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Research Article

ASSOCIATION OF RISK FACTORS WITH PREVALENCE OF GESTATIONAL DIABETES MELLITUS

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ABSTRACT

Objective: Gestational diabetes mellitus (GDM) is among the most common complications of pregnancy associated with adverse maternal and perinatal outcomes. There is an increased risk of gestational hypertension, preeclampsia, and operative delivery and their associated potential morbidities in women with GDM, especially in India, with increasing obesity, lifestyle, and dietary changes. Hence, this study was undertaken to study the prevalence of GDM and evaluate its maternal and neonatal outcomes.

Methods: This study was conducted on 200 pregnant women between 26 and 28 weeks of gestation who were screened for GDM and diagnosed to have GDM based on WHO criteria. Risk factors associated with GDM and neonatal complications were studied.

Results: Most of the GDM cases were significantly associated with body mass index (BMI) >25 kg/m^2, family history of diabetes, previous macrosomia/large for gestational age (LGA) babies, and history of GDM with p<0.001. The incidence of preeclampsia and polyhydramnios was significantly higher among GDM cases. Operative delivery and assisted (forceps) delivery had a strongly significant association with GDM (p<0.001). Hypoglycemia was the most common complication noted in neonates of GDM women. The incidence of complications was also significantly higher among neonates born with GDM.

Conclusion: Our study concluded that BMI, family history of diabetes, past GDM, and previous LGA babies were important risk factors for GDM. The study emphasizes the need to screen all pregnant women for GDM so that timely diagnosis and intervention will reduce both maternal and perinatal complications.

Keywords: Gestational diabetes mellitus, Neonatal complications, BMI, pre-eclampsia, hypoglycemia.

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INTRODUCTION

Despite more than 30 years of research, there is no unanimity regarding the ideal approach to screening for gestational diabetes mellitus. Gestational diabetes mellitus (GDM) is among the most common medical pregnancy complications. GDM is defined as glucose intolerance with onset or recognition during pregnancy [1]. The prevalence of GDM varies significantly among different ethnicities and populations [2]. With the increase in obesity and sedentary lifestyles, the prevalence of GDM is increasing globally and more so in developing countries. In India, the prevalence of GDM is high and varies with geographical areas and diagnostic methods employed. The prevalence of GDM ranged from 3.8% to 21% in different parts of India. GDM is more prevalent in urban areas than in rural areas [3]. GDM is associated with adverse outcomes for the fetus and newborn (respiratory distress syndrome, hypoglycemia, hyperbilirubinemia, and obesity). There is an increased risk of gestational hypertension, preeclampsia, and operative delivery and their associated potential morbidities in women with GDM [1]. Moreover, universal screening for GDM is essential, as women of Asian origin and especially ethnic Indians are at a greater risk of developing GDM and subsequent type 2 DM [4]. Studies have shown that increased maternal food intake, increased extrahepatic lipoprotein lipase activity, and adipose tissue lipogenesis are accountable for fat deposition [5]. The study also revealed that in late pregnancy, the maternal concentration of cortisol is 2–5-fold high. It induces insulin resistance through the post-receptor mechanism. It increases the hepatic glucose production rate. It promotes lipolysis and protein breakdown, causing an increase in free fatty acid and amino acid levels [6]. Hence, this study was undertaken to evaluate the prevalence of GDM and its associated risk factors.

METHODS

This study was conducted at Dr. S.S. Tantia Medical College, Hospital and Research Center, Sriganganagar, Rajasthan, on pregnant women attending the OPD of the Obstetrics and Gynecology Department. 200 pregnant women were recruited for the study. Pregnant women attending antenatal OPD with gestational age between 26 and 28 weeks were included in this study, whereas pregnant women diagnosed with diabetes before pregnancy, i.e., overt or pre-gestational diabetes, were excluded. The ethical approval was taken by the ethical committee before the study proceeded. The patients were enrolled in the study after obtaining written consent. Relevant data, as per the pro forma, were collected. Risk factors for GDM in all pregnant women, such as age, BMI, family history, parity, past obstetric history (unexplained fetal loss/neonatal death, preterm delivery, polyhydramnios, previous pregnancy with GDM), and previous large for gestational age (LGA) infant/macrosomia}, were noted. All pregnant women underwent a detailed clinical examination as per pro forma, irrespective of the presence or absence of risk factors.

A 75-g oral glucose tolerance test (OGTT) was performed between 26 and 28 weeks of gestation. A World Health Organization (WHO) criterion with a threshold plasma glucose concentration of ≥140 mg/dl at 2 h was used to diagnose gestational diabetes mellitus (GDM). The plasma glucose was estimated by the glucose oxidation and peroxidation (GOD-POD) colorimetric enzymatic method. Neonates born to GDM mothers were monitored by the pediatrician, and any neonatal complications during the postnatal period were documented. Neonatal hypoglycemia is defined as blood glucose <40 mg/dl. Neonatal blood glucose levels were monitored as per protocol. The presence of metabolic and

Table 1: Percentage of gestational diabetes mellitus cases according to the age distribution of pregnant women

Age (years)	Number of cases	Number of GDM cases	Percentage
<20	3	0	0.0
21–24	74	3	4.1
25–29	96	9	9.1
30–34	26	4	15.4
>35	1	0	0.0
Total	200	16	7.8

GDM: Gestational diabetes mellitus

Table 2: Association of risk factors among gestational diabetes mellitus cases

Risk factors	Number of cases	Number of GDM cases	Percentage	p
Age≥25 years	125	13	10.4	<0.276
BMI>25 kg/m^2	28	16	57.1	<0.001
Family history of DM	21	10	47.6	<0.001
Previous macrosomia/LGA baby	5	5	100	<0.001
Past GDM	3	3	100	<0.001

DM: Diabetes mellitus, GDM: Gestational DM, BMI: Body mass index, LGA: Large for gestational age

electrolyte disturbances, respiratory distress or transient tachypnea in the newborn, neonatal hyperbilirubinemia, and other complications was noted in the pro forma.

The data were analyzed by SPSS software version 15.0. The results are expressed as mean±SD and percentage of each variable. The p-values considered significant were as follows: - p<0.05 - a significant, p>0.001 - a highly significant.

RESULT AND DISCUSSION

A prospective study was conducted to study the prevalence of gestational diabetes mellitus (GDM) and evaluate its maternal and perinatal outcomes. For this, 200 patients were recruited and analyzed as follows:

As shown in Table 1, the mean age of patients was 25.0 years. Out of 200 patients, 74 cases were found in the age group of 21–24 years, while 3 cases were seen as GDM. Whereas 96 of the study population belonged to the age group of ≥25 years, as 9 cases observed GDM. Hence, maternal age is statistically associated with the prevalence of GDM in this study (p=0.358). Maternal age ≥ 25 years is not statistically associated with the prevalence of GDM in the present study. However, age ≥ 25 years has a significant independent association with GDM. Several investigators have found that maternal age is highly correlated with the risk of GDM [7]. Wahi *et al*. [8] also reported that women with GDM are older. In the present study, similar observations were made: 81.3% of the women with GDM were aged ≥ 25 years.

Out of 28 cases, 16 were diagnosed with GDM and had a BMI of 25 kg/m^2 (57%). GDM patients have a strong family history of diabetes mellitus (47.6%). Previous macrosomia and past GDM have been observed to be highly significant in the case of GDM (p<0.001) as shown in Table 2.

In the present study (Table 3), 9 (56.3%) pregnant women with GDM did not have any other obstetric complications in the study. Pre-eclampsia was present in 4 (25%) of the GDM women. One GDM case had polyhydramnios. 2 (12.5%) women with GDM had preterm delivery. Bener *et al*. [9] found similar results. The incidence of pre-eclampsia and polyhydramnios was significantly higher among GDM

Table 3: Gestational diabetes mellitus cases according to the distribution of pregnancy complications

Pregnancy complications	Number of cases	In GDM cases	Percentage	p
Preeclampsia	13	4	30.8	<0.0014
Prematurity	16	2	12.5	<0.466
Polyhydramnios	1	1	100	<0.006
Oligohydramnios	4	0	-	-
IUGR	7	0	-	-

GDM: Gestational diabetes mellitus

Table 4: Mode of delivery in gestational diabetes mellitus cases

Mode of delivery	Number of patients	GDM cases	Percentage among GDM cases
Normal delivery	150	5	31.3
Forceps/vacuum	2	1	6.3
LSCS	48	10	62.5
Total	200	16	100

GDM: Gestational diabetes mellitus

Table 5: Neonatal complication associated with gestational diabetes mellitus cases

Neonatal outcome	Number of neonates (n=200)	In GDM cases (n=16)	p
Hypoglycemia	12	7	<0.001
Respiratory distress	10	3	<0.007
Neonatal hyperbilirubinemia	8	4	<0.001
Birth asphyxia	7	1	<0.521
TTN	5	3	<0.001
MAS	2	0	-
Polycythemia	2	2	<0.001

GDM: Gestational diabetes mellitus, TTN: Transient tachypnea of the newborn

cases in this study. Prematurity or preterm labor was not significantly associated with GDM in this study (p=0.466). There is an increased incidence of obstetric complications in GDM. Gestational hypertension, pre-eclampsia, polyhydramnios, pyelonephritis, prematurity/preterm labor, and increased frequency of operative delivery [10,11].

Table 4 reveals that the cesarean delivery rate in the present study was 62.5% among the GDM patients. There is an increased rate of operative delivery in pregnancies complicated by GDM [1]. Naylor *et al*. [12] reported that "compared with normoglycemic controls, the untreated borderline GDM group had increased macrosomia and cesarean delivery rates. Operative delivery (cesarean section) and instrumental (forceps) assisted delivery had a strongly significant association with GDM p<0.001. Capula *et al*. [13] reported similar findings.

As shown in Table 5, we observed that hypoglycemia was the most common neonatal complication seen in this study. Of the 27 neonates who had neonatal complications, 12 (44.4%) had hypoglycemia. 7 (58.3%) of the 12 neonates who had neonatal hypoglycemia were born to GDM women. Hypoglycemia in neonates had a strongly significant association with GDM (p<0.001). The incidence of respiratory distress, transient tachypnea of the newborn (TTN), polycythemia, and neonatal hyperbilirubinemia were also significantly more common among neonates born to GDM women (p<0.001). Kalra *et al*. [14] observed 9.1% of cases of hypoglycemia in neonates associated with GDM pregnancy complications.

CONCLUSION

This study concluded that family history of diabetes, BMI, previous macrosomia/LGA baby, and history of GDM have a strong association with the prevalence of GDM. The incidence of pre-eclampsia and

polyhydramnios was significantly higher among GDM cases in this study. Operative delivery (cesarean section) and instrumental (forceps) assisted delivery had a strong association with GDM. Hypoglycemia was the most common complication noted in neonates of GDM women. Incidences of respiratory distress, TTN, polycythemia, and neonatal hyperbilirubinemia were also significantly more common among neonates born to GDM women. Screening of all pregnant women for the assessment of risk factors for GDM helps to reduce maternal and neonatal complications.

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AUTHORS CONTRIBUTIONS

Manuscript writing was accomplished by Dr. Mohammed Nadeem Shaikh, and data collection and analysis were done by Dr. Disha Singla and Dr. Smriti Arora. The research was reviewed and edited by Dr. Heloise Stanley, and statistical analysis was done by Dr. Mohammed Nadeem Shaikh. The manuscript was finalized by Dr. Mohammed Nadeem Shaikh and submitted for publication by Dr. Disha Singla.

CONFLICTS OF INTEREST

The authors affirm no conflicts of interest.

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REFERENCES

1. Practice Bulletin No. 137: Gestational diabetes mellitus. Obstet Gynecol 2013;122:406-16.
2. American Diabetes Association. Gestational diabetes mellitus. Diabetes Care 2004;27(Suppl 1):S88-90.
3. Seshiah V, Balaji V, Balaji MS, Paneerselvam A, Kapur A. Pregnancy and diabetes scenario around the world: India. Int JGynaecol Obstet 2009;104 (Suppl 1):S35-8.
4. Dornhorst A, Paterson CM, Nicholls JS, Wadsworth J, Chiu DC, Elkeles RS, *et al*. High prevalence of gestational diabetes in women from ethnic minority groups. Diabet Med 1992;9:820-5.
5. Knopp RH, Boroush MA, O'Sullivan JB. Lipid metabolism in pregnancy II. Post heparinlipolytic activity and hyper triglyceridemia in the pregnant rat. Metabolism 1975;24:481-93. doi: 10.1016/0026-0495(75)90073-6, PMID 1117840
6. Giorgino F, Almahfouz A, Goodyear LJ, Smith RJ. Glucocorticoid regulation ofinsulin receptor IRS-1tyrosine phosphorylation in rat skeletal muscles. J Clin Invest 1993;91:2020-30. doi: 10.1172/JCI116424, PMID 7683695
7. Seshiah V, Balaji V, Balaji MS, Paneerselvam A, Arthi T, Thamizharasi M, *et al*. Prevalence of gestational diabetes mellitus in South India (Tamil Nadu) - A community based study. J Assoc Physicians India 2008;56:329-33.
8. Wahi P, Dogra V, Jandial K, Bhagat R, Gupta R, Gupta S, *et al*. Prevalence of gestational diabetes mellitus (GDM) and its outcomes in Jammu region. J Assoc Phys India 2011;59:227-30.
9. Bener A, Saleh NM, Al-Hamaq A. Prevalence of gestational diabetes and associated maternal and neonatal complications in a fast-developing community: Global comparisons. Int J Womens Health 2011;3:367-73.
10. Magee MS, Walden CE, Benedetti TJ, Knopp RH. Influence of diagnostic criteria on the incidence of gestational diabetes and perinatal morbidity. JAMA 1993;269:609-15. doi: 10.1001/jama.1993.03500050087031, PMID 8421365
11. Sermer M, Naylor D, Gare DJ, Kenshole AB, Ritchie JW, Farine D, *et al*. Impact of increasing carbohydrate intolerance on maternal-fetal outcomes in 3,637 women without gestational diabetes. Am J Obstet Gynecol 1995;173:146-56.
12. Naylor CD, Sermer M, Chen E, Sykora K. Cesarean delivery in relation to birth weight gestational glucose tolerance: Pathophysiology or practice style? JAMA 1996;275:1165-70. doi: 10.1001/jama.1996.03530390031030, PMID 8609683
13. Capula C, Chiefari E, Vero A, Arcidiacono B, Iiritano S, Puccio L, *et al*. Gestational diabetes mellitus: Screening and outcomes in southern Italian pregnant women. ISRN Endocrinol 2013;5:387495.
14. Klara P, Kachhwaha CP, Singh HV. Prevalence of gestational diabetes mellitus and its outcome in western Rajasthan. Indian J Endocrinol Metab 2013;17:677-80.