in the instructions.

Tools Reliability:

Cronbach Alpha done for the both tools used, and founded that Cronbach Alpha was 0.711 and 0.823 for questionnaire and physical activity scale respectively.

Ethical consideration:

This study was carried out under the approval of faculty of nursing's Ethical committee, Assiut University; also an official permission was obtained from the director of Woman Health Hospital ,informed consent was taken from each nurse involved in the study.

Operational design

It was presented into two phases, pilot study and field work.

Pilot study:

A pilot research was conducted on 10% (10 women) of the sample to check that the tools were clear and thorough, as well as to calculate the amount of time needed to complete the questionnaire. The pilot study's findings indicated that no more improvements or modifications were required; hence the pilot study's women were included in the final sample.

Field work

This study's data collecting took eleven months, commencing in May 2020 and ending in March 2021. This was divided into three stages: pre-intervention, intervention, and follow-up.

Pre intervention phase:

An official letter from Assuit University's Faculty of Nursing was sent to the appropriate authorities at Women's Health Hospital, requesting permission to gather data after describing the study's goal. After obtaining women's signatures on a consent form, the researchers introduced themselves and explained the study's goal. The researchers interviewed each participant individually in a separate room to maintain confidentiality and the women's personal characteristics, obstetric, medical history and current pregnancy data were obtained.

Intervention phase:

For study group, the physical activity training program was given to every small group of women (ranged from 2 to 3) by the researchers through 4 sessions; each session took about 15- 20 minutes. The first session was designed to build a relationship between the researchers and the women in order to alleviate their anxiety and win their trust. Additionally, weight during the initial antenatal registration appointment in the first trimester was considered pre pregnancy weight as part of anthropometric measurements. During the second session physical activity was assessed in the last 7 days of the interview through the administration of a standardized GPAQ. In the third session the studied women was provided with training program about planned physical activity. Also an instructional supportive booklet was distributed among women who participated in the study.

Program given to study group took the form of lecture, discussion, demonstration and

video. The sessions were applied during the waiting time of studied women for clinical examination at the antenatal clinic. The training program content was designed based on review of relevant recent literature. The content involved planned exercises suitable to pregnancy as walking, swimming, kegal exercise, yoga and Aerobic. Each exercise was explained to pregnant woman (how to perform it, how often done/week, duration of each exercise), the researcher performed every exercise that the women should be performed through pregnancy and also the women saw videos on all exercises based on the program designed

Post intervention:

In the fourth session the studied women was followed every week to follow their implementation to planned physical activity given in the third session. After 8 weeks of planned physical activity (for study group) and routine hospital care (for control group) physical activity was assessed in the last 7 days of the interview through the administration of a standardized GPAQ and evaluation of women's random blood glucose was carried out. Finally, follow up till process of labor to identify maternal and neonatal outcomes in study and control group.

Administrative design:

Informed consent was taken from each woman involved in the study, confidentiality was assured. The woman was freely to withdraw from the study at any stage.

Statistical design:

Statistical analysis was performed using SPSS for windows version 20.0. All variables with continuous data showed normal distribution and were expressed in mean ±standard deviation (SD). Categorized data were presented in number and percentage. The comparisons were determined using t test for variables with continuous data. Chi-square and McNemar test was used for comparison of variables with categorized data. Statistical significance was considered at P-value ≤ 0.05.

Limitation of the study:

The researcher was to exclude every pregnant woman in the study group who didn't follow the planned physical program as it planned.

Results:

Table (1) shows the baseline personal characteristics of studied women in study and control group. It was found that Overall, the two groups were nearly similar as 44.0 of participants in study and 46% in control group aged 21-30 years. As regard residence it was observed that 78.0% of them in study and 68% in control group were from urban area. Also this table clears that all studied women were literate, except 20% in study and 24% in control group were an illiterate. Visibly, over 60% of the studied women in study and 64% in control group were not working (housewives). Also this table showed that there was no significant difference between the mean age, residence, level of education, and work of the two groups (study and control) ,as P-value was 0.697, 0.113, 0.679, and 0.560 respectively.

Table (2) reports that 86% and 78% of studied women in study and control group respectively were multigravida. Furthermore, 94.8% and 90% of the study sample in the study and the control group respectively were multipara. Additionally, 84% and 86% of studied women in the study and the control group respectively hadn't history of abortion. Also this table indicates that, 20% and 14 % of studied women in the study and the control group respectively reported previous gestational diabetes. Furthermore, this table showed that there was no significant difference between study and control group regarding gravidity, parity, history of abortion and previous gestational diabetes as P-value was 0.141, 0.298, 0.692, and0.259 respectively.

Table (3) indicates that 82.0% and 90.0% of the studied women in study and control group respectively reported the duration of their current pregnancy was 25-30 week. Also this table cleared that 96.0% and 90.0% of studied women in study group and 94.0% and 82.0% in control group reported that symptoms of gestational diabetes began in the 2nd half of pregnancy (20-40 weeks) and it was diagnosed by analyzing blood sugar level respectively. Moreover, 76.0% and 82.0% of studied women in study and control group respectively reported taking medications for gestational diabetes.

Figure (1) illustrates that 62.0 and 56.0% of studied women in the study and the control group respectively were classified as moderate physical active, with no statistically significant difference between physical activity before intervention in study and control group (P-value= 0.555)

Figure (2) demonstrates that all (100.0%) of studied women in the study group while, 60.0% of them in control group reported governmental hospitals were the main place used for following up. Additionally this figure illustrated that there was highly statistically significant difference between places of follow-up in study and control group (P- value= 0.001)

Figure (3) displays that the mean of women weight gain was significantly lower (9.82 Kg) in study group, while it was significantly higher (14.14Kg) in control group. Moreover this figure demonstrated that there was highly statistically significant difference between mean and standard deviation of weight gain through pregnancy in study and control group (P- value= 0.001)

Figure (4): reveals that 71.0 and 53.0% of studied women in the study and the control group respectively were classified as moderate physical active, with statistically significant difference between physical activity after intervention in study and control group (P-value= 0.001) .

Table (4) reports that there was statistically significant difference between study and control regarding mean±SD of random blood glucose level after intervention (P- value= 0.001).

Table (5) shows distribution of studied women according to maternal outcomes in study and control group. It was found that 74.0% of studied women in study group their weeks of gestation during labor were more than 38 week, compared to 26.0% in control group. Furthermore, this table reveals that there was a highly statistically significant difference between weeks of gestation during labor in the study and control groups (P- value= 0.001). Concerning mode of delivery, caesarean section was 62.0% among studied women in control group compared to 28.0% in study group. Also there was a highly statistically significant difference between study and control group regarding mode of delivery (P- value= 0.001)**.** Also, the table reports that 96.0% of studied women in study group weren't experienced any complication during birth process, compared to 18.0% of studied women in control group were experienced diabetic coma during birth process. Additionally there was a highly statistically significant difference between complication during birth process in the study and control groups (P- value= 0.001)**.**

Table (6) clears distribution of studied women according to fetal outcomes in study and control group, It was found that 4.0% and 28.0% respectively of studied women in study and control group their newborns' weight during labor was more than 4000gm. Also this table clears that the percentage of newborns with macrosomia was 0.00% in the study group, compared to 22.0% in control group. Moreover, there was a highly statistically significant difference regarding newborns' weight during labor and newborns' weight greater than 4:500 kg between study and control group (P- value= 0.003 and 0.006 respectively). In regards to Apgar scores after five minute, there was a highly statistically significant difference of Apgar scores after five minute in the study and control groups (P- value= 0.001). Also, the table explained that the percentage of newborn suffer from breathing problems was 4.0% in study group compared to 16.0% in control group. Additionally, there was a highly statistically significant difference newborn suffer from breathing problems and admission to NICU in the study and control groups (P-value= 0.005 and 0.003 respectively).

Table (1): Distribution of studied women according to personal characteristics in control and study group n= (100):

Personal characteristics	Study group		Control group		p-value
	No (50)	%	No (50)	%	
Age: (years)					
<21 years	9	18.0	7	14.0	
21-30 years	22	44.0	23	46.0	0.697
31-40 years	17	34.0	19	38.0	
More than 40 years	2	4.0	1	2.0	
Mean ± SD	**28.4±6.8**		**27.2±7.1**		
Residence:					
Rural	11	22.0	16	32.0	0.113
Urban	39	78.0	34	68.0	
Level of education:					
Illiterate, read and write	12	24.0	10	20.0	0.679
Middle	28	56.0	31	62.0	
High	10	20.0	9	18.0	
Work:					
Working	18	36.0	20	40.0	0.560
Not work	32	64.0	30	60.0	
Total	**50**	**100.0**	**50**	**100.0**	
If work, what is the current job?					
Hard					
Middle	1	5.6	2	10.0	0.201
Official	12	66.7	11	55.0	
	5	27.7	7	35.0	
Is there a shift system at work?					
Yes					0.209
No	4	22.2	6	30.0	
	14	77.8	12	70.0	
Does work cause you psychological pressure?					0.546
Yes	3	16.7	4	20.0	
No	15	83.3	14	80.0	
Total	**18**	**100.0**	**20**	**100.0**	

Table (2): Distribution of studied sample according to their obstetrics and medical history in study and control group n= (100):

Obstetrics data	Study group		Control group		p-value
	N(50)	%	N(50)	%	
Gravidity					
Primigravida	7	14.0	11	22.0	0.141
Multigravida	43	86.0	39	78.0	
Parity					
Prim para	3	6.0	5	10.0	0.298
Multipara	47	94.0	45	90.0	
History of abortion					
Yes	8	16.0	7	14.0	0.692
No	42	84.0	43	86.0	
Number of children:					
Non	9	18.0	12	24.0	0.446
< 3	16	32.0	17	34.0	
3 or more	25	50.0	21	42.0	
Type of previous delivery					
Non	8	16.0	11	22.0	0.553
Normal	23	46.0	21	42.0	
Caesarean section	19	38.0	18	36.0	
Do you suffer from chronic diseases?					
No	46	92.0	47	94.0	0.363
DM	1	2.0	0	0.0	
Hypertension	3	6.0	3	6.0	
Previous gestational diabetes					
Yes	10	20.0	7	14.0	0.259
No	40	80.0	43	86.0	
Total	**50**	**100.0**	**50**	**100.0**	
If yes, how often?					
One	9	90.0	6	85.7	0.352
More than one	1	10.0	1	14.3	
Total	**10**	**100.0**	**7**	**100.0**	

Table (3): Distribution of studied sample according to their current pregnancy data in study and control group n= (100):

Current pregnancy data	Study group		Control group		p-value
	N(50)	%	N(50)	%	
Duration of current pregnancy/ week					
20-25 week	9	18.0	5	10.0	0.103
25-30 week	41	82.0	45	90.0	
Beginning of symptoms of gestational diabetes:					
In the 1st half of pregnancy (1-19 weeks)	2	4.0	3	6.0	0.516
In the 2nd half of pregnancy (20-40 weeks)	48	96.0	47	94.0	
How gestational diabetes diagnosed?					
Analyzing the blood sugar level.	45	90.0	41	82.0	0.103
Analyzing the level of sugar in urine.	5	10.0	9	18.0	
Take any medications for Gest. diabetes?					
Yes	38	76.0	41	82.0	0.299
No	12	24.0	9	18.0	

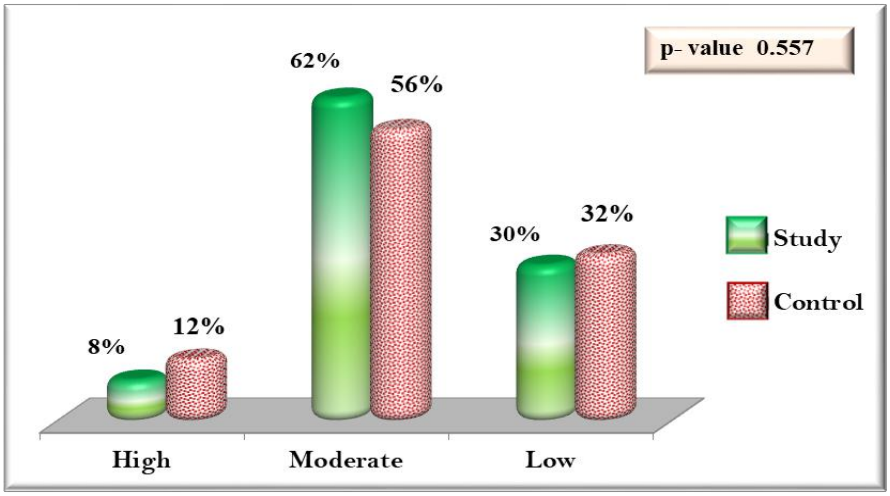

Figure (1): Distribution of studied sample according to their physical activity before intervention in study and control group n= (100)

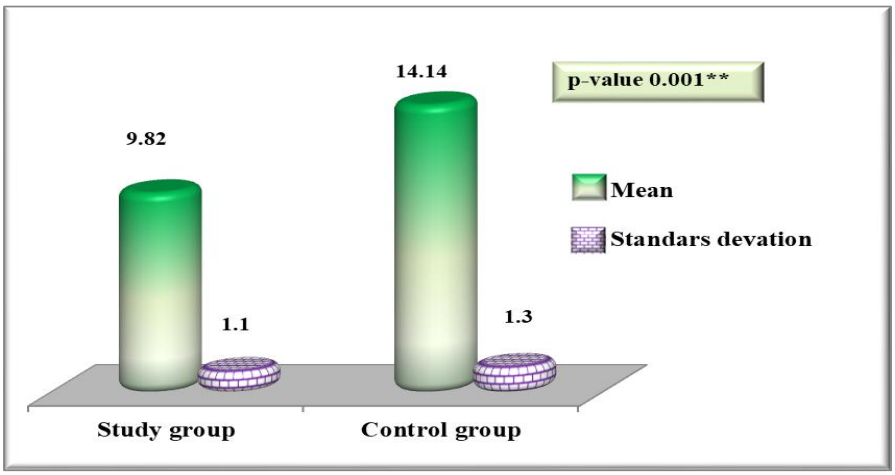

Figure (2): Distribution of studied sample according to place of Follow-up
(**) highly statistically significant difference

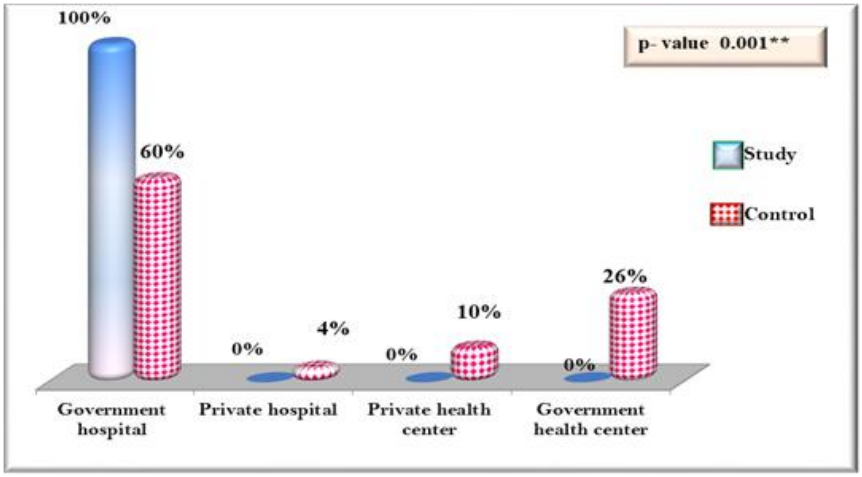

Figure (3): Distribution of studied sample according to their Mean and SD of weight gain through pregnancy in study and control group n= (100): (**) highly statistically significant difference

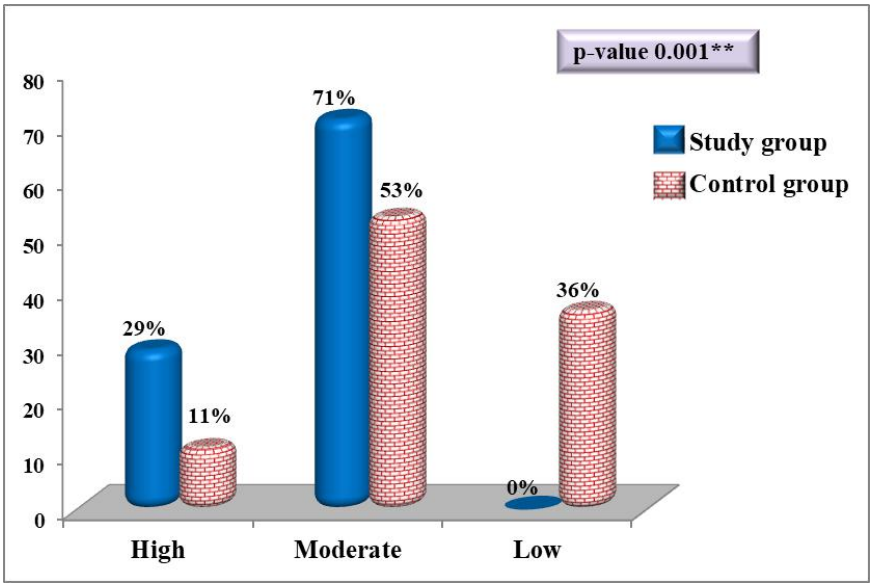

Figure (4): Distribution of studied sample according to their physical activity after intervention in study and control group n= (100): (**) highly statistically significant difference

Table (4): Distribution of studied sample according to mean±SD of random blood glucose level after intervention in study and control group n= (100):

Variable	Study group		Control group		p-value
	Mean	SD	Mean	SD	
Random blood glucose level	118.3	15.21	164.24	19.12	0.001**

(**) highly statistically significant difference

Table (5): Distribution of studied sample according to maternal outcomes in study and control group n= (100):

Maternal outcomes	Study group		Control group		p-value
	N(50)	%	N(50)	%	
Weeks of gestation during labor:					
Less than 36 week	0	0.0	5	10.0	0.001**
36-38 week	13	26.0	32	64.0	
More than 38 week	37	74.0	13	26.0	
The presence of hypertension with diabetic					
Yes	3	6.0	7	14.0	0.047*
No	47	94.0	43	86.0	
Preeclampsia associated with diabetic pregnancy					
Yes	0	0	1	2.0	0.155
No	50	100.0	49	98.0	
Mode of delivery					
Normal vaginal delivery	36	72.0	19	38.0	0.001**
Caesarean section	14	28.0	31	62.0	
Complications during the birth process					
Non	48	96.0	4	8.0	0.001**
Bleeding	1	2.0	3	6.0	
Diabetic coma	1	2.0	43	86.0	

(*) statistically significant difference

(**) highly statistically significant difference

Table (6): Distribution of studied sample according to fetal outcomes in study and control group n= (100):

Fetal outcomes	Study group		Control group		p-value
	N(50)	%	N(50)	%	
Newborns' weight during labor:					
Less than 2.500 gm	1	2.0	5	10.0	0.003**
2.500-4000 gm	47	94.0	31	62.0	
More than 4000 gm	2	4.0	14	28.0	
Newborns' weight greater than 4:500 kg					
Yes	0	0	11	22.0	0.006**
No	50	100.0	39	78.0	
Mean and SD of Newborns' heartbeat	129.2±12.8		128.8±17.3		0.037*
Mean and SD of Newborns' respiration	40.3±7.4		34.1±11.2		0.004**
Apgar scores in the first minute	8.2±1.2		5.5±1.6		0.046*
Apgar scores after five minute	9.1±0.7		7.8±1.7		0.001**
Low blood sugar after birth					
Yes	1	2.0	6	12.0	0.006**
No	49	98.0	44	88.0	
High blood sugar after birth					
Yes	2	4.0	3	6.0	0.516
No	48	96.0	47	94.0	
Congenital defects for the newborn					
Yes	0	0.0	2	4.0	0.043*
No	50	100.0	48	96.0	
Newborn suffer from breathing problems					
Yes	2	4.0	8	16.0	0.005**
No	48	96.0	42	84.0	
Newborn have jaundice after birth					
Yes	2	4.0	4	8.0	0.234
No	48	96.0	46	92.0	
Admission to NICU					
Yes	0	0.0	4	8.0	0.003**
No	50	100.0	46	92.0	
Occurrence of still birth					
Yes	0	0.0	2	4.0	0.043*
No	50	100.0	48	96.0	

(*) statistically significant difference

(**) highly statistically significant difference

Discussion:

Based on maternal outcomes in current study, it is reported that there is statistical significant difference between study and control group regarding weeks of gestation during labor (occurrence of preterm labor <36 wks), occurrence of PIH with pregnancy, method of delivery and complications during birth process p- value are 0.001, 0.047, 0.001 respectively.

On the same line **AlSheikh M. Hmoud (2020),** who applied his study in Saudi Arabia to assess the effect of exercise on glycemic control and pregnancy outcomes in women with gestational diabetes mellitus, and founded that there was significant reduced in the possibility of C.S and there is delayed labor time was observed in exercise group than in control group.

In addition, **International Weight Management in Pregnancy (2017)** conducted a study to summarize the evidence on the overall and differentiated effects of dietary and physical activity treatments during pregnancy., and showed that there was significant reduced in occurrence of PIH, preterm labor and C.S rate in group received planned physical activity than control one with a p-value 0.001 for all.

And **Wang et al (2019)** who achieved their study in china to summarize and update the evidence on the effect of exercise on maternal gestational weight gain (GWG), and displayed that exercise during pregnancy can significant reduced risk for pre eclampsia and preterm labor. All previous results demonstrate the importance of applying physical activity or exercise during pregnancy in reduces risks that may occur to mothers, and so enhance maternal outcomes.

Brown J. et al. (2017), who conducted their study in New Zealand to evaluate the effects of exercise interventions for improving maternal and fetal outcomes in women with GDM, found no clear evidence of a difference in the risk of preeclampsia, C.S., and preterm labour between the exercise and control groups. The differences between the two studies can be traced back to differences in the intervention program used on the study group and differences in the study setting.

Also **Halse et al (2015)** conducted a study to determine the effect of a home-based cycling program for women with a recent diagnosis of GDM on aerobic fitness, weight gain, self-reported mobility, attitude, and intentions toward maternal exercise, as well as obstetric and neonatal outcomes, and the researchers found no differences in the outcomes of both groups in terms of the occurrence of C.S and preterm labor. The dissimilarity back to change between two study setting, cultures and intervention program.

Macrosomia, IUD, and malformations like as anencephaly, spina bifida, transposition of great vessels, VSD, renal agenesis, caudal regression syndrome, RDS, hypoglycemia, hypothermia, and hyperbilirubinemia, hypocalcemia, hyperviscicity are all possible fetal consequences of GDM **(Fareed et al, 2017) and (Shingala et al, 2019).**

Present study revealed that there are statistical significant difference between study and control group regarding newborn weight, pulse, respiration, low glucose after birth, congenital defects, breathing problems, jaundice, admission to NICU and occurrence of still birth. These results agreed with previous findings by **Barakat, et al (2013),** who conducted a study in Spain to investigate the effect of regular moderate-intensity exercise (three training sessions per week) on the incidence of gestational diabetes mellitus, and found a significant difference between the study and control groups in terms of birth weight and Apgar score, as well as a lower incidence of macrocosmic babies. This similarity support the role of exercise or physical activity in reducing risks that neonate may exposed for pregnant women with GDM.

According to **Brown J. et al. (2017),** there was no significant difference between the study and control groups in terms of infant morbidity, neonatal mortality, or neonatal hypoglycemia. This difference back to dissimilarity in setting and intervention program that applied on pregnant women with GDM in both studies.

There were studies that concurred with the findings of the real study, such as **Bo et al (2014),** who used their study in France to see if four different lifestyle programs combining simple exercise and behavioral suggestions

could improve maternal and newborn outcomes, associated or alone could help GDM patients in improving fasting glucose values and reducing values of high-density lipoprotein (HDL)-cholesterol, insulin and the incidence of any maternal/neonatal complications, and clarified that there When compared to the control group, the study group had a lower rate of maternal and newborn problems.

Sklempe et al (2018) conducted a study in Croatia to investigate responses to a single bout of exercise performed multiple times throughout the pregnancy in women diagnosed with GDM, and discovered that the intervention group had significantly better maternal and neonatal outcomes than the control group in terms of preterm labour and neonatal BMI. This agreement implies and supports the importance of applied planned physical activity to all GD pregnant women to improve their maternal and neonatal outcomes.

As regard relation between physical activity and blood glucose level, present study showed that there was statistically significant difference between study and control regarding mean±SD of random blood glucose level after intervention (P- value= 0.001).

This was on the same line with **(Barakat et al., 2019)**, who carried out their study in Spain to identify the effects of an exercise program through- out pregnancy on maternal weight gain and prevalence of gestational diabetes.

Throughout the prenatal period, body weight is a major concern for pregnant women. Physical activity or regular exercise, one of the most generally recommended means to improve physical conditioning during pregnancy, has identified beneficial effects on both maternal and fetal health that are reported by numerous clinical trials **(Wang et al, 2019)**.

Concerning mean and SD of weight gained during pregnancy, actual study revealed that the Mean and SD of weight gained in study group is 9.82±1.1 and in control group 14.14± 1.3 with statistical significant difference between study and control group p-value 0.001.

This was similar to **Rogoziska, et al. (2017),** who used their study to see if the effects of diet and lifestyle interventions differed in subgroups of women based on maternal BMI, evaluated the association of gestational weight gain (GWG) with adverse pregnancy outcomes, and assessed the cost-effectiveness of the interventions, and found that there was a significant reduction in GWG. This agreement demonstrated the importance of physical activity in lowering GWG in women with GDM. **Wang et al. (2019)** also said that the mean and SD of GWG for GDM women in the intervention group were significantly lower than in the control group.

Inconsistent with earlier findings **Simmons et al. (2017)** conducted a study to compare the effects of two different lifestyle changes (healthy eating [HE], and physical activity [PA] on GDM risk, and found that there was no significant difference between HE and PA group p-value 0.430. this dissimilarity back to using two groups with two different intervention.

Regarding physical activity of studied women before intervention, current study demonstrated that there is no statistical significant difference between study and control group p-value 0.557.

The same opinion was observed in **Mishra, S., & Kishore, S. (2018),** they conducted a study in India to assess the link between physical activity and GDM and found that there was no statistically significant difference in physical activity before intervention between the case and control groups. This intervention is very important to clarify the similarity in activities in both groups before implementing the training program with them. That finally helps in supporting the value of this program.

Conclusion:

For pregnant diabetic women, planned physical activity is effective in improving maternal and neonatal outcomes.

Recommendation:

- Women with gestational diabetes should be encouraged to engage in planned physical exercise as part of their antenatal treatment.
- Changing one's lifestyle is an important part of managing gestational diabetes

mellitus, and it may be enough for many women.

- Before recommending an exercise program, a comprehensive clinical evaluation should be performed to ensure that a woman does not have a medical reason to avoid it.
- More research is needed to investigate the effects of exercise on pregnancy-related conditions and outcomes, as well as to better understand effective behavioral counseling techniques and the best type, frequency, and intensity of exercise.
- Future studies are needed to focus on interventions that optimize the health of women in the pre-pregnancy period.

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