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ORIGINAL RESEARCH

Maternal and fetal outcome in gestational diabetes mellitus (GDM), in a tertiary care hospital

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ABSTRACT

Background: Gestational diabetes mellitus is defined as glucose intolerance of variable degree diagnosed for the first time during pregnancy and is associated with probable resolution after the end of pregnancy. The present study aimed to determine the frequency of occurrence of glucose intolerance during pregnancy and assess maternal and fetal outcomes. **Methods**: A prospective observational study was conducted with a sample of 900 single-term pregnant women at a tertiary care hospital. At their first visit, irrespective of the gestational age, they were offered 75 g oral glucose irrespective of fasting state. After two hours, capillary blood glucose will be measured by a single prick using a hand glucometer. **Results:** Out of 900 pregnant women, 153 (17%) were detected to haveGDM and 753 (87%) were found to be in Non GDM group. More maternal and neonatal complications were found in the GDM group compared to the non-GDM group with a P value of 0.001. **Conclusion**: Antenatal screening for GDM during early antenatal visits is key for early diagnosis and treatment, thereby improving maternal and fetal outcomes.

Key Words:

- Antenatal screening for GDM
- Glucose intolerance during pregnancy
- Gestational diabetes mellitus

INTRODUCTION

Gestational diabetes mellitus is defined as glucose intolerance of variable degrees diagnosed for the first time during pregnancy and is associated with probable resolution after the end of pregnancy[1]. Due to the use of different screening criteria, the prevalence of GDM varies from 2% to 22% of all pregnancies[2]. Current knowledge of the pathophysiology of GDM is complex and not fully understood. Pregnancy itself is a diabetogenic state owing to the progressive rise of human placental lactogen, estrogen, progesterone, cortisol, and prolactin[3].

Pregnant women with GDM have increased chances of asymptomatic bacteriuria, hypertension, polyhydramnios, preterm labor, operative delivery, postpartum hemorrhage, and type-2 diabetes in the long term[4,5].

In gestational diabetes mellitus, the fetus is exposed to persistent hyperglycemia, which leads to an increased incidence of intrauterine death, macrosomia, respiratory disorders, polycythemia, hypoglycemia, hypomagnesemia, and hypocalcemia[6,7].

The present study was conducted at a tertiary care center to determine the frequency of occurrence of glucose intolerance during pregnancy and to observe the maternal and fetal outcomes.

METHODS

Study design: This Prospective observational study was conducted with the aim of investigating the frequency of occurrence of glucose intolerance during pregnancy and to monitor maternal and fetal outcomes.

Setting: The present study was conducted over one year in the Obstetrics and Gynaecology department, North DMC Medical College, Hindu Rao Hospital, Delhi.

Sample size: Considering a positivity rate of 13.4% by DIPSI criteria, to estimate an absolute difference of 2 to 2.5% at 95% confidence, a sample of 900 single-

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term pregnant women was enrolled from the antenatal clinics.

Selection of participants: All singleton pregnant women who visited the antenatal clinics during the study period were enrolled during their first antenatal visit.

Exclusion criteria

- Pre-existing diabetes or a history of Gestational Diabetes Mellitus (GDM)
- History of preeclampsia
- Antepartum haemorrhage
- A history of steroid use for any indication
- Multiple pregnancy

Interventions

All participants were offered a 75g oral glucose test during their first antenatal visit, regardless of their fasting state or gestational age. Capillary blood glucose levels were measured two hours after glucose administration using a hand-held glucometer.

Methods of measurement

Data collection: A pre-structured Performa was used that constituted the detailed history of all pregnant women, including previous history of congenital malformation of the foetus, IUD, stillbirth, and other medical disorders like hypothyroidism, hypertension, infertility treatment, and Polycystic Ovarian Disease (PCOD). Data was collected from clinical observations and laboratory test results. The information was systematically entered into an MS Excel database and further analysed using SPSS software.

All pregnant women, irrespective of gestational age and fasting state, were offered 75gm glucose at their first visit. After two hours, capillary blood glucose was measured by a single prick using a hand glucometer. The diagnosis of GDM was based on a glucose level ≥ 140 mg/dl. After the test, the 900 pregnant women were further divided into

GDM Group: Glucose level >140 mg/dl

Non-GDM Group: Glucose Level <140 mg/dl

Loss of data, such as dropouts or patients lost to follow-up: During the study, a total of 11 pregnant women were lost to follow-up.

- 3 women were from the GDM group
- 8 women were from the non-GDM group

Outcome measured

Primary outcome: In early pregnancy, Blood glucose levels were measured two hours after a 75g glucose load. A glucose level ≥ 140 mg/dl was considered indicative of Gestational Diabetes Mellitus (GDM), as per the Diabetes in Pregnancy Study Group India (DIPSI) criteria.

Secondary outcomes:

- **Maternal outcomes**: pregnancy complications like preeclampsia, abruptio placentae, premature rupture of membrane (PROM), IUD, and stillbirths. Delivery complications like shoulder dystocia, instrumental delivery, caesarean section, and postpartum haemorrhage.
- **Fetal outcomes**: Birth weight, Apgar score, NICU admission, neonatal complications like Respiratory distress syndrome, hypoglycaemia, and hyperbilirubinemia.

Statistical methods used: Data was compiled, entered into an MS Excel sheet, and analyzed using SPSS. The qualitative data were presented as frequency and percentage, and the quantitative data were presented as Mean ±SD. The Chi-square test assessed the association between qualitative variables, and an independent sample t-test was used to compare quantitative variables between the GDM and non-GDM groups. A p-value of less than 0.05 was taken as statistically significant.

Ethical guidelines followed by the investigators: The study adhered to ethical standards and was conducted in accordance with the policies of the institutional ethics committee. All participants provided informed consent. The investigators ensured the confidentiality and privacy of all patient data. Ethical approval was obtained from the Institutional Ethical committee.

RESULTS

We included a total of 900 pregnant women as per the inclusion criteria. Of these, 153 (17%) were in the GDM group, and 753 (87%) were in the non-GDM group. The mean age of the GDM group was 24.26 $\pm$ 3.589, and the non-GDM group was 22.99 $\pm$ 2.908 and showed a statistically significant difference ($p<0.001$).

The mean BMI of the GDM group was 20.913 $\pm$ 0.847, and the non-GDM group was 21.112 $\pm$ 1.25, with a nonsignificant difference ($p<0.561$). The mean gestational age of screening in the GDM group was 21.69 $\pm$ 2.110 weeks and in the non-GDM group 20.63 $\pm$ 2.584 weeks (Table 1). In our study, 11 pregnant women were lost to follow-up, 3 belonged to the GDM group 8 belonged to the non-GDM group

In the GDM group 43 (28.1%) were primigravida and 110 (71.89%) were multigravida. Among the non-GDM group 330 (44.17%) were primigravida and 417 (55.82%) were multigravida.

Various maternal complications in the GDM group were more frequent than in the non-GDM group. women had Preeclampsia GDM 8 (5.3%) Vs non-GDM 16 (2.1%), Intrahepatic cholestasis of pregnancy GDM 6(4%) Vs non-GDM 12 (1.6%), Polyhydramnios GDM 10 (6.67%) Vs non-GDM (0%), Preterm labor GDM 11(7.34%) Vs non-GDM 5(0.6%), Intrauterine death GDM 2(1.3%) Vs non-GDM (0%), Shoulder dystocia GDM 3(2%)Vs non-GDM 1(0.13%), Postpartum hemorrhage GDM 14(9.34%) Vs non-GDM 11(1.4%) and wound sepsis

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GDM 7(4.6%) Vs non-GDM 6(0.8%). The results showed a statistically significant difference (p<0.001) (Table 2).

Preterm delivery in GDM group 12(8%) Vs non-GDM 5(0.67%), term vaginal delivery GDM group 80(54%) Vs non-GDM 679(91.88%), Instrumental delivery GDM group 5(3.33%) Vs non-GDM 11(1.4%). GDM group had more cesarean deliveries, 52(34.66%) Vs non-GDM 44(5.9%) showed a statistically significant difference. (p< 0.001) (Table 3)

The mean birth weight was higher in the GDM group, 3.216 ± 0.404 Vs non-GDM 2.858± 0.172, showing a significant difference (p< 0.001).

Neonates with an Apgar score less than 7 at 1 minute were more in the GDM group 13(8.78%) whereas in non-GDM 13(1.76%), had a significant difference (0.001). More NICU admissions were noted in the GDM group 46(31.08%) Vs non-GDM 18 (2.43%), shown a significant difference (0.001) (Table 4)

Neonatal complications in the GDM group were more in comparison to the non-GDM group. Respiratory distress syndrome GDM 9(6%) Vs non-GDM 12(1.6%), Prematurity GDM 8(5.33%) Vs non-GDM 3(0.40%), Macrosomia GDM 4(2.66%) Vs non-GDM (0%), Sepsis GDM 5(3.33%) Vs non-GDM (0%), Hyperbilirubinemia GDM 10(6.66%) Vs non-GDM (0%) , Hypoglycemia GDM 9(6%) Vs non-GDM (0%) and Low birth weight GDM (0%) Vs non-GDM 1(0.13%),ho showed a significant difference(p<0.001) (Table 4)

TABLE 1 – COMPARISON OF MEAN AGE, GESTATIONAL AGE, AND BMI

	NON-GDM	GDM	LITERATURE
Mean Age	22.99 ± 2.908	24.26 ± 3.589	28.38 ± 4.31 years seshaiah et al[8] 27.9 years Ismail et al[9]
Mean Gestational Age of screening	20.63 ± 2.584	21.69 ± 2.110	20.05 ± 10.71 week seshaiah et[8]
Mean BMI	21.112 + 1.25	20.913 + 0.847	25.6± 5 Kumari R et al[10]

TABLE 2: DISTRIBUTION OF MATERNAL COMPLICATIONS

	Non GDM Group(n=739)	GDM Group (n=150)
Preeclampsia	16 (2.1%)	8 (5.3%)
Preterm labour	5 (0.6%)	11 (7.34%)
Intrauterine death	0	2 (1.3%)
Intrahepatic cholestasis of pregnancy	12(1.6%)	6 (4%)
Polyhydramnios	0	10 (6.67%)
Sholder dystocia	1 (0.13%)	3 (2%)
Postpartum hemorrhage	11 (1.4%)	14 (9.34%)
Wound sepsis	6 (0.8%)	7(4.6%)
No complication	689(93.2%)	91 (60.6%

TABLE-3- COMPARISION OF MODE OF DELIVERY

	GDM group (n=150)	Non GDM group (n=739)	Jani SK et al[15] (n=104)	Kumari, *et al*[9] (n=170)
Term Vaginal delivery	81(54%)	679(91.88%)	25(24.038%)	59(34.7%)
Preterm vaginal delivery	12(8%)	5(0.67%)	17(16.34%)	18(10.58%)
Instrumental delivery	5 (3.33%)	11(1.4%)	2 (1.92%)	8(4.7%)
Caesarean delivery	52 (34.66%)	44 (5.9%)	60(57,69%)	85(50%)

TABLE 4: DISTRIBUTION OF NEONATAL OUTCOME

	Non-GDM (n=739)	GDM(n=148)	P value
Mean Birth weight	2.858± 0.172	3.216 ± 0.404	<0.001
Apgar score at 1min <7	13(1.76%)	13(8.78%)	<0.001
Apgar score at 1min >7	726(98.24%)	135(91.21%)	
No NICU admission	721(97.56%)	102 (68.9%)	<0.001
NICU admission	18(2.43%)	46(31.08%)	

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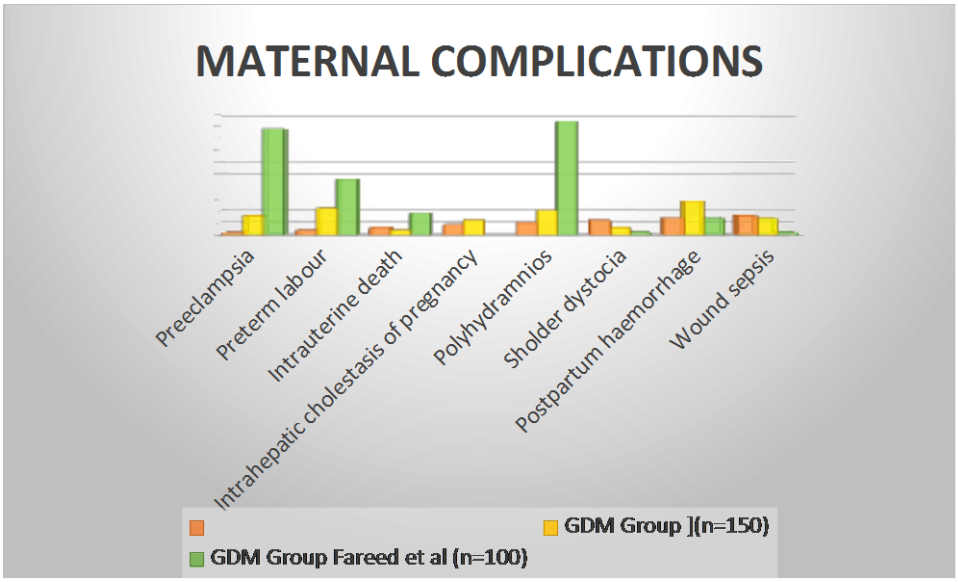

FIGURE 1.

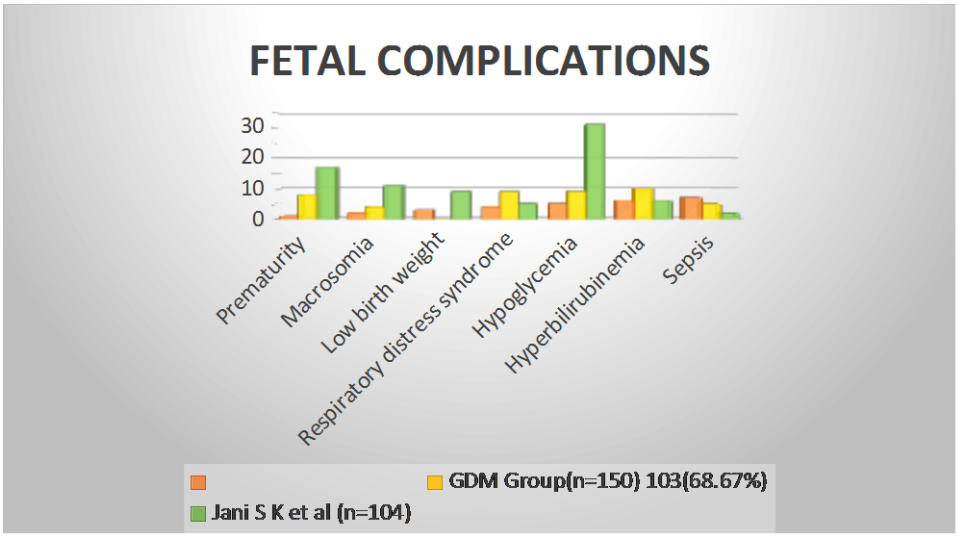

FIGURE 2.

DISCUSSION

This study was conducted at Hindu Rao Hospital, a tertiary care facility, to investigate the frequency of glucose intolerance during the early weeks of pregnancy and to observe both maternal and fetal outcomes. A total of 900 singleton pregnant women as per the inclusion criteria were enrolled, of whom 153 were in the GDM group and 747 were in the non-GDM group. We found a 17% prevalence of GDM in our study; a similar prevalence of 17.9% was observed by Seshiah et al.[8]

As shown in Table .1, the Mean age of the GDM group was 24.26 $\pm$ 3.589, and the non-GDM group 22.99 $\pm$ 2.908 ($p = 0.001$), aligning with the finding of Ismail *et al*[9] (27.9). There was no significant difference in the mean BMI of the GDM group, 20.913 ± 0.847, and the non-GDM group, 21.112 ± 1.25 ($p = 0.567$). A Similar results were observed by Kumari R et al[10] ($p = 0.723$).

The mean gestational age at screening of the GDM group was 21.69 $\pm$ 2.110 weeks and in the non-GDM group 20.63 $\pm$ 2.584 weeks, comparable to Seshiah et al[8] (20.05 ± 10.71). Most GDM cases, 135 (88.24%), were diagnosed before 24 weeks of gestation, and 18 (11.76%) were diagnosed after 24 weeks. This is in contrast to a study done by Seshiah et al[8] where 38.7% were diagnosed before 24 weeks and 61.3% after 24 weeks of gestation.

In the GDM group 43 (28.1%) were primigravida and 110 (71.89%) were multigravida. Among the non-GDM group 330 (44.17%) were primigravida and 417 (55.82%) were multigravida. Our results were comparable to those of the study by Koivunen et al[11]. 44.8% were primigravida. In both groups, there were more multigravida than primigravida. Shingala KD et al[12] also reported similar results 30% were primigravida and 70% were multigravida.

Two intrauterine deaths (1.3%) occurred in the GDM group in the third trimester, both associated with

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irregular antenatal visits and uncontrolled blood sugar levels. Saxena *et al*[13] reported less than 6% intrauterine deaths in their study. Maternal complications were significantly more in the GDM group in comparison to the non-GDM group ($p < 0.001$) as illustrated in Figure 1. They were comparable to the study done by Fareed et al[14].

The GDM group, managed by the multidisciplinary team, came for regular follow-up with blood sugar charting. 67 were continued on medical nutrition therapy, 34 were on Metformin, 24 required injection insulin, and 26 required insulin plus metformin, comparable with Jani SK et al[15]. (14 on MNT, 6 on metformin, and 84 required injection insulin) and Patel TL et al[16] (21 on MNT, 17 on metformin, and 82 required injection insulin).

We found more cesarean deliveries in the GDM Group (34.66%) Vs non-GDM Group (5.95%) ($p <.001$), Kumari R *et al*[10] who observed 50% cesarean delivery rate in their study. Jani SK et al[15] also found (57.69%) cesarean delivery.

As shown in Table 4, the mean birth weight was significantly higher in the GDM group 3.216 ± 0.404 Vs non-GDM group 2.858 ± 0.172 which was comparable to Kumari R et al[10] 2848.8 ± 539.4g) ($P = 0.04$). The Apgar score at 1 min in both groups showed a significant difference ($p <0.001$); the results were comparable to Kumari R et al[10]. At birth, the newborns in both groups do not have any congenital malformations. We found four newborns with macrosomia (2.66%) Patel TL et al[16] reported 7(6%) macrosomia in their study.

There were more NICU admissions in the GDM group, 46 (31.08%), 53% admissions reported by Fareed et al[14], 26 admissions were reported by Patel TL et al[16].

As shown in Figure 2, we found more fetal complications in the GDM group in comparison to the non-GDM group, which were comparable to Jani SK et al[15].

CONCLUSION

Pregnancy hormones, characterized by the progressive rise of hPL, estrogen, progesterone, cortisol, and prolactin, contribute to a diabetogenic state. The present study concluded that more GDM patients belong to the younger age group. We found more caesarean deliveries in the GDM group. In our study, there were only two IUDs in the third trimester, which were on poorly compliant patients. Antenatal screening for gestational diabetes mellitus (GDM) during early weeks of pregnancy, even before the stage of embryogenesis, is crucial for early diagnosis and management of GDM, thereby preventing maternal and fetal complications. Simple screening with a 75 g oral glucose tolerance test (OGTT), close monitoring, regular follow-up and management is utmost important and it can avert maternal and fetal complications and improve feto maternal outcome.

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