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Observation of the Clinical Features in Gestational Diabetes Mellitus Patients

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Abstract

Introduction: *Gestational Diabetes Mellitus (GDM) is a global health issue with varying prevalence across regions. This study aimed to observe the clinical features of the participants, and look for any possible risk factors.*

Methods: *A retrospective study was conducted at Khwaja Yunus Ali Medical College and Hospital, Bangladesh, from January 2019 to December 2020. The study included 174 pregnant women aged 18-45 years with confirmed GDM and complete medical records.*

Result: *Statistical analysis revealed significant associations between GDM and age, BMI, family history of GDM, and previous history of GDM. Women aged ≥35 years had an adjusted odds ratio (OR) of 3.65 (95% CI: 2.21, 6.01; p<0.001) for GDM. Obesity was significantly associated with GDM (adjusted OR: 2.37; 95% CI: 1.60, 3.51; p<0.001). 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) were also significant risk factors.*

Conclusion: *The study highlights age, BMI, family history of GDM, and previous history of GDM as significant risk factors for GDM. The findings underscore the need for early intervention strategies to manage these risk factors, potentially preventing or mitigating GDM's adverse effects.*

Keywords: *Diabetes, Pregnancy, Gestational, Maternal*

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I. INTRODUCTION

Gestational Diabetes Mellitus (GDM) is a health anomaly marked by heightened blood glucose levels, initially detected during the course of pregnancy. This condition is found in approximately 3-20% of all pregnancies and is linked to an escalated likelihood of unfavorable maternal, neonatal, and pregnancy outcomes (International Diabetes Federation, 2019). GDM has emerged as a global health issue, with its prevalence differing across diverse regions and populations. This paper endeavors to scrutinize the risk factors prevalent among GDM patients, with a special emphasis on the incidence in Asia and Bangladesh, and its repercussions on maternal health, pregnancy outcomes, and neonatal health. The American Diabetes Association (ADA) characterizes GDM as "diabetes diagnosed in pregnancy that is not overt diabetes" (ADA, 2014). This condition generally manifests during the second or third trimester of pregnancy and typically resolves after childbirth. However, women who have experienced GDM are at an elevated risk of developing type 2 diabetes in the future (Bellamy et al., 2009; Kim et al., 2002). The global incidence of GDM has been escalating, with estimates indicating that approximately 15.8% of pregnancies worldwide are affected (International Diabetes Federation, 2019). This rise has been linked to several factors, including an increase in obesity and sedentary lifestyles, an aging demographic, and a higher incidence of type 2 diabetes (Dabelea et al., 2005; Hu et al., 2014). In Asia, the incidence of GDM is significantly higher, ranging from 9.8% to 25.0% (Wong et al., 2013). This regional variation can be attributed to differences in genetic susceptibility, lifestyle factors, and diagnostic criteria (Makgoba et al., 2012; Zhang et al., 2011). In Bangladesh, the incidence of GDM is estimated to be around 12.9% (Jesmin et al., 2014). The increased incidence in this region may be due to the high rate of consanguineous marriages, which can lead to a higher incidence of genetic risk factors for GDM (Alzahrani et al., 2021). The causes of GDM are multifactorial, with both genetic and environmental factors playing a role in its development. Genetic susceptibility, advanced maternal age, obesity, and a history of GDM in previous pregnancies are some of the recognized risk factors (Torloni et al., 2009; Zhang & Ning, 2011; Buchanan et al., 2007). GDM can have substantial implications for 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; Landon et al., 2009). Moreover,

women with GDM have a higher risk of developing type 2 diabetes and cardiovascular disease later in life (Bellamy et al., 2009; Damm et al., 2016). Pregnancy outcomes can also be negatively impacted 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. Furthermore, 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; Metzger et al., 2008). 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 later in life (Krishnaveni et al., 2010; Dabelea et al., 2008). Given the substantial impact of GDM on maternal, pregnancy, and neonatal outcomes, it is imperative to identify the risk factors linked to this condition. Early detection and intervention can aid in preventing or reducing the negative 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; Metzger et al., 2008). Therefore, this study was undertaken with the objective to observe and identify the clinical features and significant pre-existing factors associated with gestational diabetes mellitus.

II. METHODS

This study is a retrospective observational analysis conducted at the Department of Gynecology and Obstetrics, Khwaja Yunus Ali Medical College and Hospital, Sirajganj, Bangladesh. The study spanned a duration of two years, from January 2019 to December 2020. The research was carried out using data gathered from a total of 174 pregnant mothers who had been admitted to the study hospital over the past three years. The study incorporated women aged between 18 to 45 years who had a confirmed diagnosis of GDM during pregnancy and had comprehensive medical records. The exclusion criteria included pre-existing type 1 or type 2 diabetes, multiple gestations, known fetal anomalies or chromosomal abnormalities, and incomplete medical records. Data extracted from the eligible patient records included maternal demographic characteristics, medical history, family history of diabetes, among other factors. This data was subsequently scrutinized to identify potential risk factors for GDM. Ethical approval for the study was procured from the ethical review committee of the study hospital. All the collected data was analyzed using SPSS v.25. The significance was observed using Pearson's chi square test, and a p-value of <0.05 was considered statistically significant.

III. RESULTS

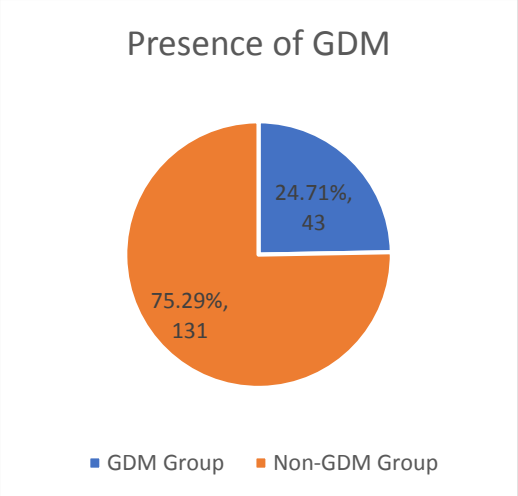

Figure 1: Distribution of participants by presence of gestational diabetes mellitus (n=174)

Among the total 174 participants, over 75% (n=131) 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=174)

Sociodemographic Characteristics	GDM Group (n=43)		Non-GDM Group (n=131)		P-Value
	n	%	n	%	
Age					
<35 years	30	69.77%	119	90.84%	<0.001
≥35	13	30.23%	12	9.16%	
Religion					
Muslim	41	95.35%	126	96.18%	>0.05
Hindu	2	4.65%	5	3.82%	
Education					
No Formal education	5	11.63%	14	10.69%	>0.05
Primary levels	23	53.49%	71	54.20%	
Secondary levels	15	34.88%	46	35.11%	
Gravida					
Primigravida	10	23.26%	42	32.06%	<0.001
Multipara	30	69.77%	84	64.12%	
Grand multipara	3	6.98%	5	3.82%	
BMI					
Normal	6	13.95%	56	42.75%	<0.001
Overweight	18	41.86%	47	35.88%	
Obese	19	44.19%	28	21.37%	

The findings revealed significant differences in various sociodemographic factors between the GDM and non-GDM groups. Age demonstrated a significant association with GDM ($p < 0.001$), as 69.77% of participants in the GDM group were below 35 years old, while the majority (90.84%) of the non-GDM group fell within the same age range. Conversely, the percentage of participants aged 35 and above was higher in the GDM group (30.23%) compared to the non-GDM group (9.16%). Religion did not show a significant association with GDM, as the majority of participants in both the GDM (95.35%) and non-GDM (96.18%) groups identified as Muslim, with a smaller percentage identifying as Hindu. Similarly, education levels did not demonstrate a significant association with GDM ($p > 0.05$), with the majority of participants in both groups having primary education levels, followed by secondary education levels and a minority with no formal education. Gravida, on the other hand, exhibited a significant association with GDM ($p < 0.001$). In the GDM group, 23.26% of participants were primigravida, while in the non-GDM group, 32.06% were primigravida. The majority of participants in both groups were multipara, with a slightly higher proportion in the GDM group (69.77%) compared to the non-GDM group (64.12%). A small percentage of participants in both groups were classified as grand multipara. BMI distribution also showed a significant association with GDM ($p < 0.001$). The GDM group had a higher proportion of obese individuals (44.19%) compared to the non-GDM group (21.37%), while the non-GDM group had a higher percentage of participants with a normal BMI (42.75%) compared to the GDM group (13.95%).

Table 2: Distribution of participants by patient clinical history (n=174)

Patient History	GDM Group (n=43)		Non-GDM Group (n=131)		P-Value
	n	%	n	%	
Family History of GDM	15	34.88%	22	16.79%	**<0.001**
Previous History of GDM	7	16.28%	7	5.34%	**<0.001**
History of Abortion	21	48.84%	5	3.82%	>0.05
History of Intrauterine death	2	4.65%	2	1.53%	**<0.05**
History of Neonatal death	1	2.33%	1	0.76%	>0.05
History of Fetal Malformation	1	2.33%	2	1.53%	**<0.05**
Urinary Tract Infection	4	9.30%	7	5.34%	>0.05
History of polyhydramnios	1	2.33%	1	0.76%	**<0.05**

A comparison of family history of GDM showed that 34.88% of individuals in the GDM group had a family history of GDM, whereas only 16.79% of individuals in the non-GDM group had a similar family history ($p < 0.001$). Similarly, a previous history of GDM was found in 16.28% of individuals in the GDM group, compared to 5.34% in the non-GDM group ($p < 0.001$). Regarding the history of abortion, 48.84% of individuals in the GDM group had a history of abortion, whereas only 3.82% of individuals in the non-GDM group reported the same ($p > 0.05$). A statistically significant difference was observed in the history of intrauterine death, with 4.65% of individuals in the GDM group and 1.53% in the non-GDM group reporting such incidents ($p < 0.05$). Similarly, the GDM group had a slightly higher percentage of individuals with a history of neonatal death (2.33%) compared to the non-GDM group (0.76%), although the difference was not statistically significant ($p > 0.05$). In terms of the history of fetal malformation, 2.33% of individuals in the GDM group reported this condition, while 1.53% of individuals in the non-GDM group had a similar history ($p < 0.05$). The occurrence of urinary tract infections was slightly higher in the GDM group (9.30%) compared to the non-GDM group (5.34%), but the difference was not statistically significant ($p > 0.05$). Similarly, the GDM group had a slightly higher percentage of individuals with a history of polyhydramnios (2.33%) compared to the non-GDM group (0.76%), although the difference was not statistically significant ($p < 0.05$).

Table 3: Distribution of participants by delivery method (n=174)

Delivery Method	GDM Group (n=43)		Non-GDM Group (n=131)		P-Value
	n	%	n	%	
Non-Spontaneous Vaginal Delivery	15	34.88%	30	22.90%	<0.001
Spontaneous Vaginal Delivery	28	65.12%	101	77.10%	

Among the GDM group, 34.88% of participants underwent non-spontaneous vaginal delivery, while in the non-GDM group, the percentage was slightly lower at 22.90% ($p < 0.001$). On the other hand, spontaneous vaginal delivery was more prevalent in the GDM group, with 65.12% of participants delivering through this method, compared to 77.10% in the non-GDM group.

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; $p>0.05$).

IV. DISCUSSION

In the present study, our aim was to explore and discuss the risk factors associated with gestational diabetes mellitus (GDM) by comparing our findings with the existing literature. Our results revealed several significant associations between sociodemographic factors and GDM, which align with previous research in this field. One of the key findings of our study was the significant association between maternal age and GDM risk. Consistent with prior studies (Makgoba et al., 2012; Zhang & Ning, 2011), we observed that women aged 35 years or older had a substantially higher risk of developing GDM compared to younger women (adjusted OR: 3.65, 95% CI: 2.21, 6.01, $p<0.001$). This finding reinforces the evidence presented by Makgoba et al. (2012), emphasizing

the importance of closely monitoring and intervening early in older pregnant women to mitigate the risk of GDM. Furthermore, our study corroborated the well-documented association between obesity and GDM risk, as supported by previous research (Torloni et al., 2009; Yogev et al., 2004). We observed a significant relationship between obesity and GDM, with an adjusted OR of 2.37 (95% CI: 1.60, 3.51, $p<0.001$). These results are consistent with the meta-analysis conducted by Torloni et al. (2009), which demonstrated that both overweight and obese women have a substantially higher risk of developing GDM compared to women with a normal BMI. The higher prevalence of obesity among GDM patients in our study is in line with the findings of Yogev et al. (2004), who identified obesity as a significant risk factor for adverse pregnancy outcomes, including GDM. Family history of GDM and previous history of GDM also emerged as significant factors associated with GDM in our study. The adjusted OR for family history of GDM was 1.88 (95% CI: 1.21, 2.91, $p<0.001$), while the adjusted OR for previous history of GDM was 2.36 (95% CI: 1.21, 4.57, $p<0.05$). These findings correspond with the research conducted by Zhang and Ning (2011), who found that both family history of diabetes and previous history of GDM were significant risk factors for GDM in a large prospective study of Chinese pregnant women. Additionally, our study revealed a noteworthy 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 likelihood 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. In summary, our study provides further evidence regarding the risk factors associated with GDM. The significant associations observed between age, obesity, family history of GDM, previous history of GDM, and non-spontaneous vaginal deliveries contribute to our understanding of the complex interplay between sociodemographic factors and GDM. These findings underscore the importance of targeted interventions, such as early monitoring, lifestyle modifications, and preconception counseling, to mitigate the risk of GDM in high-risk populations.

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.

V. CONCLUSION

In summary, our study reinforces the current body of evidence indicating that advanced maternal age, obesity, family history of gestational diabetes mellitus (GDM), and prior history of GDM are notable risk factors for GDM. These findings underscore the significance of early screening and intervention for these high-risk populations in order to mitigate the potential adverse outcomes associated with GDM. Additional research is warranted to delve into the underlying mechanisms that connect these risk factors to GDM and to formulate tailored approaches for prevention and treatment.

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Conflict of interest: None declared

Ethical approval: The study was approved by the Institutional Ethics Committee

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