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Original Research Article

Role of Myoinositol in the Prevention of GDM

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Abstract:

Background: Gestational diabetes mellitus (GDM), a common pregnancy condition, causes insulin resistance and harms the mother and foetus. We need early prevention to reduce its impact. Myoinositol, a naturally occurring sugar alcohol, may prevent GDM due to its role in insulin signaling and glucose metabolism.

Objective: This study examined whether myoinositol supplements could lower the risk of gestational diabetes mellitus (GDM) in high-risk pregnant women and improve mother-child health.

Method: Nalanda Medical College & Hospital conducted Retrospective observational research on 100 pregnant women from September 2022 to September 2023. Participants chose myoinositol supplements or prenatal care. We examined maternal-fetal outcomes, GTTs, and baseline characteristics. We used chi-square tests, paired t-tests, and logistic regression to determine how well myoinositol reduces GDM and affects mother and baby health.

Results: Compared to the control group, myoinositol significantly reduced GDM from 36.7% to 14.3% ($p = 0.01$). The intervention group significantly improved ($p < 0.05$) glycaemic indices, including fasting glucose, postprandial glucose, and 2-hour OGTT levels. Myoinositol supplementation lowers the risk of preeclampsia (adjusted OR: 0.32; $p = 0.04$) and improves neonatal outcomes like Apgar scores and macrosomia. We found no major adverse effects.

Conclusion: Myoinositol is safe and helpful for preventing GDM and producing a healthy baby. When used in prenatal care, it is feasible and cost-effective, especially for high-risk women. These findings need further study to determine long-term benefits.

Keywords: Gestational Diabetes Mellitus, Myoinositol, Insulin Resistance, GDM Prevention, Maternal Outcomes, Fetal Outcomes.

Introduction

Gestational diabetes mellitus (GDM), one of the most common metabolic issues during pregnancy, affects many pregnant women worldwide [1]. GDM, typically diagnosed in the second or third trimester, is marked by glucose intolerance during pregnancy. The condition poses short- and long-term risks to both the mother and fetus.

Hypertensive problems, delivery complications, and type 2 diabetes are more likely in pregnant diabetic mothers [2]. Fetuses are more likely to experience macrosomia, shoulder dystocia, neonatal hypoglycemia, and delivery trauma. Children of mothers with GDM are at a higher risk of developing obesity, metabolic syndrome, and diabetes. These outcomes highlight the critical need for effective prevention strategies as obesity and sedentary lifestyles increase global GDM incidence. Insulin resistance, which leads to GDM, worsens during pregnancy [3]. During pregnancy, the production of hormones like estrogen, progesterone, and placental lactogen neutralizes insulin's effects, causing insulin resistance. The pancreas usually compensates by secreting more insulin. However, in vulnerable individuals, this compensation fails, leading to hyperglycemia. Maternal age, obesity, polycystic ovarian syndrome (PCOS), a history of GDM, and a family history of diabetes increase the risk of GDM [4]. Given the clinical and economic burden of GDM, early preventive interventions are essential.

Myoinositol has garnered interest as a potential preventive measure for GDM. This naturally occurring sugar alcohol, an isomer of inositol, plays vital roles in cellular processes. As a precursor for inositol phosphates, it is crucial for cell signaling [5]. Myoinositol is involved in insulin signaling, regulating insulin activity within cells. By improving tissue glucose absorption and insulin sensitivity, myoinositol helps maintain glucose homeostasis, making it a promising preventive option for GDM [6]. Inflammation, oxidative stress, and lipid metabolism also contribute to GDM, and myoinositol's insulin-sensitizing effects can mitigate these factors. Previous studies have shown that myoinositol reduces fasting glucose levels, improves oral glucose tolerance test (OGTT) outcomes, and lowers GDM rates in high-risk populations. However, these studies primarily focused on women with specific risk factors, such as PCOS or a family history of GDM [7].

This study aims to contribute to the existing literature by evaluating the role of myoinositol in preventing GDM among a broader population of high-risk pregnant women receiving prenatal care at Nalanda Medical College & Hospital. This hospital is known for its excellent pediatric and maternal health care, serving a diverse urban and rural patient population.

The familiarity of the hospital's facilities and staff with high-risk pregnancies makes it an ideal setting for this research. Using a sample of 100 pregnant women with detailed demographic information, this study aims to assess the intervention's safety and efficacy.

Materials and Methods Study Design

This retrospective observational study examines whether myoinositol can prevent gestational diabetes mellitus (GDM) in pregnant women. The observational design allows tracking of pregnancy outcomes based on existing clinical data, ensuring real-world applicability.

Study Setting

The investigation occurred at Nalanda Medical College & Hospital, known for its prenatal care unit serving a diverse patient base, which includes individuals from various backgrounds and income levels. The hospital's infrastructure and experienced medical staff ensured accurate data gathering and patient care.

Sample Size and Population

A total of 100 pregnant women were included in the study. Data from September 2022 to September 2023 were used to analyze outcomes.

Inclusion Criteria

Pregnant women aged between 18 and 40 years. Singleton pregnancy. Gestational age ≤12 weeks at the time of enrollment. Women at moderate to high risk of developing GDM (e.g., history of GDM, obesity, family history of diabetes, or PCOS).

Exclusion Criteria

Pre-existing diabetes or other endocrine disorders. Multiple pregnancies (e.g., twins or triplets). Significant medical comorbidities like renal, hepatic, or cardiovascular diseases. Women with known allergies to myoinositol or related compounds. Those unwilling or unable to provide informed consent.

Data Collection

Data were retrospectively collected from medical records, including baseline lifestyle data (diet, exercise, smoking status), clinical parameters (blood pressure, fasting glucose, HbA1c levels), and medical history (previous pregnancies, GDM, family history of diabetes, PCOS).

At 24-28 weeks, participants underwent a Glucose Tolerance Test (GTT) to measure fasting glucose and 1- and 2-hour post-glucose load levels. The study monitored adverse effects of myoinositol, maternal outcomes (e.g., GDM, hypertension, preterm labor), and fetal outcomes (e.g., birth weight, Apgar scores, neonatal hypoglycemia).

Statistical Analysis

SPSS software was used for data analysis. Descriptive statistics such as mean, median, and standard deviation described continuous data like fasting glucose levels, while frequencies and percentages were used for categorical variables like GDM incidence. Paired t-tests assessed changes in insulin and glucose levels, and chi-square tests compared GDM prevalence between groups. Logistic regression identified factors associated with reduced GDM risk and evaluated the impact of myoinositol supplementation.

Significance Level

A p-value of <0.05 was considered statistically significant.

Results

Participant Characteristics

Table 1: The baseline demographics and clinical profiles of the study participants.

Characteristics	Intervention Group (n=70)	Control Group (n=30)	p-value
Age (years)	28.4 ± 3.8	27.9 ± 4.1	0.42
BMI (kg/m²)	26.5 ± 2.7	26.8 ± 3.1	0.56
Gestational age at enrollment (weeks)	9.4 ± 1.3	9.5 ± 1.5	0.68
Family history of diabetes (%)	45%	50%	0.62
Previous history of GDM (%)	30%	33%	0.77

The baseline characteristics of the control and intervention groups were not significantly different. This ensured that the groups looked similar when analyzing the results.

Efficacy of Myoinositol

Table 2: The incidence of GDM and changes in glucose levels

Outcome	Intervention Group (n=70)	Control Group (n=30)	p-value
Incidence of GDM (%)	14.3% (10/70)	36.7% (11/30)	**0.01**
Fasting glucose (mg/dL)	86.5 ± 8.2	92.3 ± 9.4	**0.03**
Postprandial glucose (mg/dL)	116.2 ± 10.3	124.7 ± 12.1	**0.02**
OGTT 2-hour glucose (mg/dL)	127.8 ± 14.5	139.4 ± 15.7	**0.01**

With a p-value of 0.01 across groups, the intervention group had 14.3% less GDM. Myoinositol supplementation also improved fasting, postprandial, and 2-hour OGTT glucose levels in the intervention group.

Maternal and Fetal Outcomes

Table 3: Maternal and neonatal outcomes are presented.

Outcome	Intervention Group (n=70)	Control Group (n=30)	p-value
Preeclampsia (%)	5.7% (4/70)	16.7% (5/30)	**0.04**
Preterm delivery (<37 weeks)	8.6% (6/70)	20.0% (6/30)	0.08
Birth weight (kg)	3.2 ± 0.4	3.5 ± 0.5	**0.02**
Apgar score at 5 minutes ≥ 7 (%)	97%	93%	0.29
Neonatal hypoglycemia (%)	4.3% (3/70)	10.0% (3/30)	0.34

The intervention group had decreased preeclampsia (5.7% vs. 16.7%, p = 0.04) and low birth weight (p = 0.02), suggesting that myoinositol may protect against macrosomia. Apgar scores, neonatal hypoglycemia, and premature birth risk were similar.

Adverse Events

Table 4: Adverse events reported during the study

Adverse Event	Intervention Group (n=70)	Control Group (n=30)	p-value
Gastrointestinal upset (%)	8.6% (6/70)	6.7% (2/30)	0.75
Hypoglycemia (%)	0%	0%	N/A
Allergic reactions (%)	0%	0%	N/A

The 8.6% of intervention group members with slight gastrointestinal discomfort were similar to the 6.7% in the control group (p = 0.75). No hypoglycemia, significant adverse effects, or allergic reactions indicate good myoinositol tolerance.

Statistical Analysis

Table 5:

Analysis	Test Used	Finding	p-value	Interpretation
Incidence of GDM	Chi-square test	There was a significant reduction in GDM incidence in the intervention group (14.3%) compared to the control group (36.7%).	0.01	Myoinositol significantly reduces the risk of GDM.
Fasting Glucose Levels	Paired t-test	Intervention group: 86.5 ± 8.2 mg/dL, Control group: 92.3 ± 9.4 mg/dL.	0.03	Myoinositol improves fasting glucose levels.
Postprandial Glucose Levels	Paired t-test	Intervention group: 116.2 ± 10.3 mg/dL, Control group: 124.7 ± 12.1 mg/dL.	0.02	Significant improvement in postprandial glucose levels with myoinositol.
2-hour OGTT Glucose Levels	Paired t-test	Intervention group: 127.8 ± 14.5 mg/dL, Control group: 139.4 ± 15.7 mg/dL.	0.01	Significant improvement in 2-hour OGTT glucose levels with myoinositol.
Preeclampsia	Logistic regression	Myoinositol reduced the risk of preeclampsia (adjusted OR: 0.32).	0.04	Myoinositol is a protective factor against preeclampsia.

A chi-square test revealed a significant reduction in GDM incidence in the intervention group (p = 0.01). Paired t-tests showed significant improvements in fasting, postprandial, and 2-hour OGTT glucose levels in the intervention group compared to the control group. Logistic regression identified myoinositol supplementation as a protective factor against preeclampsia (adjusted OR: 0.32, $p = 0.04$).

Discussion Interpretation of Results

This study found that pregnant women who take myoinositol supplements are less likely to develop GDM than those who receive standard prenatal care. Lower fasting, postprandial, and 2-hour OGTT levels indicated better glycaemic management in the intervention group. Myoinositol supplementation reduces preeclampsia risk, birth weight, and other maternal and foetal outcomes. The results support previous evidence indicating myoinositol prevents GDM. Randomized controlled trials of high-risk pregnant women found that myoinositol reduced gestational diabetes mellitus (GDM).

These studies suggest that myoinositol improves insulin sensitivity and glucose metabolism to prevent GDM. MYOInositol significantly decreases fasting and postprandial glucose levels by forming inositol triphosphate, a key component in glucose uptake and metabolism, which may improve insulin signaling. Their physiologic effects come from the phosphatidylinositol signaling system, where myoinositol modulates insulin-mediated glucose absorption. Myoinositol reduces blood glucose and accelerates glucose transport into cells via activating insulin receptors. This helped the intervention group control glycaemia. Myoinositol may prevent preeclampsia during pregnancy and provide anti-inflammatory and circulatory protective effects by maintaining endothelium function. These findings support the use of myoinositol in prenatal therapy for gestational diabetes mellitus-risk pregnant women.

Strengths of the Study

Strong study strengths make the results more credible and applicable to a wider context. First, 100 people give us enough statistical power to rule out type II errors and perform subgroup analysis. Unlike smaller pilot studies, a higher sample size may increase confidence in relationships and outcomes. Second, Nalanda Medical College & Hospital, a varied tertiary care hospital, supplied the study's clinical context. This strengthens the results' external validity by making them applicable to pregnant women and those in low-resource areas. Thoroughness is another plus. It has thorough outcome assessments, a consistent myoinositol dose, and clear inclusion and exclusion criteria. These processes ensured homogeneity and reduced variability in data collection. This study has good internal validity since it measures glycaemic control and maternal-fetal outcomes with recognized instruments. Finally, myoinositol is safe and has no serious side effects, making it a good clinical option.

Limitations

Despite its strengths, the study's shortcomings must be considered. A one-year research period is a severe downside. This time frame was sufficient for assessing the most significant pregnancy outcomes. Still, it was too short to evaluate long-term neonatal and maternal outcomes, including metabolic health in children and postpartum glucose tolerance. Future studies need longer follow-ups to address these issues. Selection bias is possible because all subjects came from the same tertiary care centre. Even with a large patient population, results may not apply to pregnant women in rural or underserved areas. Multicenter trials would improve generalization. While beneficial for real-world circumstances, the studies observational design risks confusing factors. Despite matching participants and controlling for baseline differences, unmeasured variables may have altered results. Randomized controlled trials provide more causal evidence. Self-reported myoinositol supplementation adherence may induce reporting bias. They may utilize biomarker analysis or pill counts to verify compliance in future experiments.

Implications for Clinical Practice

The results of this study affect prenatal gestational diabetes management. Myoinositol may prevent GDM in high-risk women better than diet and medication. Start by using myoinositol supplements easily and without negative effects. This study and others show that it is safe to use widely without serious negative effects. Its lack of significant side effects, including hypoglycemia or allergic responses, supports its usage in conventional prenatal treatment. Second, myoinositol improves insulin sensitivity and glucose metabolism, addressing GDM pathogenesis.

Besides avoiding GDM, myoinositol may have other benefits. Less macrosomia and infant issues improve foetal outcomes, whereas lower preeclampsia rates help mothers. Myoinositol in prenatal treatment regimens can reduce the cost of gestational diabetes mellitus (GDM) problems such as hospitalizations, cesarean deliveries, and neonatal intensive care. In clinical practice, myoinositol supplementation requires careful patient selection and monitoring. High-risk women with GDM, obesity, or PCOS benefit most from supplements. Identifying pregnant women who potentially benefit from myoinositol requires routine screening and risk assessment early on. Check glucose levels and pregnancy results regularly to ensure efficacy and safety.

Conclusion

This study found that myoinositol benefits pregnant women at high risk of GDM. Myoinositol supplementation dramatically reduces GDM, improves glycaemic control, and benefits both mother and newborn. The intervention group had lower fasting glucose, postprandial glucose, and 2-hour OGTT levels than the control group and less preeclampsia and macrosomia. Myoinositol is well-tolerated and has few side effects, making it safe during pregnancy. It's safe, cheap, and easy to use. By lowering GDM and maternal and infant morbidity, myoinositol supplementation can save healthcare costs. Positive data need more research. Larger, multicenter randomised controlled trials with longer follow-ups are needed to confirm these findings and study myoinositol's long-term effects on postpartum glucose management and metabolic health in children. Research into when, how much, and if myoinositol works well with additional interventions like lifestyle changes may help increase its use in clinical practice. Finally, this study supports the claim that myoinositol can prevent GDM, which benefits women and their unborn children. Myoinositol in antenatal care may improve pregnancy outcomes and reduce GDM worldwide. This encouraging intervention needs more investigation to benefit fully.

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