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Original Research Article

Observation of Risk Factors among Gestational Diabetes Mellitus Patients

Prof. Dr. Parvin Rahman[1*], Dr. Marmarin Hamid Rawli[2]

[1]Professor, Department of Gynecology and Obstetrics, Khwaja Yunus Ali Medical College and Hospital, Sirajganj, Bangladesh
[2]Registrar, Department of Gynecology and Obstetrics, Enam Medical College Hospital, Dhaka, Bangladesh

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***Corresponding author:** Prof. Dr. Parvin Rahman
Professor, Department of Gynecology and Obstetrics, Khwaja Yunus Ali Medical College and Hospital, Sirajganj, Bangladesh

Abstract

Introduction: Gestational diabetes mellitus (GDM) is a common complication during pregnancy that affects both maternal and neonatal health outcomes. Identifying risk factors associated with GDM is crucial for early detection and intervention to improve pregnancy outcomes. ***Methods:*** This retrospective observational study was conducted at the Department of Gynecology, Gonoshasthaya Nagar Hospital, Dhaka, Bangladesh during the period of January 2019 to December 2019 with a total of 348 hospital patient records. ***Result:*** Of the 348 participants, 24.71% had GDM. Significant differences were observed between the groups in age, gravida, BMI distribution, family history of GDM, and previous history of GDM. Higher rates of non-spontaneous vaginal deliveries were found in the GDM group (36.05%) compared to the non-GDM group (22.52%). Age ≥35 years, obesity, family history of GDM, and history of GDM were significantly associated with GDM ($p<0.05$). ***Conclusion:*** Our findings support the existing evidence that advanced maternal age, obesity, family history of GDM, and previous history of GDM are significant risk factors for GDM. These results highlight the importance of early screening and intervention for high-risk groups to prevent adverse pregnancy outcomes.

Keywords: Diabetes, Pregnancy, Gestational, Maternal.

INTRODUCTION

Gestational Diabetes Mellitus (GDM) is a medical condition characterized by elevated blood glucose levels, first identified during pregnancy. It affects approximately 3-20% of all pregnant women and is associated with an increased risk of adverse maternal, neonatal, and pregnancy outcomes (International Diabetes Federation, 2019). GDM is a global health concern, with its prevalence varying across different regions and populations. This paper aims to investigate the risk factors among GDM patients, with a particular focus on the prevalence in Asia and Bangladesh, and its implications on maternal health, pregnancy outcomes, and neonatal health. GDM is defined by the American Diabetes Association (ADA) as "diabetes diagnosed during pregnancy that is not clearly overt diabetes" (ADA, 2014). This condition typically occurs during the second or third trimester of pregnancy and usually resolves postpartum. However, women with a history of GDM are at a higher risk of developing type 2 diabetes later in life (Bellamy *et al.*, 2009). The global prevalence of GDM has been on the rise, with estimates suggesting that about 15.8% of pregnancies are affected worldwide (International Diabetes Federation, 2019). This increase has been attributed to several factors, including the growing prevalence of obesity and sedentary lifestyles, an aging population, and a higher prevalence of type 2 diabetes (Dabelea *et al.*, 2005). In Asia, the prevalence of GDM is notably higher, ranging from 9.8% to 25.0% (Wong *et al.*, 2013). This regional variation can be attributed to differences in genetic predisposition, lifestyle factors, and diagnostic criteria (Makgoba *et al.*, 2012). The prevalence of GDM in Bangladesh is estimated to be around 12.9% (Jesmin *et al.*, 2014). The increased prevalence in this region may be due to the high rate of consanguineous marriages, which can lead to a higher prevalence of genetic risk factors for GDM (Alzahrani *et al.*, 2021). The etiology of GDM is multifactorial, with both genetic and environmental factors

contributing to its development. Genetic predisposition, advanced maternal age, obesity, and a history of GDM in previous pregnancies are some of the established risk factors (Torloni *et al.*, 2009). Lifestyle factors, such as a lack of physical activity and unhealthy dietary habits, have also been implicated in the development of GDM (Zhang & Ning, 2011). GDM can have significant implications on maternal health. Women with GDM are at an increased risk of developing hypertensive disorders, such as preeclampsia, and may require a cesarean section due to the increased size of the fetus (Chen *et al.*, 2012). Furthermore, women with GDM have a higher risk of developing type 2 diabetes and cardiovascular disease later in life (Bellamy *et al.*, 2009). Pregnancy outcomes can also be adversely affected by GDM. The condition is associated with an increased risk of preterm birth, macrosomia (large- for-gestational-age infants), and shoulder dystocia (Metzger *et al.*, 2008). These complications can lead to an increased risk of birth injuries and perinatal mortality. Moreover, GDM can contribute to other obstetrical complications, such as polyhydramnios (excessive amniotic fluid) and an increased risk of fetal growth restriction (Farrar *et al.*, 2015). These complications not only affect the immediate health of the newborn but can also have long-term consequences. For instance, children born to mothers with GDM may experience developmental delays and are at a higher risk of developing metabolic syndrome in their later life (Krishnaveni *et al.*, 2010). Given the significant implications of GDM on maternal, pregnancy, and neonatal outcomes, it is crucial to identify the risk factors associated with this condition. Early identification and intervention can help prevent or mitigate the adverse effects of GDM on both the mother and the baby. Some strategies for managing GDM include lifestyle modifications, such as adopting a healthy diet and engaging in regular physical activity, and medical interventions, like the use of insulin or oral hypoglycemic agents when necessary (ACOG, 2018). So, the present study was conducted with the aim to determine the significant pre-existing factors associated with gestational diabetes mellitus itself.

METHODS

This retrospective observational study was conducted at the Department of Gynecology, Gonoshasthaya Nagar Hospital, Dhaka, Bangladesh during the period of January 2019 to December 2019. The study was conducted with data collected from a total of 348 pregnant mothers who had previously been admitted at the study hospital during the last 3 years. The study included women aged 18 to 45 years with a confirmed GDM diagnosis during pregnancy and complete medical records. Exclusion criteria encompassed pre-existing type 1 or type 2 diabetes, multiple gestations, known fetal anomalies or chromosomal abnormalities, and incomplete medical records. Data extracted from eligible patient records comprised maternal demographic characteristics, medical history, family history of diabetes etc. The data were subsequently analyzed to identify potential GDM risk factors. Ethical approval regarding the study was obtained from the ethical review committee of the study hospital. All collected data was analyzed using SPSS v.25, significance was observed using Pearson's chi square test, and a p-value of **<0.05** was considered statistically significant.

RESULTS

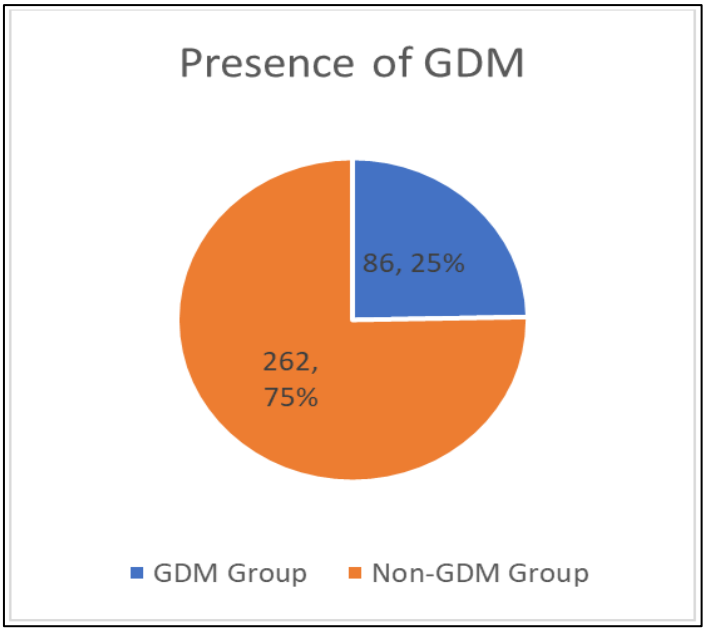

Figure 1: Distribution of participants by presence of gestational diabetes mellitus (n=348)

Among the total 348 participants, over 75% (n=262) were from the non-GDM group, while only 24.71% had gestational diabetes at the time of their admission.

Table 1: Distribution of participants by socio-demographic characteristics (n=348)

Socio-Demographic Characteristics	GDM Group (n=86)		Non-GDM Group (n=262)		P-Value
	n	%	n	%	
Age					
<35 years	60	69.77%	239	91.22%	**<0.001**
≥35	26	30.23%	23	8.78%	
Religion					
Muslim	81	94.19%	252	96.18%	**>0.05**
Hindu	5	5.81%	10	3.82%	
Education					
No Formal education	9	10.47%	27	10.31%	**>0.05**
Primary levels	45	52.33%	142	54.20%	
Secondary levels	32	37.21%	93	35.50%	
Gravida					
Primigravida	19	22.09%	84	32.06%	**<0.001**
Multipara	59	68.60%	167	63.74%	
Grand multipara	8	9.30%	10	3.82%	
BMI					
Normal	11	12.79%	111	42.37%	**<0.001**
Overweight	35	40.70%	95	36.26%	
Obese	39	45.35%	56	21.37%	

A statistically significant difference was observed in the age distribution between the groups, with 30.23% of women in the GDM group being ≥35 years old compared to 8.78% in the non-GDM group ($p<0.001$). No significant differences were found in the distribution of religion and education levels between the groups ($p>0.05$). In terms of gravida, a significant difference was observed, with 22.09% of the GDM group being primigravida compared to 32.06% in the non-GDM group ($p<0.001$). Furthermore, the GDM group had a higher percentage of grand multipara (9.30%) than the non-GDM group (3.82%). BMI distribution also showed a significant difference between the groups ($p<0.001$), with the GDM group having a higher proportion of obese individuals (45.35%) compared to the non-GDM group (21.37%), while the non-GDM group had a higher proportion of participants with a normal BMI (42.37%) than the GDM group (12.79%).

Table 2: Distribution of participants by patient clinical history (n=348)

Patient History	GDM Group (n=86)		Non-GDM Group (n=262)		P-Value
	n	%	n	%	
Family History of GDM	29	33.72%	44	16.79%	<0.001
Previous History of GDM	14	16.28%	15	5.73%	<0.001
History of Abortion	42	48.84%	10	3.82%	>0.05
History of Intrauterine death	3	3.49%	3	1.15%	<0.05
History of Neonatal death	2	2.33%	3	1.15%	>0.05
History of Fetal Malformation	1	1.16%	3	1.15%	<0.05
Urinary Tract Infection	8	9.30%	14	5.34%	>0.05
History of polyhydramnios	2	2.33%	1	0.38%	<0.05

A statistically significant difference was observed in the prevalence of a family history of GDM between the groups, with 33.72% in the GDM group compared to 16.79% in the non-GDM group ($p<0.001$). Similarly, a significant difference was found in the previous history of GDM, with 16.28% in the GDM group and 5.73% in the non-GDM group ($p<0.001$). No significant difference was observed in the history of abortion between the groups ($p>0.05$). However, a significant difference was found in the history of intrauterine death, with 3.49% in the GDM group compared to 1.15% in the non-GDM group ($p<0.05$). No significant differences were found in the history of neonatal death, urinary tract infection, and history of fetal malformation between the groups ($p>0.05$). Lastly, a significant difference was observed in the history of polyhydramnios, with 2.33% in the GDM group and 0.38% in the non-GDM group ($p<0.05$).

Table 3: Distribution of participants by delivery method (n=348)

Delivery Method	GDM Group (n=86)		Non-GDM Group (n=262)		P-Value
	n	%	n	%	
Non-Spontaneous Vaginal Delivery	31	36.05%	59	22.52%	**<0.001**
Spontaneous Vaginal Delivery	55	63.95%	203	77.48%	

A statistically significant difference was observed between the groups in the prevalence of non-spontaneous vaginal delivery, with 36.05% in the GDM group compared to 22.52% in the non-GDM group ($p<0.001$). Consequently, a higher percentage of spontaneous vaginal deliveries was reported in the non-GDM group (77.48%) compared to the GDM group (63.95%).

Table 4: Observation of predeterminate factors associated with GDM (95% CI)

Variables	Adjusted OR (95% confidence interval)	P-Value
Age ≥35 years	3.65 (2.21,6.01)	<0.001
Multipara	1.01(0.64,1.57)	>0.05
Grand multipara	1.50 (0.65,3.43)	>0.05
Obese	2.37 (1.60,3.51)	<0.001
Family History of GDM	1.88 (1.21,2.91)	<0.001
History of GDM	2.36 (1.21,4.57)	<0.05
History of intra-uterine death	2.79 (0.80,9.68)	>0.05

Age ≥35 years was found to be significantly associated with GDM, with an adjusted OR of 3.65 (95% CI: 2.21, 6.01; $p<0.001$). No significant associations were found between GDM and multipara (adjusted OR: 1.01; 95% CI: 0.64, 1.57; $p>0.05$) or grand multipara status (adjusted OR: 1.50; 95% CI: 0.65, 3.43; $p>0.05$). Obesity was significantly associated with GDM (adjusted OR: 2.37; 95% CI: 1.60, 3.51; $p<0.001$), as were family history of GDM (adjusted OR: 1.88; 95% CI: 1.21, 2.91; $p<0.001$) and history of GDM (adjusted OR: 2.36; 95% CI: 1.21, 4.57; $p<0.05$). However, no significant association was observed between GDM and history of intra-uterine death (adjusted OR: 2.79; 95% CI: 0.80, 9.68; $p>0.05$).

DISCUSSION

In this study, we aimed to observe the risk factors among gestational diabetes mellitus (GDM) patients and compare our findings with existing literature. Our results showed that age, BMI, family history of GDM, and previous history of GDM were significantly associated with GDM, which is consistent with previous research. The association between maternal age and GDM risk has been well-established in previous studies (Makgoba *et al.*, 2012; Zhang & Ning, 2011). Our findings indicate that women aged 35 years or older have a significantly higher risk of developing GDM, with an adjusted odds ratio (OR) of 3.65 (95% CI: 2.21, 6.01; $p<0.001$). This is in line with the results of Makgoba *et al.*, (2012), which demonstrated that older maternal age was associated with an increased risk of GDM, highlighting the importance of close monitoring and early intervention for older pregnant women. The relationship between obesity and GDM risk has also been well-documented in previous research (Torloni *et al.*, 2009; Yogev *et al.*, 2004). Our study supports these findings, as we observed a significant association between obesity and GDM, with an adjusted OR of 2.37 (95% CI: 1.60, 3.51; $p<0.001$). This is consistent with the results of the meta-analysis by Torloni *et al.*, (2009), which found that both overweight and obese women had a significantly increased risk of developing GDM compared to women with a normal BMI. The higher prevalence of obesity in the GDM group in our study also aligns with the findings of Yogev *et al.*, (2004), which demonstrated that obesity was significantly associated with adverse pregnancy outcomes, including GDM. Family history of GDM and previous history of GDM were also found to be significant factors associated with GDM in our study. The adjusted ORs for family history of GDM and previous history of GDM were 1.88 (95% CI: 1.21, 2.91; $p<0.001$) and 2.36 (95% CI: 1.21, 4.57; $p<0.05$), respectively. This is in accordance with the findings of Zhang and Ning (2011), who identified family history of diabetes and previous history of GDM as significant risk factors for GDM in a large prospective study of Chinese pregnant women. In our study, we also observed a significant difference in the prevalence of non-spontaneous vaginal deliveries between the GDM and non-GDM groups. This finding is consistent with the study by Yogev *et al.*, (2004), which reported that obesity, a significant risk factor for GDM, was also associated with an increased risk of cesarean delivery. This suggests that GDM and its associated risk factors may contribute to the higher rate of non-spontaneous vaginal deliveries observed in our study.

Limitations of the Study

The study was conducted in a single hospital with a small sample size. So, the results may not represent the whole community.

CONCLUSION

In conclusion, our study supports the existing evidence that advanced maternal age, obesity, family history of GDM, and previous history of GDM are significant risk factors for GDM. The findings highlight the importance of early screening and intervention for these high-risk groups to prevent adverse pregnancy outcomes. Further research is needed to explore the underlying mechanisms linking these risk factors to GDM and to develop targeted strategies for prevention and management.

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Conflict of Interest: None declared.

Ethical Approval: The study was approved by the Institutional Ethics Committee.

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