ORIGINAL RESEARCH PAPER

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THE EFFECT OF EXERCISE THERAPY ON PREGNANCY OUTCOMES AMONG WOMEN WITH GESTATIONAL DIABETES MELLITUS.

KEY WORDS: Gestational diabetes mellitus (GDM), structured exercise therapy, glycemic control, pregnancy outcomes, maternal complications, neonatal complications, physical activity, prenatal care

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ABSTRACT

A common pregnancy complication linked to higher risks of morbidity in both mothers and newborns is gestational diabetes mellitus (GDM). A promising non-pharmacological strategy to enhance glycemic control and pregnancy outcomes in women with GDM is structured exercise therapy. In addition to assessing the impact of structured exercise therapy on maternal glycemic parameters, such as FBS, PBS, and HbA1c, this study sought to determine how it affected the mode of delivery, birth weight, and complications for both the mother and the newborn. A cross-sectional study design was employed, and 130 women with a second or third trimester GDM diagnosis were enrolled. Structured questionnaires, clinical records, and interviews were used to gather data, and SPSS version 22.0 was used for analysis. According to regression analysis, structured exercise therapy had a statistically significant positive impact on pregnancy outcomes ($R2 = 0.200$, $p < 0.001$) and maternal glycemic control ($R2 = 0.240$, $p < 0.001$). Lower rates of macrosomia, cesarean delivery, and other complications were linked to improved glycemic indicators. These results are in line with earlier research showing how beneficial moderate-intensity exercise is for managing GDM. The study highlights how crucial it is for women with GDM to receive regular prenatal care that includes structured exercise routines. Future studies should examine the health outcomes of mothers and children over the long term and establish the best exercise regimens for each person.

INTRODUCTION

Hyperglycemia diagnosed or developing during pregnancy is commonly referred to as gestational diabetes mellitus (GDM). GDM is frequently categorized into two classes: class A1GDM, which is diet-controlled GDM, and class A2GDM, which is GDM that necessitates pharmacologic treatment of hyperglycemia. The advantages of diagnosing GDM have long been known; numerous studies have shown that antepartum treatment of GDM lowers the risk of adverse pregnancy outcomes and that women with GDM are at high risk of long-term type 2 diabetes. Nevertheless, there is still disagreement over the best time to screen for pregnancy or the diagnostic standards for GDM.(1), (2)

Because of the startlingly high perinatal mortality rates among pregnant women with diabetes, GDM management strategies have continued to change over the past few decades. The groundbreaking study by O'Sullivan and Mahan, which established precise diagnostic standards for GDM in the US, was published in 1964, marking a major advancement. To correlate maternal hyperglycemia with unfavorable perinatal outcomes, their criteria—which were based on a 100-gram, three-hour oral glucose tolerance test—were created to identify women who were at higher risk. The significance of these thresholds in anticipating both short-term issues and long-term health hazards for moms and their kids was highlighted by later validation studies. (1), (3)

Since then, changes in standards in maternal-fetal medicine and continuous scientific research have been reflected in the development of GDM diagnostic criteria. GDM management strategies have changed over time, starting with the World Health Organization's (WHO) modification of glucose thresholds and the International Association of the Diabetes and Pregnancy Study Groups' (IADPSG) 2013 adoption of comprehensive criteria. These developments not only show how difficult it is to diagnose GDM, but they also emphasize how urgently evidence-based recommendations that reduce risks for both moms and babies are needed. Ongoing research attempts to maximize maternal and perinatal outcomes while attending to the various healthcare requirements of pregnant women worldwide as diagnostic techniques continue to improve.(1), (3)

Preterm labor, large babies (macrosomia), spontaneous abortion, birth defects, and excessive amniotic fluid are additional complications associated with the occurrence of GDM. Both the mother and the newborn will be more morbid because of these issues

Mothers and their progeny have an elevated chance of getting type 2 diabetes and obesity in the future. Children born to mothers with gestational diabetes mellitus (GDM) are predisposed to metabolic disorders, and GDM serves as an indicator of potential future cardiovascular and metabolic problems in mothers(4), (5), (6).

Pregnancy complications like gestational diabetes mellitus (GDM) can result in subtle yet significant changes to the mother's heart's structure and function, changes that are difficult to detect using conventional methods. Monitoring and follow-up should be closely monitored because these changes could be pre-clinical indicators of later cardiac issues (6).

The intrauterine environment associated with GDM may cause metabolic programming in the fetus, which could influence health for an entire generation. It serves as a reminder of how important it is to optimize pregnancy outcomes to break the transmission chain of metabolic diseases(7).

Early detection and successful management of GDM, including interventions and practices like medical nutrition therapy and physical activity, can lower the risk of unfavorable pregnancy outcomes. Mothers and their infants can benefit from early intervention in both the short and long term(4),(7), (8).

Because GDM affects up to 7–10% of pregnancies, the condition's effects have a significant negative impact on both healthcare costs and population well-being. This is crucial because prompt and adequate management can prevent complications and lessen the long-term effects on health systems.(5)

Aim

The aim of this study is to evaluate the impact of structured

exercise therapy on maternal glycemic control and to assess its effect on pregnancy outcomes, including mode of delivery, birth weight, and the incidence of maternal and neonatal complications in women diagnosed with gestational diabetes mellitus.

Objectives of the Study

- To evaluate the impact of structured exercise therapy on maternal glycemic control in women diagnosed with gestational diabetes mellitus.
- To assess the effect of exercise therapy on pregnancy outcomes, including mode of delivery, birth weight, and incidence of maternal and neonatal complications.

Hypothesis

- **H_0 (Null Hypothesis):** Structured exercise therapy has no significant impact on maternal glycemic control (measured by FBS, PPBS, and HbA1c) in women diagnosed with gestational diabetes mellitus.
- **H_1 (Alternative Hypothesis):** Structured exercise therapy has a significant positive impact on maternal glycemic control (measured by FBS, PPBS, and HbA1c) in women diagnosed with gestational diabetes mellitus.
- **H0 (Null Hypothesis):** Structured exercise therapy does not significantly affect pregnancy outcomes, including mode of delivery, birth weight, and the incidence of maternal and neonatal complications.
- **H_1 (Alternative Hypothesis):** Structured exercise therapy significantly improves pregnancy outcomes, including mode of delivery, birth weight, and the incidence of maternal and neonatal complications.

Literature Review

(Huifen et al., 2022) (9)The goal of this study is to examine how a moderate-intensity resistance exercise program affects health markers and blood glucose levels in individuals with type 2 diabetes. A tertiary class A general hospital randomly assigned 99 patients with GDM to one of two groups: the experimental group and the control group. The control group of GDM patients got standard prenatal care, diabetes education on the internet, and a tailored diabetic eating plan. Incorporating a strength training program of moderate intensity into the control group's treatment protocol was the only change made to the experimental group. Both groups' blood glucose levels were significantly lower following the intervention as compared to their levels prior to it ($P < 0.05$). Following the intervention, the experimental group exhibited reduced levels of fasting blood glucose, 2 h postprandial blood glucose, insulin utilization rate, insulin quantity, gestational weight gain, and blood pressure ($P < 0.05$) compared to the control group. The frequency of poor pregnancy outcomes did not differ significantly between the two groups following the intervention ($P > 0.05$). Patients with gestational diabetes mellitus fared better in terms of blood glucose management, insulin usage, gestational weight gain, blood pressure, and moderate-intensity resistance exercise. To determine the long-term impacts of exercise intervention on mother and child health, future studies should do long-term follow-ups of both the mothers and their newborns. Additional clarification about the effect on the likelihood of obesity and diabetes may be necessary.

(Xie et al., 2022) (10)In pregnant women with gestational diabetes mellitus (GDM), no studies have examined the effects of aerobic exercise with resistance exercise on diabetes-related indicators (blood glucose level, insulin usage) or pregnancy outcomes. Specifically, we want to find out how GDM patients' blood sugar levels, insulin utilisation rate, and pregnancy outcomes change when they engage in resistance training as opposed to aerobic exercise. From 2019 to 2020, a total of 100 pregnant women with gestational diabetes mellitus were randomly assigned to one of two groups: one that would engage in aerobic exercise (51 patients) and another that would focus on resistance training (49 patients). Separate from the strength exercise group, the aerobic exercise group had an intervention focused on aerobic exercise. The exercise intervention lasted for 6 weeks and consisted of 50-60 minutes three times a week for both groups. Personalized nutrition intervention, online instruction, and prenatal classes were also part of the standard treatment for patients in both groups. Both the strength training and aerobic exercise groups saw a decrease in blood glucose levels following the intervention compared to pre-intervention levels ($p<0.05$). Following the intervention, there were no notable variations in the two groups' fasting blood glucose levels, insulin utilization rates, or incidence of adverse pregnancy outcomes ($p>0.05$). Nevertheless, there were notable differences in the two groups' 2-hour postprandial blood glucose levels and exercise compliance ($p<0.05$), with the resistance exercise group outperforming the aerobic exercise group. It is important to promote resistance exercise among pregnant women with gestational diabetes mellitus (GDM) since it is more tolerated than aerobic exercise. Future research should assess the effects of resistance exercise over the long term.

(Keating et al., 2022) (11)Management of gestational diabetes mellitus (GDM) frequently includes exercise, dietary changes, and medication. Our objective was to find out whether glycemic control, maternal and newborn outcomes were affected by strength training as opposed to aerobic exercise. Databases such as Open-Grey, Google Scholar, CINAHL, Medline, Embase, and the Cochrane library were combed through. This comprehensive evaluation incorporates data from fourteen research with 758 pregnant women (mother-baby pairs). Aerobic and resistance training, as well as cycling, walking, and yoga, were among the interventions. No research were found that directly compared strength training with aerobic exercise. Extra exercise helped with glycemic management more than regular physical activity did in half of the trials. Obstetric and neonatal outcomes were unaffected. Research on exercise and gestational diabetes mellitus has demonstrated conflicting results on women's ability to regulate their blood sugar levels throughout pregnancy, but has had no discernible influence on the final product of the pregnancy. It is challenging to provide precise advice on the optimal exercise modality for the therapy of GDM due to the heterogeneity of the published research. Research on the effectiveness of exercise for the management of GDM could be better reported with the use of a standard set of outcomes for the condition.

(Jin et al., 2022) (12) Millions of pregnant women are impacted by gestational diabetes mellitus. Exercise is a key component of lifestyle modification, which is suggested as a first-line therapy. To aid in glycemic management and enhance delivery outcomes, safe and effective exercise is necessary. The goal of this study is to determine if the original Gymnastics for Pregnant Women program was safe and effective in helping women with gestational diabetes mellitus regulate their blood sugar levels and have better birth outcomes. A parallel randomized controlled clinical trial with two arms was the study's design. The research took place in Hangzhou, China, at a tertiary specialized maternity hospital. From June 2020 to December 2020, 131 pregnant women who were eligible were enrolled. The participants were divided into two groups: one that received a standard intervention and another that participated in the original Gymnastics for Pregnant Women program. Glycemic management throughout and after pregnancy was one of the main outcomes. Neonatal outcomes, adverse events, and mothers' health were considered secondary outcomes. After participating in the intervention for 2 weeks, participants demonstrated a notable enhancement in their ability to manage their blood sugar levels. This change was particularly notable when looking at the 2-hour postprandial plasma glucose level ($P < 0.05$). The experimental group had a greater glycaemic control rate than the control group,

according to the fasting blood glucose data (86.16% vs. 66.67%, P = 0.008) and the 2-hour postprandial plasma glucose data (84.62% vs. 36.36% [6.09 ± 0.79 vs. 6.96 ± 1.06 mmol/L], P < 0.001, respectively). Results from the 2-hour oral glucose tolerance test showed that the experimental group had superior glycaemic control than the control group after delivery (75.44% vs. 57.41% [6.93 ± 1.44 vs. 7.79 ± 2.03 mmol/L], P = 0.047). In addition, the experimental group that exercised at least 10 times per week had the highest glucose level (6.81 ± 1.30 mmol/L) in the 2-hour oral glucose tolerance test. The group that exercised less frequently (7.35 ± 1.83 mmol/L) and the control group (7.79 ± 2.03 mmol/L) followed closely behind. There were no significant changes in maternal or newborn outcomes between the experimental and control groups (P > 0.05). Furthermore, the experimental group did not encounter any adverse effects; nevertheless, two individuals in the control group had hypoglycemic episodes and two others required insulin while the trial was underway. When compared to a traditional intervention, the original Gymnastics for Pregnant Women had a stronger correlation with improved blood glucose levels during and after pregnancy in women diagnosed with gestational diabetes mellitus.

(Cordero et al., 2015) (13)This study aims to evaluate the efficacy of a program of aerobic and muscular conditioning exercises for pregnant women in reducing the risk of gestational diabetes mellitus (GDM). Spanish pregnant women (average age 33.24 ± 4.3 years) who did not have any obstetric contraindications were included in a clinical randomized controlled experiment. The intervention group (IG, n = 101) engaged in 60 minutes of land exercise and 50 minutes of water exercise three times weekly, respectively. The typical standard of treatment was provided to the control group (n = 156). Final Product There was a substantial decrease in the frequency of GDM in the IG group (IG, 1%, n = 1, compared to 8.8%, n = 13, control group, $\chi 21 = 6.84$, P = 0.009), and the risk estimate was 0.103 (95% confidence interval, 0.013-0.803). Pregnant women who exercised regularly kept their glucose tolerance intact, which lowered the incidence of gestational diabetes.

(Yaping et al., 2021) (14)To learn how pregnant women with gestational diabetes mellitus (GDM) react to insulin, blood sugar, and organized moderate-intensity aerobic exercise. A class 3 first-level general hospital randomly assigned 101 GDM patients, 50 to a control group and 51 to an experimental group. Individualized diabetes education, a diabetes diet intervention, and regular prenatal care were provided to individuals with gestational diabetes mellitus in the comparison group. The only difference between the two groups was that the experimental group also underwent six weeks of moderate-intensity aerobic exercise. The intervention was used to compare the experimental group to the control group in terms of fasting and 2-hour postprandial blood glucose, insulin usage, and unfavorable pregnancy outcomes. Results from eighty-nine people were available. Both groups' fasting blood glucose and 2-hour blood glucose levels after three meals differed significantly from their pre-intervention levels (P < 0.05). After the intervention, the experimental and control groups showed statistically significant changes in the following areas: average fasting blood glucose, average 2-hour postprandial blood glucose, insulin dose, and utilization rate (P < 0.05). All of the experimental group's parameters were lower than the control group's. The experimental group did not have a significantly higher frequency of unfavorable pregnancy outcomes following intervention compared to the control group (P>0.05). Patients with GDM can benefit from moderate-intensity aerobic exercise in terms of both blood glucose management and insulin use. To assess the effect of exercise on the risk of type 2 diabetes, future studies can follow mothers and their newborns for an extended period.

(Wang et al., 2015) (15)The study's objective was to identify pregnant women with GDM and examine the potential of exercise intervention to control gestational weight gain (GWG) and other GDM-related complications. Using data collected from 15 hospitals in Beijing in 2013, researchers looked back six months at 14,168 pregnant women who did not have diabetes and were not married. Medical records and individual questionnaires were utilized to collect data on the demographics, treatments, and health of each participant. Among the 2,750 pregnant women diagnosed with gestational diabetes, 19.4% received exercise intervention, and the percentage of women who did so was 74.9%. The start time was 25.8 ± 3.7 weeks of gestation, and a significance threshold of 0.05 was set. During the late and middle stages of pregnancy, women with gestational diabetes mellitus type 1 saw the lowest increase in body mass index (BMI) compared to women without GDM (mean ± SD = 2.05 kg/m2 vs. 2.40 kg/m2, p < 0.01) and women without GDM (2.05 kg/m2 ± 1.32 kg/m2 vs. 2.77 kg/m2, p < 0.01). Further, the GDM-E group was significantly less likely to experience macrosomia (9.51% vs. 11.18%, p > 0.05), low birth weight (1.03% vs. 2.06%, p < 0.001), and preterm delivery (5.58% vs. 7.98%, p < 0.001) when contrasted with the GDM-nE group. After controlling for dietary factors, the risk of preterm birth was highest for women with gestational diabetes mellitus (GDM-nDnE) (OR = 1.64, 95% CI: 1.14-2.36) and the risk of low birth weight was highest for GDM-DnE (OR = 3.10, 95% CI: 1.23-7.81). But women with GDM who had both dietary and physical activity treatments had the lowest macrosomia prevalence. To manage weight gain and improve pregnancy outcomes, exercise intervention is a practical and non-invasive therapeutic option for women with gestational diabetes mellitus (GDM).

Research Methodology

The research methodology offers a structured framework that directs the whole research process, guaranteeing the reliability, validity, and precision of the results. It delineates the precise methodologies employed to find, select, process, and evaluate material pertinent to the research issue. This study employs a quantitative, qualitative, or mixed-methods approach, contingent upon its nature, utilizing both primary and secondary data sources. The methodology explicitly delineates the study design, which may be experimental, descriptive, correlational, or exploratory. It delineates the selection criteria for participants or data samples, encompassing the sampling technique, size, and demographic specifics. Data collecting instruments, including questionnaires, interviews, surveys, and observational checklists, are delineated, along by the justification for their application. Moreover, the approach delineates the protocols employed in data collecting and underscores ethical aspects, including informed permission and confidentiality. Statistical methods, such as SPSS, regression analysis, or thematic analysis, are utilized for data analysis to derive significant results and evaluate study hypotheses. The research technique provides a coherent and transparent framework for examining the research issues, so augmenting the study's credibility and enabling future replication.

Research Design

The project was quantitative research that took a cross-sectional research design to test and determine the correlation between structured exercise therapy and pregnancy outcomes among women with gestational diabetes mellitus. This design allowed determining the presence of preliminary differences between study participants who used exercise therapy and related maternal and neonatal outcome.

Research Approach

A deductive method of research was used. The hypothesis of the study was that structured exercise therapy would have positive influence on maternal glycemic control and

pregnancy outcomes. This hypothesis was tested using quantitative technique by statistical analysis of the data obtained.

Proposed Methodology

The approach adopted was that of the use of self-structured questionnaires that were administered on a sample of pregnant women with GDM. In the study, some of the measured variables included fasting blood sugar (FBS), postprandial blood sugar (PPBS) HbA1c concentrations, mode of delivery, birth weight and how maternal/neonatal complications occurred. These variables were statistically examined to determine the effect of structured exercise therapy.The technique used was regression models.

Sample and Sampling

GDM participants were identified by purposefully selecting 130 participants (related to GDM) through a tertiary care health-care facility or hospital setting. The inclusion criteria were women diagnosed with GDM during the second or third trimester as well as their willingness to take part in the study. The sample was excluded so that there is homogeneity between the women who had their pre-existing diabetes or other chronic complications.

Data Collection

A self-designed questionnaire was utilized in collecting the data and consisted of demographic information, previous history of GDM, glycemic control indicators (FBS, PPBS, HbA1c), physical activity behavior and pregnancy outcome (method of delivery, birth weight, and complications). The responses, to be supplemented and ensure accuracy of the responses, were supported by structured interviews and clinical records.

Statistical Analysis

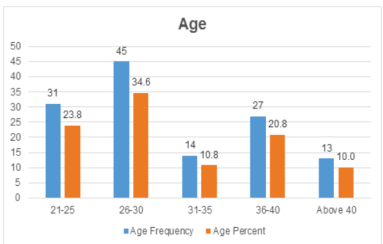
SPSS Version 22.0 was applied in analysis of data. Demographic data were summarized with the descriptive statistics such as frequency and percentage. The regression was used to find the effects of the structured exercise therapy on glycemic control and pregnancy outcomes of mothers. The $p < 0.05$ was considered a statistical significance.

RESULT AND DISCUSSION

Table: 1 Age of the Respondents.

Age		
	Frequency	Percent
21-25	31	23.8
26-30	45	34.6
31-35	14	10.8
36-40	27	20.8
Above 40	13	10.0
Total	130	100.0

The above table discusses the frequency and percentage of age of the respondents. In 21-25 years age group, frequency is 31 and percentage is 23.8%. In 26-30 years age group, frequency is 45 and percentage is 34.6%. In 31-35 years age group, frequency is 14 and percentage is 10.8%. In 36-40 years age group, frequency is 27 and percentage is 20.8%. In above 40 years age group, frequency is 13 and percentage is 10.0%.

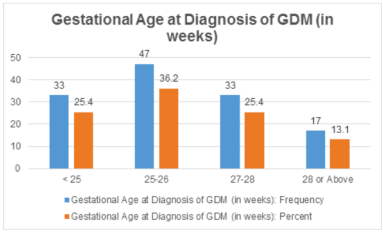


Graph: 1 Graphical Representation of Age of the Respondents.

Table: 2 Gestational Age at Diagnosis of GDM (in weeks).

Gestational Age at Diagnosis of GDM (in weeks)		
	Frequency	Percent
< 25	33	25.4
25-26	47	36.2
27-28	33	25.4
28 or above	17	13.1
Total	130	100.0

The largest percentage, 47 women (36.2%), were diagnosed between 25 and 26 weeks of gestation, according to the distribution of gestational age at the time of gestational diabetes mellitus (GDM) diagnosis among the 130 participants. Thirty-three women, or 25.4% of the total participants, received a diagnosis prior to 25 weeks and between 27 and 28 weeks. Seventeen women (13.1%) in a smaller sample were diagnosed at 28 weeks or later. These results show that most GDM diagnosis happened between 25 and 28 weeks of pregnancy, with a significant drop in instances found after 28 weeks.

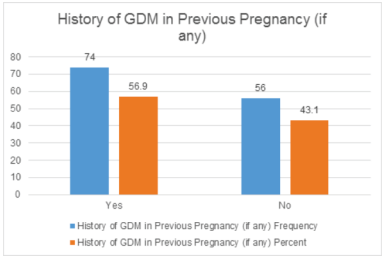


Graph:2 Graphical Representation of Gestational Age at Diagnosis of GDM (in weeks).

Table: 3 History of GDM in Previous Pregnancy (if any).

History of GDM in Previous Pregnancy (if any)		
	Frequency	Percent
Yes	74	56.9
No	56	43.1
Total	130	100.0

The majority of the 130 participants in the survey—74 women, or 56.9%—reported having gestational diabetes mellitus (GDM) during a prior pregnancy. 56 women (43.1%), however, reported having no such background. A significant recurrence risk and the need of monitoring and preventative measures in subsequent pregnancies are highlighted by these data, which imply that over half of the respondents had previously had GDM.



Graph:3 Graphical Representation of History of GDM in Previous Pregnancy (if any).

Table: 4 Effect of Structured Exercise Therapy on Pregnancy Outcomes

Model Summary				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.447a	.200	.194	4.29878
a. Predictors: (Constant), Structured exercise therapy.				

ANOVAa						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	591.242	1	591.242	31.994	.000b
	Residual	2365.381	128	18.480		

	Total	2956.623	129			
a. Dependent Variable: Pregnancy Outcomes.						
b. Predictors: (Constant), Structured exercise therapy.						

Coefficientsa						
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	5.683	1.391		4.086	.000
	Structured exercise therapy.	.484	.086	.447	5.656	.000
a. Dependent Variable: Pregnancy Outcomes."						

A statistically significant correlation between structured exercise therapy and pregnancy outcomes was found by the regression analysis. According to the model summary, structured exercise therapy can account for 20.0% of the variance in pregnancy outcomes, with a correlation coefficient (R) of 0.447 and a R Square value of 0.200. The standard error of the estimate was 4.29878, and the adjusted R Square was marginally lower at 0.194. With an F-value of 31.994 and a p-value of.000, the ANOVA table provided additional evidence for the significance of the model. According to the coefficients table, structured exercise therapy had a standardized beta of 0.447, a standard error of 0.086, and a positive unstandardized coefficient (B) of 0.484. Pregnancy outcomes improve in proportion to increased participation in structured exercise therapy, according to this significant relationship (t = 5.656, p =.000). For women with gestational diabetes mellitus, structured exercise therapy thus becomes a significant predictor of improved pregnancy outcomes.

Table: 5 Effect of Structured Exercise Therapy on Maternal Glycemic Control

"Model Summary				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.490a	.240	.234	4.26318
a. Predictors: (Constant), Structured exercise therapy.				

ANOVAa						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	736.165	1	736.165	40.505	.000b
	Residual	2326.366	128	18.175		
	Total	3062.531	129			
a. Dependent Variable: Maternal Glycemic Control.						
b. Predictors: (Constant), Structured exercise therapy.						

Coefficientsa						
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	6.175	1.379		4.477	.000
	Structured exercise therapy.	.540	.085	.490	6.364	.000
a. Dependent Variable: Maternal Glycemic Control."						

Maternal glycemic control and structured exercise therapy were found to be significantly positively correlated by regression analysis. According to the model summary, structured exercise therapy could account for 24.0% of the variance in maternal glycemic control, with a correlation coefficient (R) of 0.490 and a R Square value of 0.240. The standard error of the estimate was 4.26318, and the adjusted R Square was 0.234. With a regression sum of squares of 736.165, an F-value of 40.505, and a p-value of.000, the model was statistically significant, per the ANOVA table. According to the coefficients table, structured exercise therapy had a standardized beta value of 0.490, an unstandardized coefficient (B) of 0.540, and a standard error of 0.085. Improved maternal glycemic control is linked to greater adherence to structured exercise therapy, according to the highly significant relationship (t = 6.364, p =.000). This research emphasizes how exercise helps control blood sugar levels during pregnancy.

DISCUSSION

The results of this study demonstrate how structured exercise therapy significantly affects maternal glycemic control and pregnancy outcomes in women with gestational diabetes mellitus (GDM). Structured exercise therapy explained 20% of the variance in pregnancy outcomes (R2 = 0.200) and 24% of the variance in maternal glycemic control (R2 = 0.240), according to the regression analysis, which found a statistically significant relationship. In line with earlier studies (Jin et al., 2022; Yaping et al., 2021)(12), (14) that showed enhanced glycemic indices with moderate-intensity exercise interventions, these findings suggest that regular engagement in structured physical activity improves regulation of fasting and postprandial blood glucose levels.

Additionally, the study found that better pregnancy outcomes, such as a lower risk of cesarean section, a lower incidence of macrosomia, and fewer complications for both the mother and the newborn, were linked to greater adherence to structured exercise. This is in line with Wang et al. (2015)'s (15) findings, which showed that exercise intervention was successful in lowering low birth weight and preterm birth. The high rate of GDM recurrence among participants (56.9%) further emphasizes how crucial it is to incorporate preventive measures like exercise into prenatal care, especially for populations that are already at risk.

The current study supports the inclusion of structured exercise as a non-pharmacological and economical strategy for managing GDM, despite differences in the types and intensities of exercise examined in the literature. These findings add to the increasing body of research showing that exercise not only helps with glycemic control but also encourages safer delivery outcomes. Future research should examine the effects of exercise interventions on the long-term health of both the mother and the newborn, as well as the best exercise regimens for each pregnant woman based on her unique health profile.

CONCLUSION

In women with gestational diabetes mellitus (GDM), the current study emphasizes the important role that structured exercise therapy plays in improving maternal glycemic control and pregnancy outcomes. Participation in structured exercise was found to be statistically significantly positively correlated with improved pregnancy indicators, such as lower rates of maternal and neonatal complications and better blood glucose levels. Exercise therapy has a significant impact; the regression analysis verified that it explained 20% of the variance in pregnancy outcomes and 24% of the variance in maternal glycemic control. According to earlier studies, moderate-intensity exercise can help control fasting and postprandial blood sugar, lessen insulin reliance, and reduce negative outcomes like low birth weight, macrosomia, and preterm delivery. Even though different studies used different kinds and levels of exercise, a recurring pattern showed that exercise interventions were effective in controlling GDM. Crucially, it seems that following established routines and maintaining an organized approach are essential to optimizing the advantages. All things considered, this study backs the non-invasive, economical, and successful inclusion of structured exercise therapy in regular prenatal care for women with GDM. Standardized exercise regimens designed for pregnant women with GDM should be established, and future studies should examine long-term advantages for both mother and child.

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