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RESEARCH ARTICLE
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EFFECT OF PHYSICAL ACTIVITY ON GESTATIONAL DIABETES MELLITUS: INSIGHTS FROM A RANDOMIZED CLINICAL TRIAL

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Abstract

Background: Physical inactivity is a known modifiable risk factor for gestational diabetes mellitus (GDM). This study explores the association between physical activity levels and glycemic control in women with GDM.

Methods: A total of 60 pregnant women with newly diagnosed GDM were enrolled in a double-blind, randomized placebo-controlled trial. Participants' physical activity levels were categorized as low, moderate, or high. Correlations were drawn between physical activity patterns and fasting blood sugar (FBS), postprandial blood sugar (PPBS), and insulin resistance (HOMA-IR).

Results: 85% of women reported low physical activity, with only 15% engaged in moderate levels. While physical activity was not significantly different between probiotic and placebo groups, those with moderate activity tended to have better glycemic profiles, though values did not reach statistical significance.

Conclusion: The study supports existing evidence suggesting that increased physical activity may be associated with improved glycemic control in GDM. Promotion of maternal physical activity remains a critical intervention strategy.

Introduction

Gestational diabetes mellitus (GDM) affects 5–26% of pregnancies in India, depending on regional disparities and diagnostic criteria. Risk factors include obesity, advanced maternal age, family history of diabetes, and particularly *low physical activity levels* during pregnancy. Sedentary lifestyle contributes to insulin resistance and dysglycemia during gestation. Conversely, moderate physical activity is associated with reduced insulin resistance and lower GDM risk.

Several global studies have advocated prenatal physical activity for glycemic management; however, Indian data remain scarce. This paper analyzes physical activity data within a randomized controlled trial to explore this association in a semi-urban Indian setting.

Methods

Study Design

- **Type:** Double-blind, randomized placebo-controlled trial
- **Location:** Dr. RPGMC Tanda, Himachal Pradesh
- **Duration:** 1 year
- **Participants:** 60 newly diagnosed diet-controlled GDM patients
- **Inclusion criteria:** Singleton pregnancy, age 18–45 years, diagnosis per IADPSG criteria
- **Exclusion criteria:** Pre-existing diabetes, chronic illness, recent antibiotic or probiotic use

Assessment of Physical Activity:

Participants completed a physical activity questionnaire at baseline, and were classified into three groups:

- *Low physical activity:* Sedentary lifestyle (e.g., mostly household chores)
- *Moderate physical activity:* Walking, childcare-related movement
- *High physical activity:* Regular structured physical exercise (e.g., aerobics)

Primary Outcomes:

- Fasting blood sugar (FBS)
- Postprandial blood sugar (PPBS)
- HOMA-IR index:$\text{HOMA-IR} = \frac{\text{Fasting Glucose (mmol/L)} \times \text{Fasting Insulin (μIU/mL)}}{22.5}$

Results

Physical Activity Distribution

- Low activity: 85.0% (n = 51)
  - Probiotic: 93.3%
  - Placebo: 76.7%
- Moderate activity: 15% (n = 9)
  - Probiotic: 6.7%
  - Placebo: 23.3%
- High activity: 0%

Though a **higher proportion of women in the placebo group engaged in moderate activity**, the distribution was not statistically significant ($\chi^2 = 3.268$, $p = 0.071$).

Glycemic Correlations

Although stratified analysis by physical activity was not the primary aim of the RCT, the observational data indicated that:

- Patients with **moderate physical activity had relatively lower mean FBS and HOMA-IR** values.
- No significant within-group or between-group change in **PPBS** or **insulin levels** was seen across physical activity categories.

Discussion

Our findings are consistent with prior research showing physical activity reduces GDM risk:

- A **2024 systematic review and meta-analysis by Xie et al.** found that women in the highest physical activity categories had a **36% lower risk of GDM** compared to the lowest group (RR = 0.64, 95% CI: 0.53–0.78)[12].
- **Simmons et al.**, in the DALI lifestyle study, demonstrated that physical activity interventions during pregnancy improved glycemic profiles and insulin sensitivity.
- **Russo et al.** highlighted that physical activity before or early in pregnancy significantly reduces the likelihood of developing GDM.

While the present study had a small sample size and limited variability in activity levels (no participants reported high activity), the trend aligns with international data. Physical activity promotes glucose uptake through **non-insulin-dependent mechanisms**, reductions in adiposity and inflammatory cytokines, and improvements in mitochondrial function.

Limitations

- Physical activity categorization was based on self-reporting, which may introduce recall bias.
- The study was not powered to detect glycemic differences across activity categories.
- High activity categories were underrepresented.
- Glycemic control may have been influenced by concurrent dietary counseling, limiting the isolated effect of physical activity.

Conclusion

Although not statistically significant, this study showed a **trend favoring moderate physical activity for better glycemic outcomes** among GDM patients. Given its safety, cost-effectiveness, and broad benefits, prenatal physical activity should be a focus of all GDM prevention and management strategies. Larger trials with prospective assessment of activity levels are warranted.

References

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