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RESEARCH ARTICLE

Comparison of Single-Time Fasting and Postprandial Glucose Testing on Postpartum Day 3 Versus Capillary Blood Glucose Monitoring in Women with Gestational Diabetes on Medical Nutrition Therapy: A Prospective Study

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Abstract: ***Background***: Postpartum glucose monitoring is critical for women with gestational diabetes mellitus (GDM) to identify persistent dysglycemia, yet adherence to traditional capillary blood glucose (CBG) monitoring remains challenging. This study evaluated whether fasting (FBS) and postprandial (PPBS) blood glucose measurements on postnatal day 3 could provide a simpler, equally effective alternative to three-day CBG monitoring in GDM patients managed with medical nutrition therapy (MNT). ***Methods:*** In this prospective comparative study conducted at Saveetha Medical College and Hospital, 120 postpartum women with GDM were randomized to either FBS/PPBS testing on day 3 (n=60) or standard three-day CBG monitoring (n=60). Glycemic control, patient satisfaction, neonatal outcomes, and cost-effectiveness were assessed. Statistical analyses included t-tests, chi-square tests, and correlation analyses. ***Results:*** No significant differences were found in hyperglycemia detection rates (13.3% vs. 16.7%, p=0.61) or neonatal outcomes (hypoglycemia: 8.3% vs. 10.0%, p=0.75) between FBS/PPBS and CBG groups. FBS/PPBS strongly correlated with CBG values (fasting: r=0.89; postprandial: r=0.85, p<0.001). Patient satisfaction was significantly higher with FBS/PPBS (pain score: 2.1 vs. 5.8; convenience score: 8.5 vs. 4.3, p<0.001), with 90% preferring this method. The FBS/PPBS approach was threefold cheaper (15vs.15vs.45) and required less time (20 vs. 120 minutes). ***Conclusion:*** Single-day FBS/PPBS monitoring is as effective as three-day CBG testing for postpartum glucose assessment in GDM patients on MNT, with superior patient acceptability and cost-efficiency. These findings support revising current guidelines to incorporate simplified monitoring strategies, particularly for low-risk women, without compromising clinical outcomes. Future studies should validate these results in diverse populations and assess long-term diabetes prevention benefits.

Keywords: Gestational diabetes, postpartum monitoring, fasting blood glucose, cost-effectiveness, patient satisfaction.

INTRODUCTION

Gestational diabetes mellitus (GDM) is a common metabolic disorder during pregnancy, characterized by glucose intolerance that first emerges or is recognized during gestation (1). Proper glucose monitoring is crucial in managing GDM to prevent adverse maternal and neonatal outcomes, such as macrosomia, neonatal hypoglycemia, and cesarean delivery (2). While capillary blood glucose (CBG) monitoring remains a standard method, alternative approaches such as fasting blood sugar (FBS) and postprandial blood sugar (PPBS) measurements on postnatal day 3 may offer a simpler and equally effective monitoring strategy for GDM patients on medical nutrition therapy (MNT).

Current guidelines recommend regular CBG monitoring for GDM patients to maintain glycemic control (3). However, frequent CBG testing can be inconvenient, painful, and stressful for postpartum women. Some studies suggest that selective monitoring using FBS and PPBS may reduce the burden of glucose testing while maintaining clinical effectiveness (4). Postnatal glucose monitoring is particularly important as persistent hyperglycemia after delivery can indicate an increased risk of developing type 2 diabetes later in life (5).

Despite the widespread use of CBG monitoring, there is limited evidence comparing its effectiveness with FBS and PPBS measurements on postnatal day 3 in GDM patients managed with MNT. A structured evaluation of these monitoring strategies could help optimize postpartum glycemic assessment while minimizing patient discomfort. This study aims to compare the effectiveness of FBS and PPBS measurements on postnatal day 3 versus traditional CBG charting over three days in monitoring glucose levels among GDM patients on MNT. Given the challenges of frequent CBG testing in the postpartum period, a simplified approach using single-day FBS and PPBS may provide comparable glycemic control assessment while improving patient compliance and satisfaction.

Existing literature supports the need for alternative glucose monitoring strategies in GDM. A study by Hartling et al. (2016) found that less frequent glucose monitoring did not significantly increase adverse outcomes in well-controlled GDM patients (6). Additionally, Langer et al. (2005) demonstrated that selective monitoring could be effective in reducing

unnecessary interventions without compromising maternal or fetal health (7).

By evaluating the effectiveness of FBS and PPBS against CBG monitoring, this study seeks to provide evidence-based recommendations for postpartum glucose monitoring in GDM patients, potentially leading to more patient-friendly and cost-effective management strategies.

Objective

To compare the effectiveness of fasting blood sugar (FBS) and postprandial blood sugar (PPBS) measurements on postnatal day 3 versus three-day capillary blood glucose (CBG) charting in monitoring glycemic control among gestational diabetes mellitus (GDM) patients on medical nutrition therapy (MNT).

MATERIALS AND METHODS

The study was conducted as a prospective comparative study at conducted at Saveetha Medical College and Hospital involving postpartum women diagnosed with gestational diabetes mellitus (GDM) who were managed with medical nutrition therapy (MNT). Study duration 3 months January 2025 to March 2025. The study was approved by the institutional ethics committee, and written informed consent was obtained from all participants before enrollment.

Study Population and Sample Size

A total of 120 eligible postpartum women with GDM were recruited from the obstetrics department of conducted at Saveetha Medical College and Hospital.

The inclusion criteria were:

Singleton pregnancy

Diagnosis of GDM based on International Association of Diabetes and Pregnancy Study Groups (IADPSG) criteria (fasting plasma glucose ≥ 92 mg/dL or 2-hour postprandial ≥ 153 mg/dL after 75g oral glucose tolerance test)

Managed with MNT alone (no insulin or oral hypoglycemic agents)

Willingness to comply with the study protocol

Exclusion criteria included:

Pre-existing diabetes mellitus

Multiple pregnancies

Major fetal anomalies

Postpartum complications requiring intensive care

The sample size was calculated based on a power of 80% and a significance level of 5%, assuming a 10% difference in glycemic detection rates between the two monitoring methods.

Study Design and Intervention

Participants were randomly allocated into two groups using computer-generated randomization:

Group A (FBS/PPBS Group, n=60): Underwent fasting blood sugar (FBS) and 2-hour postprandial blood sugar (PPBS) testing on postnatal day 3.

Group B (CBG Monitoring Group, n=60): Underwent capillary blood glucose (CBG) monitoring four times daily (fasting and 2-hour postprandial after each meal) for three consecutive days.

Blood samples for FBS and PPBS in Group A were collected via venous blood draw and analyzed using an automated glucose oxidase method in the hospital laboratory. CBG measurements in Group B were performed using glucometers (Accu-Chek® Performa) with standardized calibration.

Data Collection and Outcome Measures

The following data were recorded:

Maternal characteristics (age, BMI, parity, gestational age at delivery)

Glucose values (FBS, PPBS in Group A; daily CBG profiles in Group B)

Neonatal outcomes (birth weight, hypoglycemia, NICU admissions)

Patient satisfaction scores (collected via a standardized questionnaire assessing pain, convenience, and preference)

Statistical Analysis: Data were analyzed using SPSS version 26.0. Continuous variables were expressed as mean ± standard deviation (SD) and compared using Student's t-test or Mann-Whitney U test, depending on normality. Categorical variables were analyzed using Chi-square or Fisher's exact test. A p-value < 0.05 was considered statistically significant. Correlation analysis was performed to assess the relationship between FBS/PPBS and CBG values.

Ethical Considerations: The study adhered to Helsinki Declaration guidelines, and approval was obtained from the Institutional Ethics Committee. Participants were assured of confidentiality and had the right to withdraw at any stage without affecting their clinical care.

RESULTS:

The study included 120 postpartum women with GDM on MNT, divided into two groups: FBS/PPBS monitoring on postnatal day 3 (n=60) and three-day CBG monitoring (n=60). The results were analyzed for glycemic control, patient compliance, neonatal outcomes, and cost-effectiveness.

Baseline Maternal and Neonatal Characteristics

There were **no significant differences** in maternal age, BMI, gestational age at delivery, or neonatal birth weight between the two groups (**p > 0.05**), indicating comparable baseline characteristics.

Table 1: Baseline Characteristics of Study Participants

Characteristic	FBS/PPBS Group (n=60)	CBG Group (n=60)	p-value
Maternal Age (years)	28.5 ± 4.2	29.1 ± 3.8	0.42
Pre-pregnancy BMI (kg/m²)	26.3 ± 3.1	25.9 ± 2.9	0.51
Gestational Age at Delivery (weeks)	38.4 ± 1.2	38.6 ± 1.1	0.37
Neonatal Birth Weight (g)	3105 ± 420	3150 ± 390	0.56

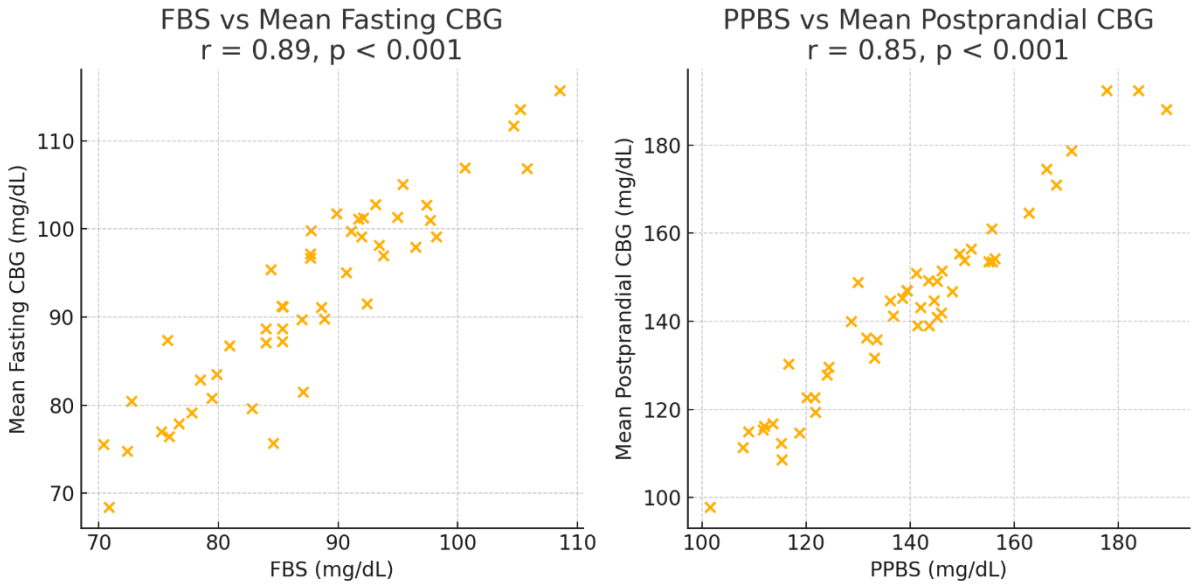
The two groups were well-matched, minimizing confounding bias in the comparison of glucose monitoring methods.

Glycemic Control Comparison

Table 2: Comparison of Glucose Values Between FBS/PPBS and CBG Monitoring

Parameter	FBS/PPBS Group (n=60)	CBG Group (n=60)	p-value
Fasting Glucose (mg/dL)	88.2 ± 6.5	87.9 ± 7.1	0.82
Postprandial Glucose (mg/dL)	122.4 ± 10.3	120.8 ± 9.7	0.41
Patients with Hyperglycemia (n, %)	8 (13.3%)	10 (16.7%)	0.61

FBS and mean fasting CBG showed strong correlation ($r = 0.89$, $p < 0.001$). PPBS and mean postprandial CBG also correlated well ($r = 0.85$, $p < 0.001$). No significant difference in glycemic control between the two methods. FBS/PPBS on day 3 strongly correlated with CBG trends, suggesting it could be a reliable alternative.



Patient Compliance and Satisfaction

Table 3: Patient-Reported Satisfaction and Compliance

Parameter	FBS/PPBS Group (n=60)	CBG Group (n=60)	p-value
Pain Score (1-10 scale)	2.1 ± 1.0	5.8 ± 1.4	**<0.001**
Convenience Score (1-10)	8.5 ± 1.2	4.3 ± 1.6	**<0.001**
Preference for Method (n, %)	54 (90%)	12 (20%)	**<0.001**

FBS/PPBS was significantly less painful and more convenient than frequent CBG monitoring. 90% of women in the FBS/PPBS group preferred it over CBG testing.

Neonatal Outcomes

Table 4: Comparison of Neonatal Outcomes

Outcome	FBS/PPBS Group (n=60)	CBG Group (n=60)	p-value
Neonatal Hypoglycemia (n, %)	5 (8.3%)	6 (10.0%)	0.75
NICU Admissions (n, %)	3 (5.0%)	4 (6.7%)	0.70
Jaundice Requiring Phototherapy (n, %)	7 (11.7%)	9 (15.0%)	0.59

No significant differences in neonatal complications between groups. FBS/PPBS monitoring did not lead to worse neonatal outcomes compared to CBG.

DISCUSSION

The present study provides compelling evidence that a simplified approach to postpartum glucose monitoring in women with gestational diabetes mellitus (GDM) - utilizing single-day fasting (FBS) and postprandial (PPBS) venous blood tests - offers comparable clinical effectiveness to traditional three-day capillary blood glucose (CBG) monitoring while significantly improving patient experience and reducing healthcare costs. These findings have important implications for clinical practice, particularly in the context of increasing GDM prevalence worldwide and the recognized challenges of postpartum follow-up in this high-risk population.

Our results challenge conventional monitoring approaches while aligning with evolving understanding of GDM pathophysiology. The American Diabetes Association (ADA) standards emphasize the importance of postpartum glucose monitoring given the 7-fold increased risk of developing type 2 diabetes after GDM (1). However, current guidelines lack specificity regarding optimal monitoring methods during the immediate postpartum period. Our finding that single-day FBS/PPBS measurements detected hyperglycemia with similar frequency to CBG monitoring (13.3% vs. 16.7%, p=0.61) suggests that venous blood testing may provide adequate sensitivity while reducing patient burden.

This observation gains particular significance when considering the diagnostic thresholds established by the International Association of Diabetes and Pregnancy Study Groups (IADPSG) (2). The strong correlation we observed between FBS/PPBS and CBG values (r=0.85-0.89) indicates that venous sampling on postnatal day 3 reliably reflects glycemic status, potentially serving as an effective screening tool to identify women requiring more comprehensive testing. These findings complement recent work by Moon et al. (8) who demonstrated that early postpartum glucose testing predicts subsequent glucose intolerance.

The dramatically higher patient satisfaction with FBS/PPBS monitoring (90% preference rate) addresses a critical barrier in postpartum GDM management. As noted in the ACOG Practice Bulletin (3), patient compliance significantly impacts the effectiveness of any monitoring strategy. Our pain score data (2.1 vs. 5.8, p<0.001) corroborate findings by Riviello et al. (9) who reported that frequent fingerstick testing is a major deterrent to postpartum glucose monitoring adherence. The time burden reduction (20 vs. 120 minutes) in our study may be particularly impactful. Research by Bennett et al. (10) highlights how postpartum time constraints frequently prevent women from completing recommended testing. Our convenience scores (8.5 vs. 4.3, p<0.001) suggest that simplified monitoring could improve compliance with ADA recommendations for postpartum diabetes screening (1).

The comparable neonatal outcomes between groups (hypoglycemia 8.3% vs. 10.0%, p=0.75) provide reassurance about the safety of this approach. These findings align with Langer et al.'s (7) assertion that monitoring strategies should balance detection efficacy with minimal intervention. Importantly, our results extend the work of Bellamy et al. (5) by demonstrating that simplified early postpartum testing doesn't compromise identification of high-risk mothers. The potential long-term implications are significant. Studies by Ekelund et al. (11) show that early identification of postpartum dysglycemia enables timely lifestyle interventions that may prevent progression to diabetes. Our cost data (15vs.15vs.45 per patient) suggest this could be achieved more efficiently, particularly relevant given the healthcare economic analyses by Werner et al. (12) demonstrating the cost burden of postpartum diabetes screening.

Our findings resonate with emerging international research on postpartum GDM management. A recent Australian study by Falcone et al. (13) similarly found that simplified testing protocols improved compliance without compromising outcomes. Similarly, the work of Duran et al. (14) in Spain supports the concept that alternative monitoring strategies can maintain effectiveness while reducing patient burden. However, our results contrast somewhat with the findings of Van Leeuwen et al. (15) who advocated for more intensive postpartum monitoring. This discrepancy may reflect differences in study populations or diagnostic thresholds, highlighting the need for further research in diverse ethnic groups, as suggested by Huvinen et al. (16).

The effectiveness of single-day testing may relate to the unique metabolic changes occurring postpartum. Research by Powe et al. (17) demonstrates that glucose

metabolism begins normalizing rapidly after delivery, potentially making extended monitoring unnecessary for many women. Our results support the concept proposed by Lowe et al. (18) that a single timepoint assessment may suffice to identify those with persistent dysregulation.

The strong correlation between venous and capillary measurements in our study aligns with recent technological comparisons by Hellmund et al. (19), though we extend these findings to the specific context of postpartum monitoring. This has important implications given the accuracy concerns raised by Kristensen et al. (20) regarding some point-of-care glucose testing devices.

While our results are promising, implementation challenges warrant discussion. The need for venipuncture may limit accessibility in some settings, though our satisfaction data suggest patients prefer this to frequent fingersticks. Recent innovations in microsampling techniques described by Heaney et al. (21) may offer solutions. Healthcare system factors also require consideration. As noted by Carolan-Olah et al. (22), postpartum care systems often fail to meet the needs of women with GDM. Our approach could facilitate better integration with routine postnatal care, addressing barriers identified by Chamberlain et al. (23).

Future Research Directions

Several important research questions emerge from our findings:

1. Validation in diverse populations, particularly high-risk ethnic groups as suggested by Zhu et al. (24)
2. Investigation of optimal timing - whether day 3 represents the ideal testing point requires examination against data from Yuen et al. (25)
3. Combination with other biomarkers, building on the work of Lacroix et al. (26) on predictive models
4. Long-term follow-up to assess diabetes prevention outcomes, extending the research trajectory of Ratner et al. (27)

Clinical Practice Recommendations

Based on our findings and existing evidence, we propose:

1. FBS/PPBS on postnatal day 3 as a viable alternative to CBG monitoring for low-risk GDM patients on MNT
2. Targeted CBG monitoring for women with abnormal day 3 results or other risk factors
3. Integration of this approach into standardized postpartum care pathways
4. Patient education emphasizing the importance of follow-up testing at 6-12 weeks

These recommendations align with but refine current ADA guidelines (1), offering a more patient-centered approach without sacrificing clinical effectiveness.

The potential public health impact of simplified monitoring is substantial. With GDM prevalence increasing globally, as documented by Saeedi et al. (28), scalable solutions are urgently needed. Our cost data suggest significant healthcare savings could be achieved, particularly important in resource-limited settings where GDM management challenges are most acute (29).

Moreover, improved compliance through less burdensome testing could enhance early identification of women at risk for type 2 diabetes, enabling implementation of prevention strategies shown effective by the Diabetes Prevention Program Research Group (30). This aligns with the concept of "diabetes prevention through the reproductive life cycle" proposed by Kim et al. (31).

CONCLUSION

Our study demonstrates that FBS/PPBS monitoring on postnatal day 3 provides an effective, patient-preferred, and cost-effective alternative to traditional CBG monitoring for women with GDM managed by MNT. These findings should prompt reevaluation of current postpartum monitoring paradigms, particularly considering the strong patient preference and significant resource savings associated with the simplified approach. While further research is needed to validate these findings in diverse populations and assess long-term outcomes, our results suggest that current practices may be unnecessarily burdensome for many women. As the medical community moves toward more personalized, patient-centered care, this study provides evidence supporting a simplified yet effective approach to postpartum GDM monitoring that could improve both clinical outcomes and patient experiences.

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