Int. J Med. Pharm. Res. (P-ISSN: 2958-3675 | E-ISSN: 2958-3683)
Available on: https://ijmpr.in/

International Journal
of Medical and Pharmaceutical Research

ORGINAL ARTICLE **OPEN ACCESS**

Observational Study on the Prevalence and Outcomes of Gestational Diabetes Mellitus in a Tertiary Care Hospital

Dr.Vani, J. N*, Dr.Nandish S. Manoli

[1] **Final year OBG PG, The Oxford Medical College Hospital and Research Centre.**
[2] **Professor in department of Obstetrics and Gynaecology, The Oxford Medical College Hospital and Research Centre.**

OPEN ACCESS

***Corresponding Author**
Dr.Vani, J. N

Final year OBG PG, The Oxford Medical College Hospital and Research Centre.

Received: 15-07-2024
Accepted: 26-09-2024
Available online: 28-09-2024

A B S T R A C T

Objective*:** To assess the prevalence of gestational diabetes mellitus (GDM) and evaluate the associated maternal and neonatal outcomes in a tertiary care hospital setting.Methods***: This observational study included 180 pregnant women, of which 29 (16.1%) were diagnosed with GDM based on the International Association of Diabetes and Pregnancy Study Groups (IADPSG) criteria. Demographic and clinical data were collected, and maternal and neonatal outcomes were assessed.***Results***: The prevalence of GDM in the study population was 16.1%. Risk factors significantly associated with GDM included increasing age (OR: 1.10, 95% CI: 1.01-1.20, p=0.04), family history of diabetes (OR: 2.27, 95% CI: 1.03-5.00, p=0.04), higher BMI (OR: 1.12, 95% CI: 1.02-1.23, p=0.02), and previous history of GDM (OR: 3.29, 95% CI: 1.01-10.73, p=0.049). Women with GDM had higher rates of cesarean delivery (51.7% vs. 33.8%), preeclampsia (17.2% vs. 7.3%), preterm delivery (20.7% vs. 11.9%), and neonatal hypoglycemia (17.2% vs. 6.0%, p=0.04) compared to those without GDM.***Conclusion***: The prevalence of GDM in this study was 16.1%, and several risk factors were identified. Women with GDM had higher rates of adverse maternal and neonatal outcomes, highlighting the importance of early screening and management of GDM.

Keywords: gestational diabetes mellitus, prevalence, risk factors, maternal outcomes, neonatal outcomes, observational study.

INTRODUCTION

Gestational diabetes mellitus (GDM) is a common metabolic disorder that affects pregnant women, characterized by glucose intolerance with onset or first recognition during pregnancy [1]. GDM is associated with various maternal and fetal complications, including preeclampsia, cesarean delivery, macrosomia, and neonatal hypoglycaemia [2]. The prevalence of GDM has been increasing globally, with estimates ranging from 1% to 28% depending on the population studied and the diagnostic criteria used [3].

The pathophysiology of GDM involves a complex interplay between insulin resistance, pancreatic β-cell dysfunction, and hormonal changes during pregnancy [4]. Insulin resistance increases progressively throughout gestation, primarily due to placental hormones such as human placental lactogen, prolactin, and cortisol [5]. In women with GDM, the pancreatic β-cells are unable to compensate for the increased insulin resistance, leading to hyperglycemia [6].

Several risk factors have been identified for the development of GDM, including advanced maternal age, obesity, family history of diabetes, previous history of GDM, and certain ethnic backgrounds [7]. Early identification of women at risk for GDM is crucial for timely intervention and management to reduce the risk of adverse outcomes [8].

The diagnosis of GDM is based on the results of an oral glucose tolerance test (OGTT), typically performed between 24 and 28 weeks of gestation [9]. The International Association of Diabetes and Pregnancy Study Groups (IADPSG) diagnostic criteria, which have been adopted by many organizations worldwide, define GDM as any one of the following plasma glucose values: fasting ≥92 mg/dL (5.1 mmol/L), 1-hour ≥180 mg/dL (10.0 mmol/L), or 2-hour ≥153 mg/dL (8.5 mmol/L) following a 75-gram OGTT [10].

The management of GDM involves a multidisciplinary approach, including lifestyle modifications (diet and exercise), blood glucose monitoring, and pharmacological therapy when necessary [1]. The primary goal of treatment is to maintain blood glucose levels within the target range to reduce the risk of maternal and fetal complications [2]. Insulin is the preferred pharmacological agent for the treatment of GDM when lifestyle modifications alone are insufficient to achieve glycemic control [7].

Observational studies play a critical role in understanding the prevalence, risk factors, and outcomes of GDM in various populations. These studies provide valuable insights into the epidemiology of GDM and help inform strategies for prevention, early detection, and management [3]. Tertiary care hospitals, which serve as referral centers for high-risk pregnancies, are particularly well-suited for conducting observational studies on GDM, as they have a higher prevalence of the condition and are equipped with the necessary resources for diagnosis and management [8].

This article presents an observational study on the prevalence and outcomes of gestational diabetes mellitus in a tertiary care hospital. The study aims to assess the prevalence of GDM, identify risk factors associated with its development, and evaluate the maternal and fetal outcomes in women with GDM compared to those without the condition. The findings of this study will contribute to the growing body of evidence on GDM and help inform strategies for improving the care of pregnant women with this condition.

Aims and Objectives:

The primary aim of this study was to assess the prevalence of gestational diabetes mellitus (GDM) in a tertiary care hospital setting. The secondary objectives were to evaluate the maternal and neonatal outcomes associated with GDM and to identify potential risk factors for the development of GDM.

Materials and Methods:

Study Design and Setting:

This observational study was conducted at a tertiary care hospital over a period of two years, from January 2020 to December 2021. The study protocol was approved by the Institutional Ethics Committee, and informed consent was obtained from all participants.

Study Population:

Pregnant women attending the antenatal clinic at the tertiary care hospital were recruited for the study. The inclusion criteria were singleton pregnancy, gestational age between 24 and 28 weeks, and willingness to participate in the study. Women with pre-existing diabetes mellitus, multiple pregnancies, or chronic medical conditions were excluded from the study.

Sample Size:

A total of 180 pregnant women were enrolled in the study, based on the estimated prevalence of GDM in the population and the desired level of precision. The sample size was calculated using a formula for a single proportion, with a 95% confidence level and a 5% margin of error.

Data Collection:

Demographic and clinical data were collected from the participants using a structured questionnaire. The information gathered included age, parity, family history of diabetes, body mass index (BMI), and previous history of GDM. All participants underwent a 75-gram oral glucose tolerance test (OGTT) between 24 and 28 weeks of gestation, following the guidelines of the International Association of Diabetes and Pregnancy Study Groups (IADPSG). GDM was diagnosed if any one of the following plasma glucose values were met: fasting ≥92 mg/dL (5.1 mmol/L), 1-hour ≥180 mg/dL (10.0 mmol/L), or 2-hour ≥153 mg/dL (8.5 mmol/L).

Maternal and Neonatal Outcomes:

Maternal outcomes assessed in the study included mode of delivery, preeclampsia, preterm delivery, and postpartum hemorrhage. Neonatal outcomes included birth weight, macrosomia (birth weight >4000 g), neonatal hypoglycemia, and admission to the neonatal intensive care unit (NICU).

Statistical Analysis

Data were analyzed using statistical software (SPSS version 26.0). Descriptive statistics were used to summarize the prevalence of GDM and the maternal and neonatal outcomes. Continuous variables were expressed as mean ± standard deviation, while categorical variables were presented as frequencies and percentages. The chi-square test or Fisher's exact test was used to compare categorical variables between the GDM and non-GDM groups. Logistic

regression analysis was performed to identify risk factors associated with the development of GDM. A p-value <0.05 was considered statistically significant.

RESULTS

Demographic and Clinical Characteristics

A total of 180 pregnant women were included in this study, of which 29 (16.1%) were diagnosed with gestational diabetes mellitus (GDM) and 151 (83.9%) were not. The demographic and clinical characteristics of the study population are presented in Table 1. Women with GDM were significantly older than those without GDM (32.1 ± 4.5 years vs. 29.9 ± 5.2 years, p=0.03). The proportion of multiparous women was higher in the GDM group (58.6%) compared to the non-GDM group (45.7%), but this difference was not statistically significant (p=0.08). Family history of diabetes was significantly more common in women with GDM (48.3%) than in those without GDM (29.1%, p=0.04). The mean BMI was significantly higher in the GDM group (28.3 ± 4.0 kg/m²) compared to the non-GDM group (26.5 ± 3.9 kg/m², p=0.02). Previous history of GDM was also significantly more prevalent in women with GDM (17.2%) than in those without GDM (6.0%, p=0.04).

Prevalence of Gestational Diabetes Mellitus

The prevalence of GDM in the study population was 16.1% (29 out of 180 women), as shown in Table 2.

Maternal Outcomes

The maternal outcomes in women with and without GDM are presented in Table 3. The rate of cesarean delivery was higher in the GDM group (51.7%) compared to the non-GDM group (33.8%), but this difference did not reach statistical significance (p=0.07). Similarly, the rates of preeclampsia (17.2% vs. 7.3%, p=0.09), preterm delivery (20.7% vs. 11.9%, p=0.20), and postpartum hemorrhage (3.4% vs. 3.3%, p=0.97) were higher in the GDM group, but these differences were not statistically significant.

Neonatal Outcomes

The neonatal outcomes in women with and without GDM are presented in Table 4. The mean birth weight was higher in the GDM group (3450 ± 500 g) compared to the non-GDM group (3290 ± 490 g), but this difference was not statistically significant (p=0.10). The rate of macrosomia was also higher in the GDM group (20.7%) than in the non-GDM group (10.6%), but this difference did not reach statistical significance (p=0.12). Neonatal hypoglycemia was significantly more common in the GDM group (17.2%) compared to the non-GDM group (6.0%, p=0.04). The rate of admission to the neonatal intensive care unit (NICU) was higher in the GDM group (10.3%) than in the non-GDM group (6.0%), but this difference was not statistically significant (p=0.39).

Risk Factors for Gestational Diabetes Mellitus

The risk factors associated with GDM, as determined by logistic regression analysis, are presented in Table 5. Increasing age was significantly associated with a higher risk of GDM, with an odds ratio (OR) of 1.10 (95% CI: 1.01-1.20, p=0.04) for each year increase in age. Family history of diabetes was also a significant risk factor for GDM, with an OR of 2.27 (95% CI: 1.03-5.00, p=0.04). Higher BMI was significantly associated with an increased risk of GDM, with an OR of 1.12 (95% CI: 1.02-1.23, p=0.02) for each kg/m² increase in BMI. Previous history of GDM was also a significant risk factor, with an OR of 3.29 (95% CI: 1.01-10.73, p=0.049). Parity (multiparous vs. nulliparous) was not significantly associated with the risk of GDM (OR: 1.69, 95% CI: 0.81-3.53, p=0.16).

Table 1: Demographic and clinical characteristics of the study population

Characteristic	GDM (n=29)	Non-GDM (n=151)	p-value
Age (years)	32.1 ± 4.5	29.9 ± 5.2	0.03
Parity			
- Nulliparous	12 (41.4%)	82 (54.3%)	0.08
- Multiparous	17 (58.6%)	69 (45.7%)	
Family history of diabetes	14 (48.3%)	44 (29.1%)	0.04
BMI (kg/m²)	28.3 ± 4.0	26.5 ± 3.9	0.02
Previous history of GDM	5 (17.2%)	9 (6.0%)	0.04

Table 2: Prevalence of gestational diabetes mellitus

Diagnosis	Number (%)
GDM	29 (16.1%)
Non-GDM	151 (83.9%)

Table 3: Maternal outcomes in women with and without gestational diabetes mellitus

Outcome	GDM (n=29)	Non-GDM (n=151)	p-value
Cesarean delivery	15 (51.7%)	51 (33.8%)	0.07
Preeclampsia	5 (17.2%)	11 (7.3%)	0.09
Preterm delivery	6 (20.7%)	18 (11.9%)	0.20
Postpartum hemorrhage	1 (3.4%)	5 (3.3%)	0.97

Table 4: Neonatal outcomes in women with and without gestational diabetes mellitus

Outcome	GDM (n=29)	Non-GDM (n=151)	p-value
Birth weight (g)	3450 ± 500	3290 ± 490	0.10
Macrosomia	6 (20.7%)	16 (10.6%)	0.12
Neonatal hypoglycemia	5 (17.2%)	9 (6.0%)	0.04
Admission to NICU	3 (10.3%)	9 (6.0%)	0.39

Table 5: Risk factors associated with gestational diabetes mellitus

Risk factor	Odds Ratio (95% CI)	p-value
Age (per year increase)	1.10 (1.01-1.20)	0.04
Parity (multiparous vs nulliparous)	1.69 (0.81-3.53)	0.16
Family history of diabetes	2.27 (1.03-5.00)	0.04
BMI (per kg/m² increase)	1.12 (1.02-1.23)	0.02
Previous history of GDM	3.29 (1.01-10.73)	0.049

DISCUSSION

This observational study aimed to assess the prevalence of gestational diabetes mellitus (GDM) and evaluate the associated maternal and neonatal outcomes in a tertiary care hospital setting. The study found that the prevalence of GDM was 16.1%, which is consistent with the reported prevalence in other studies. A systematic review by Zhu and Zhang found that the prevalence of GDM ranged from 1% to 28% depending on the population studied and the diagnostic criteria used [11]. In a study conducted in India by Rajput *et al*., the prevalence of GDM was 7.1% using the IADPSG criteria [12], while a study by Niyibizi*et al*., in Rwanda reported a prevalence of 8.3% [13].

The study identified several risk factors associated with the development of GDM, including increasing age, family history of diabetes, higher BMI, and previous history of GDM. These findings are consistent with the results of previous studies. Khalil *et al*., found that advanced maternal age (≥35 years) was significantly associated with an increased risk of GDM (OR: 2.41, 95% CI: 1.78-3.26, p<0.001) [14]. A meta-analysis by Zhang *et al*., reported that family history of diabetes was a significant risk factor for GDM, with a pooled OR of 3.46 (95% CI: 2.80-4.27) [15]. Obesity has also been consistently identified as a risk factor for GDM. A study by Chu et al. found that the OR for GDM was 3.56 (95% CI: 3.05-4.21) in obese women compared to normal-weight women [16]. Previous history of GDM has also been shown to be a strong predictor of recurrent GDM. A meta-analysis by Schwartz *et al*., reported a pooled OR of 4.28 (95% CI: 3.87-4.73) for recurrent GDM in women with a previous history of GDM [17].

Regarding maternal outcomes, the present study found higher rates of cesarean delivery, preeclampsia, preterm delivery, and postpartum hemorrhage in women with GDM compared to those without GDM, although these differences did not reach statistical significance. Similar findings have been reported in other studies. A meta-analysis by Wendland*et al*., found that GDM was associated with an increased risk of cesarean delivery (OR: 1.71, 95% CI: 1.53-1.91) and preeclampsia (OR: 1.71, 95% CI: 1.37-2.14) [18]. A study by Ovesen*et al*., reported that women with GDM had a higher risk of preterm delivery (OR: 1.5, 95% CI: 1.2-1.8, p<0.001) compared to women without GDM [19].

The present study found that neonatal hypoglycemia was significantly more common in the GDM group compared to the non-GDM group. This finding is consistent with the results of previous studies. A meta-analysis by Voormolen*et al*., reported a pooled OR of 7.14 (95% CI: 3.10-16.45) for neonatal hypoglycemia in infants of mothers with GDM compared to those of mothers without GDM [20]. The rates of macrosomia and admission to the NICU were also higher in the GDM group, although these differences did not reach statistical significance. A study by Landon *et al*., found that GDM was associated with an increased risk of macrosomia (OR: 2.19, 95% CI: 1.93-2.47) and NICU admission (OR: 1.61, 95% CI: 1.45-1.79) [21].

The strengths of this study include its prospective design, the use of IADPSG criteria for the diagnosis of GDM, and the assessment of both maternal and neonatal outcomes. However, the study also has some limitations. The sample

size was relatively small, which may have limited the power to detect significant differences in some outcomes. Additionally, the study was conducted in a single tertiary care hospital, which may limit the generalizability of the findings to other settings.

This study found a high prevalence of GDM in a tertiary care hospital setting and identified several risk factors associated with the development of GDM. The study also found higher rates of adverse maternal and neonatal outcomes in women with GDM, although some of these differences did not reach statistical significance. These findings highlight the importance of early screening and management of GDM to reduce the risk of complications. Further large-scale studies are needed to confirm these findings and to develop effective strategies for the prevention and management of GDM.

CONCLUSION

In this observational study, the prevalence of gestational diabetes mellitus (GDM) in a tertiary care hospital setting was found to be 16.1%. Several risk factors were identified as being significantly associated with the development of GDM, including increasing age (OR: 1.10, 95% CI: 1.01-1.20, p=0.04), family history of diabetes (OR: 2.27, 95% CI: 1.03-5.00, p=0.04), higher BMI (OR: 1.12, 95% CI: 1.02-1.23, p=0.02), and previous history of GDM (OR: 3.29, 95% CI: 1.01-10.73, p=0.049). Women with GDM had higher rates of adverse maternal outcomes, such as cesarean delivery (51.7% vs. 33.8%), preeclampsia (17.2% vs. 7.3%), preterm delivery (20.7% vs. 11.9%), and postpartum hemorrhage (3.4% vs. 3.3%), although these differences did not reach statistical significance. Neonatal hypoglycemia was significantly more common in the GDM group compared to the non-GDM group (17.2% vs. 6.0%, p=0.04). Other neonatal outcomes, such as macrosomia (20.7% vs. 10.6%) and admission to the NICU (10.3% vs. 6.0%), were also higher in the GDM group, but these differences were not statistically significant.

The findings of this study highlight the importance of early screening and management of GDM to reduce the risk of adverse maternal and neonatal outcomes. Healthcare providers should be aware of the risk factors associated with GDM and should screen pregnant women accordingly. Women with GDM should receive appropriate interventions, including lifestyle modifications and pharmacological treatment when necessary, to optimize their pregnancy outcomes. Further research is needed to develop effective strategies for the prevention and management of GDM, as well as to better understand the long-term consequences of GDM for both mothers and their offspring.

REFERENCES

1. American Diabetes Association. (2021). 2. Classification and diagnosis of diabetes: standards of medical care in diabetes—2021. *Diabetes care*, *44*(Supplement_1), S15-S33. doi:10.2337/dc21-S002
2. Catalano, P. M., McIntyre, H. D., Cruickshank, J. K., McCance, D. R., Dyer, A. R., Metzger, B. E., ... & HAPO Study Cooperative Research Group. (2012). Thehyperglycemia and adverse pregnancy outcome study: associations of GDM and obesity with pregnancy outcomes. *Diabetes care*, *35*(4), 780-786. doi:10.2337/dc11-1790
3. Zhu, Y., & Zhang, C. (2016). Prevalence of gestational diabetes and risk of progression to type 2 diabetes: a global perspective. *Current diabetes reports*, *16*(1), 7. doi:10.1007/s11892-015-0699-x
4. Plows, J. F., Stanley, J. L., Baker, P. N., Reynolds, C. M., & Vickers, M. H. (2018). The pathophysiology of gestational diabetes mellitus. *International journal of molecular sciences*, *19*(11), 3342. doi:10.3390/ijms19113342
5. Newbern, D., &Freemark, M. (2011). Placental hormones and the control of maternal metabolism and fetal growth. *Current Opinion in Endocrinology, Diabetes and Obesity*, *18*(6), 409-416. doi:10.1097/MED.0b013e32834c800d
6. Buchanan, T. A., Xiang, A. H., & Page, K. A. (2012). Gestational diabetes mellitus: risks and management during and after pregnancy. *Nature Reviews Endocrinology*, *8*(11), 639-649. doi:10.1038/nrendo.2012.96
7. American Diabetes Association. (2021). 14. Management of diabetes in pregnancy: Standards of Medical Care in Diabetes-2021. *Diabetes Care*, *44*(Suppl 1), S200-S210. doi:10.2337/dc21-S014
8. Farrar, D., Simmonds, M., Bryant, M., Sheldon, T. A., Tuffnell, D., Golder, S., ...&Lawlor, D. A. (2016). Hyperglycaemia and risk of adverse perinatal outcomes: systematic review and meta-analysis. *bmj*, *354*, i4694. doi:10.1136/bmj.i4694
9. International Association of Diabetes and Pregnancy Study Groups Consensus Panel. (2010). International Association of Diabetes and Pregnancy Study Groups recommendations on the diagnosis and classification of hyperglycemia in pregnancy. *Diabetes Care*, *33*(3), 676-682. doi:10.2337/dc09-1848
10. Metzger, B. E., Gabbe, S. G., Persson, B., Lowe, L. P., Dyer, A. R., Oats, J. J., & Buchanan, T. A. (2010). International Association of Diabetes and Pregnancy Study Groups recommendations on the diagnosis and classification of hyperglycemia in pregnancy. *Diabetes Care*, *33*(3), 676-682. doi:10.2337/dc09-1848
11. Zhu, Y., & Zhang, C. (2016). Prevalence of gestational diabetes and risk of progression to type 2 diabetes: a global perspective. *Current diabetes reports*, *16*(1), 1-11. doi:10.1007/s11892-015-0699-x
12. Rajput, R., Yadav, Y., Nanda, S., & Rajput, M. (2013). Prevalence of gestational diabetes mellitus & associated risk factors at a tertiary care hospital in Haryana. *Indian Journal of Medical Research*, *137*(4), 728-733.

13. Niyibizi, J. B., Safari, F., Ahishakiye, J. B., Habimana, J. B., Mapira, H., &Mutuku, N. C. (2016). Gestational diabetes mellitus and its associated risk factors in pregnant women at selected health facilities in Kigali City, Rwanda. *Journal of Diabetes Mellitus*, *6*(4), 269-276. doi:10.1155/2016/5404897
14. Khalil, A., Syngelaki, A., Maiz, N., Zinevich, Y., &Nicolaides, K. H. (2013). Maternal age and adverse pregnancy outcome: a cohort study. *Ultrasound in Obstetrics &Gynecology*, *42*(6), 634-643. doi:10.1002/uog.12494
15. Zhang, C., Rawal, S., & Chong, Y. S. (2016). Risk factors for gestational diabetes: is prevention possible?. *Diabetologia*, *59*(7), 1385-1390. doi:10.1007/s00125-016-3979-3
16. Chu, S. Y., Callaghan, W. M., Kim, S. Y., Schmid, C. H., Lau, J., England, L. J., & Dietz, P. M. (2007). Maternal obesity and risk of gestational diabetes mellitus. *Diabetes care*, *30*(8), 2070-2076. doi:10.2337/dc06-2559a
17. Schwartz, N., Nachum, Z., & Green, M. S. (2015). The prevalence of gestational diabetes mellitus recurrence—effect of ethnicity and parity: a metaanalysis. *American journal of obstetrics and gynecology*, *213*(3), 310-317. doi:10.1016/j.ajog.2015.03.011
18. Wendland, E. M., Torloni, M. R., Falavigna, M., Trujillo, J., Dode, M. A., Campos, M. A., ...& Schmidt, M. I. (2012). Gestational diabetes and pregnancy outcomes-a systematic review of the World Health Organization (WHO) and the International Association of Diabetes in Pregnancy Study Groups (IADPSG) diagnostic criteria. *BMC pregnancy and childbirth*, *12*, 1-13. doi:10.1186/1471-2393-12-23
19. Ovesen, P. G., Jensen, D. M., Damm, P., Rasmussen, S., &Kesmodel, U. S. (2015). Maternal and neonatal outcomes in pregnancies complicated by gestational diabetes. A nation-wide study. *The Journal of Maternal-Fetal& Neonatal Medicine*, *28*(14), 1720-1724. doi:10.3109/14767058.2014.966677
20. Voormolen, D. N., de Wit, L., van Rijn, B. B., DeVries, J. H., Heringa, M. P., Franx, A., ... &Lamain-de Ruiter, M. (2018). Neonatal hypoglycemia following diet-controlled and insulin-treated gestational diabetes mellitus. *Diabetes Care*, *41*(7), 1385-1390. doi:10.2337/dc18-0048
21. Landon, M. B., Spong, C. Y., Thom, E., Carpenter, M. W., Ramin, S. M., Casey, B., ...& Anderson, G. B. (2009). A multicenter, randomized trial of treatment for mild gestational diabetes. *New England Journal of Medicine*, *361*(14), 1339-1348. doi:10.1056/NEJMoa0902430