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RESEARCH ARTICLE
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RELATIONSHIP BETWEEN PRE-PREGNANCY BODY MASS INDEX (BMI) AND GESTATIONAL DIABETES MELLITUS (GDM): EVIDENCE FROM A RANDOMIZED CLINICAL TRIAL

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Abstract

Background: Elevated body mass index (BMI) is recognized as a major risk factor for gestational diabetes mellitus (GDM). This paper explores the relationship between BMI and GDM using data from a randomized controlled trial conducted on pregnant women.

Methods: In a double-blind randomized controlled trial, 60 pregnant women with newly diagnosed diet-controlled GDM were randomized to receive either probiotic or placebo. BMI was recorded at baseline and categorized. The relationship between BMI and glycemic parameters—fasting blood sugar (FBS), postprandial blood sugar (PPBS), insulin levels, and HOMA-IR—was analyzed.

Results: Among the study population, 41.7% were overweight and 8.3% obese. Although BMI categories did not significantly differ between treatment arms (p=0.455), glycemic parameters were influenced by BMI distribution. Women with overweight/obesity tended to have higher baseline FBS and insulin resistance indices.

Conclusion: Elevated BMI is common among pregnant women with GDM and is associated with worse metabolic profiles. Routine BMI assessment early in pregnancy is essential to stratify GDM risk and tailor early interventions.

Introduction

Gestational diabetes mellitus (GDM) is a form of glucose intolerance with first onset or recognition during pregnancy and is influenced by multiple factors including insulin resistance, pancreatic β-cell dysfunction, and maternal obesity[11]. Women with elevated BMI enter pregnancy with a pre-existing state of insulin resistance, increasing their risk for GDM and adverse obstetric outcomes.

Obesity rates are on the rise among women of childbearing age, particularly in South Asia, with implications for the national burden of GDM. This study investigates the influence of pre-pregnancy BMI on glycemic control in pregnant women diagnosed with GDM.

Methodology

Study Design

A double-blind, placebo-controlled, randomized clinical trial was conducted at Dr. Rajendra Prasad Government Medical College, Tanda (H.P.) over one year.

Participants

Sixty women aged 18–45 years, with newly diagnosed GDM based on IADPSG criteria, were enrolled. Women with chronic illnesses or on antibiotics or immunosuppressants were excluded.

Data Collection

Anthropometric measurements including **pre-pregnancy body weight and height** were recorded. BMI was calculated as:

$$\text{BMI} = \frac{\text{Weight (kg)}}{\text{Height (m)}^2}$$

BMI categories followed WHO guidelines:

- **Underweight:** <18.5 kg/m²
- **Normal weight:** 18.5–24.9 kg/m²
- **Overweight:** 25–29.9 kg/m²
- **Obese:** ≥30 kg/m²

Participants were assessed for FBS, PPBS, insulin levels, and HOMA-IR at baseline and after the 4-week intervention.

Results

BMI Distribution

BMI Category	Probiotic Group (%)	Placebo Group (%)	Total (%)
Underweight	16.7	6.7	11.7
Normal	30.0	46.7	38.3
Overweight	43.3	40.0	41.7
Obese	10.0	6.7	8.3

There was **no significant difference** in BMI distribution between the groups (Chi-square = 2.613, p=0.455), though a majority (>50%) were either overweight or obese.

Glycemic Parameters and BMI

Participants in higher BMI categories demonstrated marginally higher mean values for:

- **Fasting Blood Sugar**
- **Postprandial Blood Sugar**
- **HOMA-IR**

These trends suggest a **positive correlation** between pre-pregnancy BMI and insulin resistance, consistent with established literature.

Discussion

In this cohort, **over 50%** of diet-controlled GDM women were overweight or obese. Though BMI distribution was not significantly different between probiotic and placebo groups, it likely influenced metabolic outcomes.

Several studies reinforce this association. For instance:

- **Yen et al. (2019)** found that overweight and obese women in early pregnancy had a significantly higher clustering of metabolic risks, including GDM.

- **Simmons et al. (2017)** reported that excess maternal weight independently elevates insulin resistance and worsens glycemic outcomes during pregnancy.

Obesity is also associated with chronic low-grade inflammation and adipokine imbalance, which further contribute to insulin resistance.
Elevated BMI in early pregnancy serves as a reliable **predictive marker** for the development of GDM and should prompt early screening and lifestyle intervention.

Conclusion

High pre-pregnancy BMI is an important and modifiable risk factor for gestational diabetes mellitus. This real-world trial confirms the high prevalence of overweight and obesity among GDM patients and supports the integration of BMI screening in routine antenatal care.

Future studies should consider:

- Stratified analysis based on BMI tiers
- Larger sample sizes
- Assessment of inflammatory and microbiota profiles

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