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Fetomaternal Outcomes in Gestational Diabetes Mellitus Diagnosed by the DIPSI Method: A Prospective Observational Study

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ABSTRACT

Background Gestational diabetes mellitus (GDM) remains an important metabolic disorder of pregnancy in South Asian populations, where universal antenatal testing is often favoured because selective testing may miss clinically relevant cases. The Diabetes in Pregnancy Study Group India (DIPSI) method offers a pragmatic single-step approach that can be performed without fasting.

Objective To evaluate fetomaternal outcomes among women diagnosed with GDM by the DIPSI method in a prospective antenatal cohort.

Methods This prospective observational study included 115 pregnant women who underwent DIPSI testing between 24 and 28 weeks of gestation at Maharaja Krishna Chandra Gajapati (MKCG) Medical College, Berhampur, Odisha. The study period was January 2025 to December 2025. GDM was diagnosed when the two-hour plasma glucose value after 75 g oral glucose was ≥140 mg/dL. Maternal, obstetric, neonatal, and fetomaternal outcomes were analysed according to DIPSI status.

Results DIPSI-positive GDM was identified in 22 women (19.1%). The GDM-positive group had higher mean age (32.9±1.8 vs. 26.7±1.9 years), higher BMI (26.6±1.4 vs. 22.8±1.1 kg/m²), and higher two-hour plasma glucose (164.0±17.3 vs. 119.3±9.7 mg/dL), with all comparisons showing $p<0.001$. Induction of labour was more frequent in the GDM-positive group (12/22, 54.5%) than in the DIPSI-negative group (10/93, 10.8%; $p<0.001$). LSCS delivery was also higher among DIPSI-positive women (45.5% vs. 21.5%; $p=0.031$). Neonatal hypoglycemia occurred in 7 (31.8%) newborns of DIPSI-positive mothers compared with 1 (1.1%) among DIPSI-negative pregnancies ($p<0.001$). Macrosomia >4 kg was observed in 4 (18.2%) DIPSI-positive pregnancies and 1 (1.1%) DIPSI-negative pregnancy ($p=0.005$).

Conclusion DIPSI-positive GDM was associated with higher maternal age, higher BMI, and a greater frequency of selected obstetric and neonatal complications. The findings support the practical relevance of DIPSI-based testing in routine antenatal care, while emphasising that women with positive results require closer surveillance rather than risk labelling alone.

Keywords: *Gestational Diabetes Mellitus, DIPSI, Fetomaternal Outcome, Neonatal Hypoglycemia, Macrosomia, Pregnancy.*

INTRODUCTION

Gestational diabetes mellitus is generally understood as hyperglycaemia first recognised during pregnancy, although diagnostic definitions have shifted as evidence has matured. The clinical importance of GDM lies in its double window of

risk. It may disturb the index pregnancy through hypertensive disorders, macrosomia, operative delivery, neonatal hypoglycemia, and NICU admission, and it may also identify a mother-child pair at higher future metabolic risk.[1]

In India, the problem has a particular public health weight. Antenatal women often move between primary centres, private clinics, district hospitals, and tertiary referral units. A diagnostic strategy that needs fasting, multiple samples, and repeated visits can fail simply because it does not fit the realities of crowded outpatient care. The national technical and operational guideline therefore supports universal testing using a single-step 75 g oral glucose test, irrespective of the last meal, with two-hour plasma glucose ≥140 mg/dL taken as diagnostic for GDM.[2]

International bodies have also emphasised the need for feasible screening models, especially in settings where the background risk of diabetes is high. FIGO has argued for pragmatic GDM screening and care pathways adapted to local resources rather than a single rigid global model.[3]

The American Diabetes Association continues to recognise that screening, diagnosis, nutritional therapy, glucose monitoring, and pharmacological treatment when needed are central to reducing pregnancy-related morbidity.[4]

The biological basis for concern is no longer speculative. The Hyperglycemia and Adverse Pregnancy Outcome study demonstrated continuous associations between maternal glucose levels and adverse perinatal outcomes, including birth weight above the 90th percentile, primary caesarean delivery, neonatal hypoglycemia, and elevated cord C-peptide.[5]

This work strongly influenced later international diagnostic frameworks, including the IADPSG recommendations. Even then, for many Indian clinics, the immediate question remains practical: will a simple DIPSI-based diagnosis identify women who actually experience adverse obstetric or neonatal events?[6]

The DIPSI method has remained attractive because it compresses screening and diagnosis into one visit. Current DIPSI guidance reaffirms its role in Indian practice, especially where universal antenatal testing is expected but fasting OGTT logistics are difficult.[7]

Indian work has also supported the single-test approach as economical, acceptable, and implementable in community settings. However, outcome-focused evidence remains important because diagnostic convenience alone is not enough. The test must lead to meaningful risk recognition.[8]

The present study was therefore conducted to assess fetomaternal outcomes among pregnant women diagnosed with GDM by the DIPSI method in a prospective cohort. The emphasis was deliberately clinical: hypertensive disorders, polyhydramnios, mode of delivery, preterm birth, macrosomia, neonatal hypoglycemia, NICU admission, sepsis, and composite fetomaternal outcome.

MATERIALS AND METHODS

Study Design and Setting

This was a prospective observational study conducted in the Department of Obstetrics and Gynaecology at Maharaja Krishna Chandra Gajapati (MKCG) Medical College, Berhampur, Odisha.

Study Period

The study was conducted over one year from January 2025 to December 2025.

Study Population

The study included 115 pregnant women who underwent DIPSI testing during antenatal care. Gestational age at testing ranged from 24 to 28 weeks.

DIPSI Procedure and Diagnostic Criterion

Each participant was evaluated using the DIPSI method. A 75 g oral glucose load was administered irrespective of the last meal, and venous plasma glucose was measured two hours later. GDM was diagnosed when the two-hour plasma glucose value was ≥140 mg/dL.

Variables Recorded

Maternal age, BMI, parity, gestational age at DIPSI testing, and two-hour plasma glucose value were recorded. Maternal outcomes included hypertensive disorder, preeclampsia, gestational hypertension, polyhydramnios, urinary tract infection, postpartum haemorrhage, induction of labour, LSCS delivery, and any maternal complication. Neonatal and perinatal outcomes included preterm birth, macrosomia defined as birth weight >4 kg, shoulder dystocia, neonatal hypoglycemia, NICU admission, neonatal sepsis, perinatal death, and adverse fetomaternal outcome.

Statistical Analysis

Continuous variables were expressed as mean ± standard deviation. Categorical variables were expressed as frequency and percentage. Women with DIPSI-positive GDM were compared with DIPSI-negative women. Independent-sample t-test was used for continuous variables. Chi-square test or Fisher's exact test was used for categorical variables, as appropriate. A p-value <0.05 was considered statistically significant.

RESULTS

A total of 115 pregnant women were included. DIPSI-positive GDM was diagnosed in 22 women (19.1%), while 93 women (80.9%) were DIPSI-negative. The distribution of DIPSI status is shown in Figure 1.

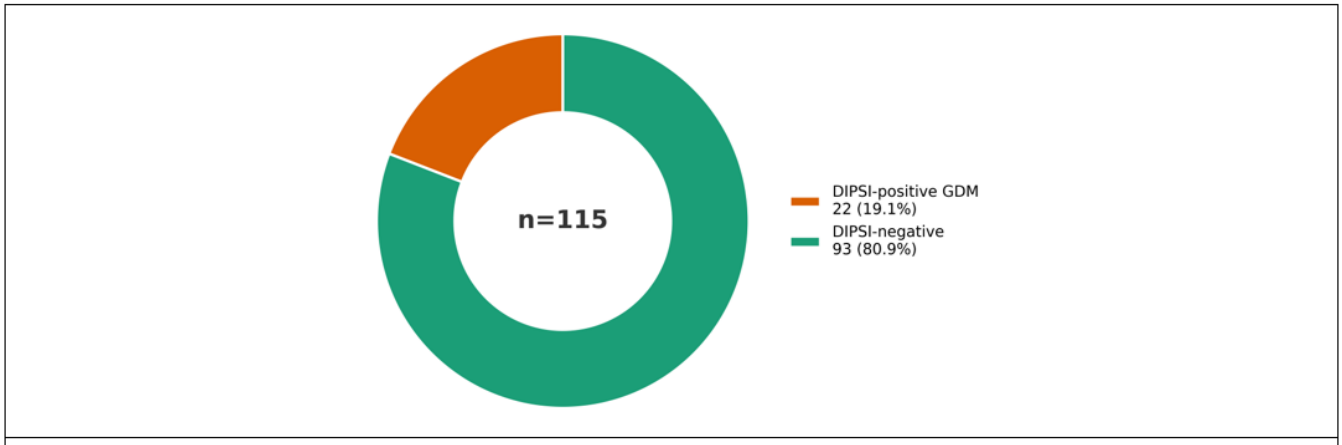


Figure 1. Distribution of DIPSI status in the study cohort

Donut chart displays the proportion of women with DIPSI-positive GDM and DIPSI-negative status.

The GDM-positive group was older, had higher BMI, and had a higher two-hour plasma glucose value than the DIPSI-negative group. Parity distribution showed a higher proportion of higher-order parity among DIPSI-positive women, although the overall parity distribution did not reach statistical significance. Baseline and glycaemic characteristics are presented in Table 1.

Variable	Overall (n=115)	DIPSI-positive GDM (n=22)	DIPSI-negative (n=93)	p-value
Age (years)	27.9 ± 3.1	32.9 ± 1.8	26.7 ± 1.9	<0.001
BMI (kg/m²)	23.5 ± 1.9	26.6 ± 1.4	22.8 ± 1.1	<0.001
Gestational age at DIPSI (weeks)	25.7 ± 1.0	24.4 ± 0.6	26.0 ± 0.8	<0.001
2-hour plasma glucose (mg/dL)	127.9 ± 21.0	164.0 ± 17.3	119.3 ± 9.7	<0.001
Nulliparous	60 (52.2%)	8 (36.4%)	52 (55.9%)	0.137
Parity 1	29 (25.2%)	7 (31.8%)	22 (23.7%)	
Parity 2	17 (14.8%)	3 (13.6%)	14 (15.1%)	
Parity 3	9 (7.8%)	4 (18.2%)	5 (5.4%)	
DIPSI-positive GDM	22 (19.1%)	22 (100.0%)	0 (0.0%)	—

Table 1. Baseline clinical and glycaemic profile according to DIPSI status (n=115)

Values are presented as mean±SD or n (%). DIPSI: Diabetes in Pregnancy Study Group India; GDM: gestational diabetes mellitus

Maternal and obstetric outcomes were observed in both DIPSI-positive and DIPSI-negative women, but several events were proportionately more frequent among those with GDM. Induction of labour, LSCS delivery, polyhydramnios, gestational hypertension, and any maternal complication showed statistically significant differences between the two groups. The distribution of maternal outcomes is summarized in Table 2, and selected maternal events are illustrated in Figure 2.

Outcome	Overall (n=115)	DIPSI-positive GDM (n=22)	DIPSI-negative (n=93)	p-value
Hypertensive disorder	13 (11.3%)	5 (22.7%)	8 (8.6%)	0.126
Preeclampsia	8 (7.0%)	3 (13.6%)	5 (5.4%)	0.178
Gestational hypertension	5 (4.3%)	3 (13.6%)	2 (2.2%)	0.048
Polyhydramnios	7 (6.1%)	4 (18.2%)	3 (3.2%)	0.024
Urinary tract infection	14 (12.2%)	4 (18.2%)	10 (10.8%)	0.466

Postpartum haemorrhage	5 (4.3%)	2 (9.1%)	3 (3.2%)	0.243
Induction of labour	22 (19.1%)	12 (54.5%)	10 (10.8%)	<0.001
LSCS delivery	30 (26.1%)	10 (45.5%)	20 (21.5%)	0.031
Any maternal complication	10 (8.7%)	5 (22.7%)	5 (5.4%)	0.022
Table 2. Maternal and obstetric outcomes according to DIPSI status				
Values are presented as n (%). Fisher's exact test was used where expected cell counts were small				

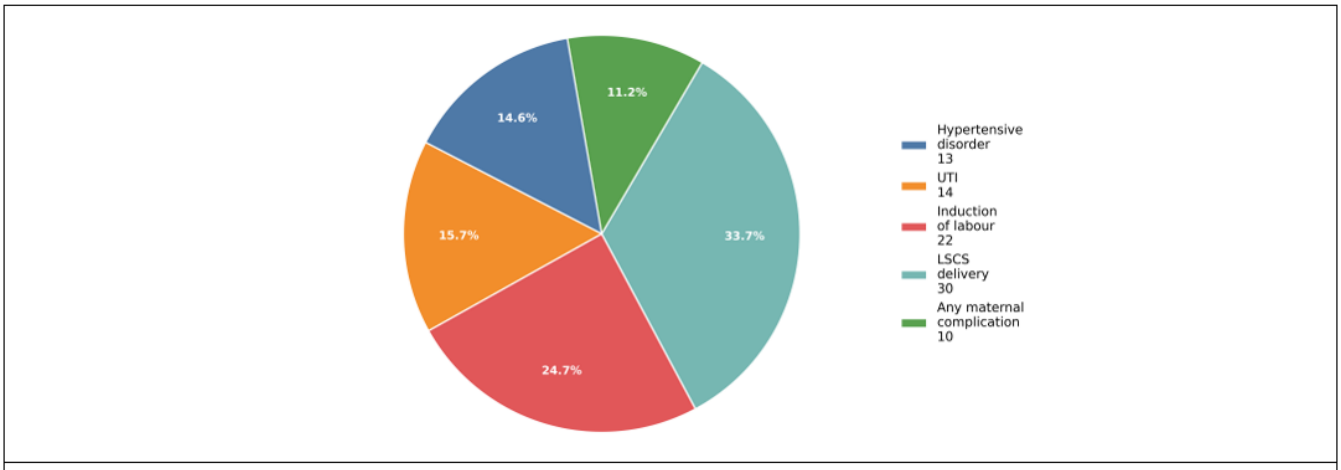


Figure 2. Distribution of selected maternal and obstetric outcomes

Pie chart shows event counts for selected maternal and obstetric outcomes. Percentages reflect distribution across displayed events, not cohort prevalence.

Neonatal morbidity also showed a clinically relevant pattern. Neonatal hypoglycemia, macrosomia >4 kg, shoulder dystocia, preterm birth, and neonatal sepsis were proportionately more frequent among DIPSI-positive pregnancies. There was one perinatal death, recorded in the DIPSI-positive group. Neonatal and perinatal outcomes are presented in Table 3 and Figure 3.

Outcome	**Overall (n=115)**	**DIPSI-positive GDM (n=22)**	**DIPSI-negative (n=93)**	**p-value**
Preterm birth	10 (8.7%)	5 (22.7%)	5 (5.4%)	0.022
Macrosomia (>4 kg)	5 (4.3%)	4 (18.2%)	1 (1.1%)	0.005
Shoulder dystocia	4 (3.5%)	3 (13.6%)	1 (1.1%)	0.022
Neonatal hypoglycemia	8 (7.0%)	7 (31.8%)	1 (1.1%)	<0.001
NICU admission	9 (7.8%)	4 (18.2%)	5 (5.4%)	0.066
Neonatal sepsis	5 (4.3%)	3 (13.6%)	2 (2.2%)	0.048
Perinatal death	1 (0.9%)	1 (4.5%)	0 (0.0%)	0.191
Any adverse fetomaternal outcome	4 (3.5%)	2 (9.1%)	2 (2.2%)	0.165
Table 3. Neonatal and perinatal outcomes according to DIPSI status				
Values are presented as n (%). NICU: neonatal intensive care unit				

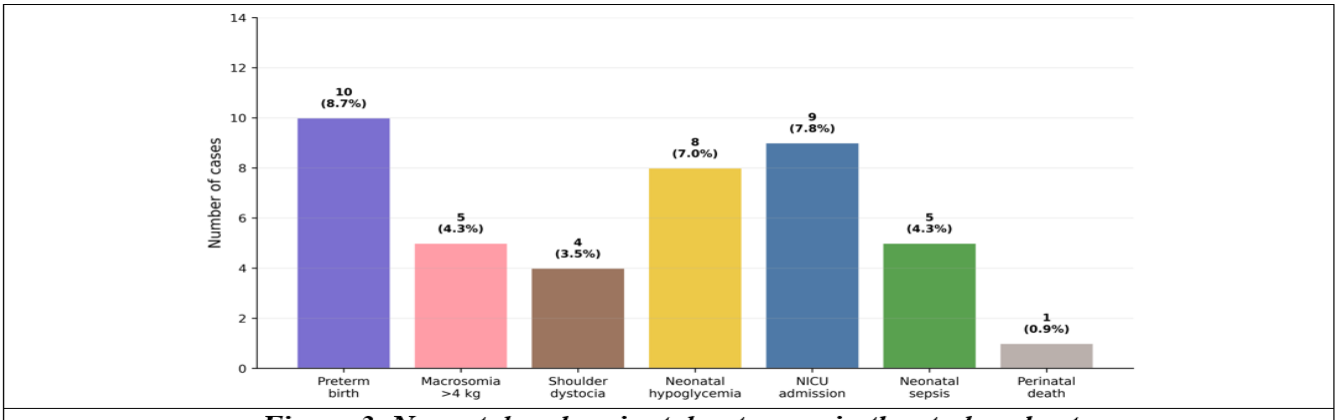


Figure 3. Neonatal and perinatal outcomes in the study cohort

Bar chart displays cohort-level prevalence of selected neonatal and perinatal outcomes. Values above bars indicate counts and percentages.

When outcomes were examined across two-hour plasma glucose strata, women with plasma glucose values ≥140 mg/dL showed higher clustering of LSCS delivery, neonatal hypoglycemia, NICU admission, and macrosomia compared with the <140 mg/dL stratum. The glucose-strata distribution is shown in Table 4 and Figure 4.

2-hour PG stratum (mg/dL)	n	Any adverse outcome	LSCS delivery	Neonatal hypoglycemia	NICU admission	Macrosomia (>4 kg)
<140	93	2 (2.2%)	20 (21.5%)	1 (1.1%)	5 (5.4%)	1 (1.1%)
140-159	12	1 (8.3%)	6 (50.0%)	4 (33.3%)	2 (16.7%)	2 (16.7%)
160-179	6	0 (0.0%)	2 (33.3%)	2 (33.3%)	1 (16.7%)	1 (16.7%)
≥180	4	1 (25.0%)	2 (50.0%)	1 (25.0%)	1 (25.0%)	1 (25.0%)

Table 4. Key outcomes according to two-hour plasma glucose strata

Values are presented as n (% within stratum). PG: plasma glucose; NICU: neonatal intensive care unit

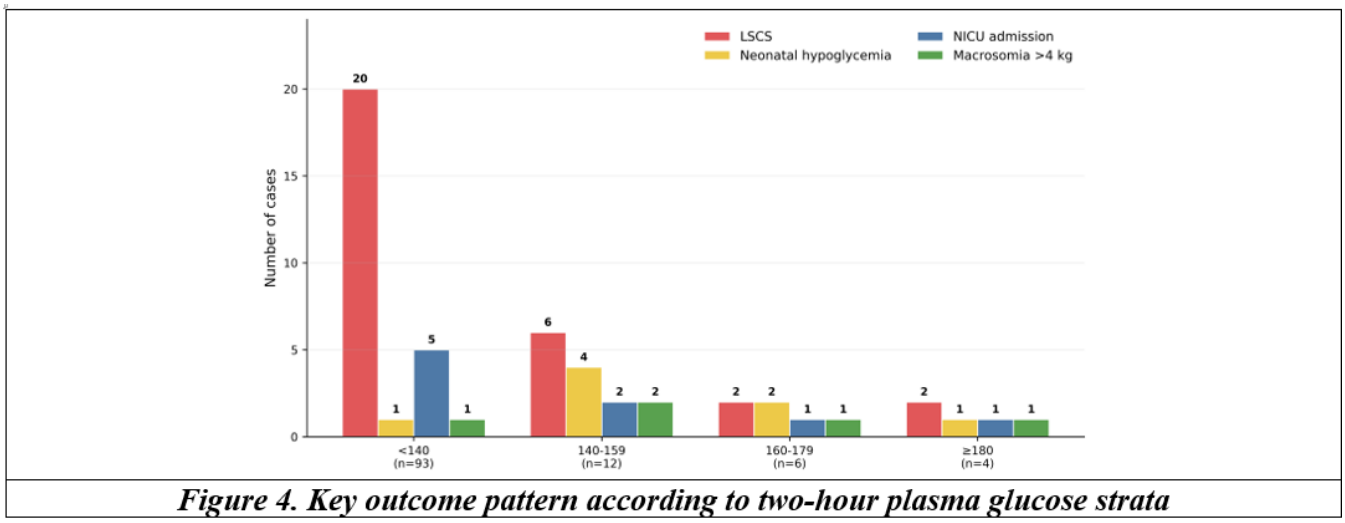


Figure 4. Key outcome pattern according to two-hour plasma glucose strata

Grouped histogram-style bar chart displays selected outcome counts across plasma glucose categories.

DISCUSSION

The present study found that 19.1% of antenatal women tested positive for GDM by the DIPSI method. This rate lies within the broad Indian range reported across different regions, risk profiles, and diagnostic strategies. DIPSI-positive women were older, had higher BMI, and showed substantially higher two-hour plasma glucose values than DIPSI-negative women.

Indian data have repeatedly shown that GDM prevalence varies widely by geography, socioeconomic position, maternal age, BMI, and diagnostic method. Balaji et al. reported the usefulness of DIPSI criteria among Asian-Indian women, while also highlighting the need for a feasible approach in Indian antenatal practice.[9] Swaminathan et al., using large national data, further demonstrated marked heterogeneity in GDM prevalence across Indian subgroups. This variation makes a single prevalence figure less useful than a context-aware interpretation of hospital-based findings.[10]

The clinical pattern observed here is coherent rather than absolute. Adverse outcomes were observed in both DIPSI-positive and DIPSI-negative women, although several clinically important events were proportionately more frequent in the DIPSI-positive group. This is consistent with real obstetric practice: GDM increases risk, but it does not monopolise risk. Anaemia, hypertensive disease, infection, obstetric history, fetal factors, and institutional delivery practice may also shape outcomes in routine Indian obstetric care.

The utility of DIPSI in Indian settings has been debated. Tripathi et al. cautioned that the non-fasting 75 g glucose load may miss some GDM cases when compared with fasting OGTT-based criteria, particularly because it does not capture isolated fasting hyperglycaemia.[11]

Conversely, more recent work from Puducherry reported high specificity and almost perfect agreement with WHO 2013 criteria, supporting DIPSI as a practical screening and diagnostic tool in primary-care environments.[12]

Maternal morbidity in the present cohort was not uniformly distributed. Induction of labour and LSCS delivery were significantly more frequent among DIPSI-positive women. Polyhydramnios and gestational hypertension also showed

higher proportional occurrence in the GDM-positive group. These findings resemble routine obstetric experience, where GDM often interacts with suspected fetal size, hypertensive surveillance, and delivery planning.

Neonatal hypoglycemia was one of the clearest neonatal signals, occurring in 31.8% of newborns of DIPSI-positive mothers compared with 1.1% among DIPSI-negative pregnancies. Prakash et al. similarly documented neonatal morbidity among infants of mothers with GDM in an Indian tertiary-care cohort.[13] The mechanism is familiar: maternal hyperglycaemia can stimulate fetal insulin secretion, and after delivery, withdrawal of placental glucose transfer may precipitate neonatal hypoglycemia. Langer et al. showed that untreated GDM increases perinatal morbidity, strengthening the argument that detection must be followed by active management rather than simple documentation.[14] Neonatal-focused reviews also emphasise hypoglycemia, macrosomia, respiratory problems, and birth trauma as important concerns in pregnancies complicated by maternal diabetes.[15]

The glucose-strata analysis adds a practical layer. The <140 mg/dL group was not completely free from complications, but selected adverse outcomes became denser across the diagnostic and higher-glucose strata. This pattern is consistent with the HAPO concept of graded glucose-related risk, even though the present study was not designed as a dose-response modelling study.

The findings also reinforce the value of timely management after diagnosis. Randomised evidence has shown that treatment of GDM can reduce serious perinatal morbidity, supporting the idea that diagnosis is an entry point into nutritional counselling, glucose monitoring, and pharmacological therapy where required.[16]

This study has limitations. It was hospital-based, and the findings should not be read as community prevalence. The sample remains modest for rare outcomes such as perinatal death and shoulder dystocia. Treatment details, glycaemic control after diagnosis, birth weight as a continuous variable, fetal growth centiles, and postpartum glucose follow-up were not available for detailed analysis. The study also did not compare DIPSI with WHO 2013 or IADPSG criteria. Even so, it provides a practical outcome-oriented view of DIPSI-positive GDM in routine antenatal care.

CONCLUSION

In this prospective observational study, 19.1% of antenatal women tested positive for GDM by the DIPSI method. DIPSI-positive GDM was associated with higher maternal age, higher BMI, higher two-hour plasma glucose values, and a greater proportional burden of induction of labour, LSCS delivery, polyhydramnios, gestational hypertension, neonatal hypoglycemia, macrosomia >4 kg, and selected neonatal complications. These findings support the practical role of DIPSI-based testing in routine antenatal care, especially when followed by timely surveillance and management.

Source of Funding
Nil.

Conflict of Interest
None declared.

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