Section: Obstetrics and Gynaecology

Original Research Article

PREVALENCE AND CLINICAL BURDEN OF GESTATIONAL DIABETES MELLITUS AT A TERTIARY CARE CENTRE

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Abstract

Background: To determine the prevalence and clinical impact of Gestational Diabetes Mellitus (GDM) in a tertiary care hospital. **Materials and Methods:** The present study was conducted within the Obstetrics and Gynaecology Department of a tertiary care hospital. The total number of deliveries recorded during the specified period amounted to 2258, out of which 120 cases were identified as having gestational diabetes mellitus (GDM). A cohort of 2258 pregnant women underwent screening between the 16th and 32nd weeks of gestation using the oral glucose test (75 gm GTT), resulting in a positive screening outcome. The study included individuals with a blood glucose level of 130 mg/dl. **Result:** The study revealed that 50% of the participants were classified as obese, 12.5% were categorised as overweight, 35% fell within the normal BMI range, and 2.5% were classified as underweight. Normoglycemia was attained in 24 (20%) mothers through the use of oral hypoglycemic agents (OHA) exclusively, while 78 (65%) mothers achieved normoglycemia through a combination of medical nutrition therapy (MNT) and insulin therapy. In addition to medical nutrition therapy (MNT), metformin was also administered in 18 cases, accounting for 15% of the total. The study observed a total of 40 cases (33.33%) of Hypertensive disorder of pregnancy among the maternal population. Additionally, 6 (5%) mothers with abnormal Glucose Tolerance Test (GTT) were found to have Anaemia. Polyhydramnios was observed in 3 cases, accounting for 2.5% of the total sample. Urinary tract infection (UTI) was diagnosed in 22 cases, representing 18.33% of the sample. Hypothyroidism was identified in 24 cases, corresponding to 20% of the total sample. A total of three infants, accounting for 2.5% of the newborns, exhibited foetal growth restriction (FGR) among mothers diagnosed with gestational diabetes mellitus (GDM). **Conclusion:** It is important to highlight the identification of risk factors for gestational diabetes mellitus (GDM) in order to enable clinicians to identify individuals who are more susceptible to developing GDM. This early recognition allows for prompt diagnosis and the initiation of intensive lifestyle modifications and treatment.

INTRODUCTION

The global incidence of Diabetes is on the rise, encompassing a significant proportion of women affected by Gestational diabetes mellitus. According to the demographic projections conducted by the United Nations Population Division for the year 2025, the World Health Organisation (WHO) has provided estimates regarding the prevalence of diabetes among adults in all countries. The findings indicate that there will be a higher number of women affected by diabetes compared to men. Additionally, it is anticipated that there will be a significant rise in the burden of gestational diabetes mellitus (GDM), particularly in economically disadvantaged nations.Gestational Diabetes Mellitus (GDM) is characterised by varying levels of impaired glucose tolerance that manifest or are initially identified during pregnancy.[1] Gestational diabetes mellitus impacts approximately 7% of pregnancies in the United States on an annual basis, leading to an estimated 200,000 cases per year. Following pregnancy, a notable proportion of women, ranging from 5 to 10 percent, who previously experienced Gestational Diabetes Mellitus (GDM), persistently develop Type 2 diabetes. The global incidence of gestational diabetes mellitus (GDM) exhibits a range of 1.4 to 14 percent. The prevalence of Gestational

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Diabetes Mellitus (GDM) in India exhibits significant variation, ranging from 3.8% to 21% across different regions of the country. This variation can be attributed to factors such as geographical location and the specific diagnostic methods employed. According to recent research, there is a higher incidence of gestational diabetes mellitus in urban regions compared to rural regions. According to research findings, there is a correlation between the prevalence of Gestational Diabetes Mellitus (GDM) and Impaired Glucose Tolerance (IGT) within a specific population and ethnicity. Women who have been diagnosed with gestational diabetes mellitus (GDM) face a higher likelihood of developing diabetes in the future, specifically type 2 diabetes mellitus. Additionally, their children are also at an elevated risk of developing diabetes.[2-5] Therefore, gestational diabetes mellitus (GDM) presents a significant opportunity for the advancement, evaluation, and execution of clinical approaches aimed at preventing diabetes. The implementation of a comprehensive screening programme for glucose intolerance in pregnant women, along with prompt intervention to achieve euglycemia and ensure proper nutrition, has the potential to effectively break the cycle of transmitting glucose intolerance from one generation to the next. The precise aetiology of Gestational Diabetes Mellitus (GDM) remains elusive. The primary characteristic of Gestational Diabetes Mellitus (GDM) is the heightened level of insulin resistance. The state of pregnancy elicits gradual alterations in the metabolic processes related to carbohydrates in the maternal body. As gestation progresses, the presence of placental hormones leads to increased insulin resistance and diabetogenic stress, which in turn requires a compensatory rise in insulin secretion. The development of gestational diabetes occurs when the level of compensation provided is insufficient. The aetiology of familial clustering of Gestational Diabetes Mellitus (GDM) in individuals with a first-degree relative who has a history of GDM or another form of diabetes is presumed to involve both genetic and non-genetic environmental factors. This is particularly evident in females, as both low and high birth weights have been linked to an increased risk of developing GDM in subsequent pregnancies. This implies that pregnant women with pre-existing Type 1 diabetes that is not well controlled face a higher likelihood of delivering a macrosomic infant. Additionally, if the infant is female, there is an elevated risk of developing Gestational diabetes mellitus and/or Type 2 diabetes in her subsequent pregnancies and beyond. In addition to the aforementioned metabolic programming effects, genetic variation also contributes to the regulation of birth size and subsequent risk of gestational diabetes mellitus (GDM) in women with either low or high birth weight.[6] The complications experienced during the foetal and neonatal stages encompass a range of issues, such as foetal malformation, macrosomia, perinatal morbidity including prematurity, respiratory distress syndrome (RDS), neonatal hypoglycaemia, hypocalcemia, and hyperbilirubinemia. Additionally, perinatal morbidity may involve intrauterine death (IUD) or stillbirth (SB), as well as neonatal death (NND). Euglycemia refers to the maintenance of glucose levels within the desired range throughout the entirety of the day. This can be accomplished through various interventions, including medical nutrition therapy (MNT), insulin therapy, exercise, metformin administration, and monitoring of both the foetus and the mother. Hence, it is imperative to engage in diligent surveillance of blood glucose levels and commence suitable interventions in order to provide optimal care for women diagnosed with gestational diabetes mellitus (GDM).[7,8]

MATERIALS AND METHODS

The present study was conducted within the Obstetrics and Gynaecology Department of a tertiary care hospital. The total number of deliveries recorded during the specified period amounted to 2258, out of which 120 cases were identified as having gestational diabetes mellitus (GDM). A cohort of 2258 pregnant women underwent screening between the 16th and 32nd weeks of gestation using the oral glucose test (75 gm GTT), resulting in a positive screening outcome. The study included individuals with a blood glucose level of 130 mg/dl.

Methodology

The primary method for diagnosing gestational diabetes mellitus (GDM) is through the utilisation of an oral glucose tolerance test (OGTT). The oral glucose tolerance test (OGTT) can be conducted using a 75-gram load administered over a two-hour period. The 75-gram two-hour oral glucose tolerance test (OGTT) is a diagnostic method that follows a one-step approach. A diagnosis of gestational diabetes mellitus (GDM) is established when the glucose level exceeds 130mg % during the 75-gram two-hour oral glucose tolerance test (OGTT). Patients diagnosed with gestational diabetes mellitus (GDM) were provided with medical nutrition therapy (MNT) and their blood glucose levels were monitored after a period of 14 days. The IADPSG criteria has become widely adopted as the primary threshold for determining elevated values, particularly in light of the findings from the Hyperglycemia and Adverse Pregnancy Outcome (HAPO) study.[9] In general, the 75-gram two-hour test is deemed to be a more pragmatic and expedient alternative when contrasted with the 100-gram three-hour test. The 75-g two-hour test demonstrates greater sensitivity in predicting complications during pregnancy, such as gestational hypertension, preeclampsia, and macrosomia, when compared to the 100-g three-hour test.[10] This is primarily due to the fact that the 75-g two-hour test only requires a single elevated glucose value to diagnose gestational

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diabetes mellitus (GDM), whereas the 100-g three-hour test necessitates two abnormal glucose values.[9] The management options encompassed medical nutrition therapy (MNT), insulin therapy, exercise for sugar control, and monitoring of both the foetus and the mother. The International workshop on Gestational Diabetes Mellitus (GDM) reached the conclusion that in cases where the fasting blood sugar (FBS) level exceeds 95mg/dl and the postprandial blood sugar (PPBS) level exceeds 120mg/dl, with a mean glucose level exceeding 105mg/dl, it is recommended to initiate insulin therapy.

In addition to standard investigations and estimation of blood sugar levels, serial ultrasound examinations were conducted alongside other antepartum foetal surveillance tests to evaluate the condition of the foetus. Doppler ultrasound was performed exclusively in specific instances. Hospital admission was initiated in cases where there was evidence of maternal or foetal compromise. Spontaneous labour is permitted for cases that are uncomplicated. The delivery occurred earlier due to inadequate management of gestational diabetes mellitus (GDM) and impending foetal compromise (IFC). Gestational diabetes mellitus (GDM) patients who were prescribed insulin treatment underwent delivery at 38-39 weeks gestation.

The research employed a semi-structured questionnaire to gather sociodemographic and obstetrics information, while an interview schedule was utilised for data collection purposes. The pre-gestational body mass index (BMI) was determined by calculating the BMI at the initial antenatal visit. The calculation of gestational weight gain involved the subtraction of pre-gestational weight from the weight recorded during the last trimester of pregnancy. The study was conducted after obtaining institutional ethical clearance and written informed consent was obtained from each individual patient. The variables examined in this study were maternal age at the time of delivery, parity (number of previous pregnancies), body mass index (BMI), and weight gain during pregnancy. Gestational diabetes mellitus (GDM) managed with medical nutrition therapy (MNT) and the administration of insulin or metformin was observed to be associated with maternal complications, mode of delivery, and indications for caesarean section. The study aimed to investigate the birth weight, gestational age (term/preterm), and Apgar scores of infants born to mothers with gestational diabetes mellitus (GDM).

The data that was gathered was inputted into Microsoft Excel and subsequently analysed utilising the SPSS 25.0 software version. The categorical variables were represented using proportions, while the continuous variables were represented using the mean and standard deviation.

RESULTS

Among the 2,258 deliveries observed during the designated study period, it was found that 120 cases, accounting for 5.31% of the total, were diagnosed with gestational diabetes mellitus (GDM). The study observed that the largest proportion of patients, accounting for 45.33%, fell within the age range of 25-30 years. This was followed by individuals aged 20-25 years, constituting 28.33% of the sample. Patients below the age of 20 accounted for 12.5%, while those aged 30-35 years represented 10% of the population. Lastly, patients above the age of 35 years constituted the smallest proportion, with a percentage of 3.33%. The mean age of the patients was calculated to be 29.44±3.85 years. Approximately 48.33% of the participants in the study were classified as first-time mothers, while the remaining 51.67% were categorised as multi-gravid individuals. The study revealed that 50% of the participants were classified as obese, 12.5% were categorised as overweight, 35% fell within the normal BMI range, and 2.5% were classified as underweight. Seventy percent of the participants experienced weight gain below 12 kg during their pregnancy, while 25% observed weight gain between 12-15 kg, and the remaining 5% reported weight gain exceeding 15 kg. Normoglycemia was attained in 24 (20%) mothers through the use of oral hypoglycemic agents (OHA) exclusively, while 78 (65%) mothers achieved normoglycemia through a combination of medical nutrition therapy (MNT) and insulin therapy. In addition to medical nutrition therapy (MNT), metformin was also administered in 18 cases, accounting for 15% of the total. The following table, labelled as [Table 2]

The study observed a total of 40 cases (33.33%) of Hypertensive disorder of pregnancy among the maternal population. Additionally, 6 (5%) mothers with abnormal Glucose Tolerance Test (GTT) were found to have Anaemia. Polyhydramnios was observed in 3 cases, accounting for 2.5% of the total sample. Urinary tract infection (UTI) was diagnosed in 22 cases, representing 18.33% of the sample. Hypothyroidism was identified in 24 cases, corresponding to 20% of the total sample.A total of three infants, accounting for 2.5% of the newborns, exhibited foetal growth restriction (FGR) among mothers diagnosed with gestational diabetes mellitus (GDM). [Table 3]

In relation to the duration of pregnancy, it was observed that 54 cases (45%) resulted in preterm delivery, while 66 cases (55%) exhibited term delivery. [Table 4]

A total of 10% of the participants underwent operative vaginal delivery. A significant proportion of mothers diagnosed with gestational diabetes, specifically 45%, required Caesarean delivery. A total of 45% of the participants experienced a vaginal delivery as their chosen mode of delivery. Patients were prohibited from exceeding their scheduled

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appointment date. A caesarean section (LSCS) is performed in approximately 45% of cases, with the most frequent indications being a history of previous caesarean section, cephalopelvic disproportion, preeclampsia, foetal growth restriction (FGR) with unsuccessful induction, and failed induction accompanied by foetal distress. Seventy percent of the cases required emergency caesarean delivery due to various factors such as non-reassuring foetal heart rates, failed induction, cephalopelvic disproportion (CPD), impending eclampsia, and previous caesarean section. There were a total of five cases in which preterm premature rupture of membranes (PPROM) occurred, resulting in early preterm caesarean deliveries. [Table 5]

Out of the total number of infants observed, 6 infants (equivalent to 5%) exhibited a weight below 2.5kg, while 39 infants (32.5%) had a weight ranging from 2.5kg to 3.0kg. A total of 27 infants, accounting for 22.5% of the sample, had a birth weight exceeding 3.5 kilogrammes. The majority of the infants, specifically 40% of them, had a weight ranging from 3 to 3.5 kilogrammes. [Table 6]

Table 1: Basic parameter of the patients

Age group	Number	Percentage
Below 20	15	12.5
20-25	34	28.33
25-30	55	45.83
30-35	12	10
Above 35	4	3.33
Mean Age	29.44±3.85	
Parity		
Nullipara	58	48.33
P2	49	40.83
P3	11	9.17
>P3	2	1.67
BMI		
Under weight (<18.5)	3	2.5
Normal (18.5-23)	42	35
Over weight (23-27.5)	15	12.5
Obese (>27.5)	60	50
Mean BMI	26.74±3.26	
Mean weight gained	12.11±2.58	
Baby weight grams	3215.87	

Table 2: Severity of GDM

Severity of GDM	Number	Percentage
OHA	24	20
MNT and insulin therapy	78	65
MNT and metformin	18	15

Table 3: Morbidity in GDM mothers

Morbidity	Frequency	Percentage
Hypertensive disorders of Pregnancy	40	33.33
Hypothyroidism	24	20
Urinary tract infection	22	18.33
Anemia	6	5
Polyhydramnios	3	2.5
FGR- Fetal growth restriction	3	2.5
Normal	22	18.33

Table 4: Gestational age at birth

Gestational age at birth	Frequency	Percentage
>37 weeks Term	66	55
<37 weeks Preterm	54	45

Table 5: Mode of delivery

Mode of outcome of delivery	Frequency	Percentage
Vaginal birth	54	45
Emergency caesarean	45	45
Elective cesarean	9	
Assisted vaginal birth	12	10

Table 6: GDM and Birth weight

Birth weight	Frequency	Percentage
below 2.5	6	5
2.5-3.0	39	32.5

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3.0-3.5	48	40
Above 3.5	27	22.5

DISCUSSION

Gestational diabetes mellitus (GDM) is widely recognised as the prevailing metabolic disorder that can arise during pregnancy. Seshiah et al. emphasise the significance of prioritising maternal health during the antepartum and post-partum period as a crucial public health measure in India's efforts to prevent diabetes.[11] Around 3-5% of pregnancies are affected by diabetes, with the majority (90%) being gestational diabetes mellitus (GDM), while the remaining cases are classified as pregestational diabetes. According to research conducted in Germany, Gestational Diabetes Mellitus (GDM) was found to complicate approximately 4% of pregnancies.[12] The present study comprised a sample of 120 cases diagnosed with gestational diabetes mellitus (GDM), with an observed incidence rate of 5.31%. Seshiah et al. conducted a study in Chennai, Wahi et al. conducted a study in Jammu, and Gajjar et al. conducted a study in Baroda, Gujarat. These studies collectively observed a significant prevalence of gestational diabetes mellitus (GDM) as indicated by the high occurrence rates reported.[13-15] The observed variations in pregnant women residing in these regions may be ascribed to disparities in age and/or socioeconomic status. Approximately four million women in India are impacted by gestational diabetes mellitus (GDM) at any given moment.[16,17] According to the study conducted by Hold M et al., gestational diabetes mellitus (GDM) is associated with various complications for both the mother and the foetus, which share similar characteristics with those observed in pregestational diabetes.[18] According to Green MF et al., it is recommended to use a 50gm oral glucose challenge test (OGCT) as a screening method.[19] If the measured value is greater than or equal to 130 mg/dl, a diagnostic test known as the 100 gm oral glucose tolerance test (OGTT) is performed. According to O'Sullivan et al,[20] the recommended diagnostic test for gestational diabetes is the 100 gramme glucose tolerance test (GTT), which is widely utilised in clinical practise. Impaired glucose tolerance test was deemed as indicative of a single abnormal value, while the presence of two or more abnormal values was considered as gestational diabetes mellitus (GDM). The management options encompassed in this study comprised of Medical nutrition therapy (MNT), Insulin therapy, and exercise for the purpose of controlling blood sugar levels, as well as monitoring the health of both the foetus and the mother. According to Langer et al. (year), Metformin has been proposed as a potential alternative therapy.[21]

The association between maternal age and gestational diabetes mellitus (GDM) is well-documented, although there remains a lack of consensus regarding the specific relationship between age and the heightened risk of developing GDM. This finding is substantiated by the current study, which reveals that the largest proportion of patients (45.33%) fell within the age range of 25-30 years. This was followed by individuals aged 20-25 years (28.33%), below 20 years (12.5%), 30-35 years (10%), and above 35 years (3.33%). The mean age of patients in the present study was 29.44±3.85 years, whereas Ennazhiyil SV et al,[22] reported a mean age of 26.56±4.473 years.

The Body Mass Index (BMI) is frequently employed as a risk assessment tool in the screening process for Gestational Diabetes Mellitus (GDM). In the current study, it was observed that 50% of the participants exhibited obesity, 12.5% were classified as overweight, 35% fell within the normal range of body mass index (BMI), and 2.5% were categorised as underweight. Among patients with gestational diabetes mellitus (GDM), it was observed that South Asian women exhibited higher mean age and a greater prevalence of obesity.[23] Hence, the elevated prevalence of gestational diabetes mellitus (GDM) in Asia can be attributed to factors such as advancing age, increasing body mass index (BMI), and racial group. The higher risk of insulin resistance observed in Asians compared to Caucasians may also be attributed to a genetic predisposition.[24]

The present study, as well as the study conducted by Ennazhiyil SV et al, identified multiparity ≥2 as a significant risk factor for gestational diabetes mellitus (GDM). According to Lee et al,[25] factors such as a prior history of gestational diabetes mellitus (GDM), congenital anomalies, stillbirth, abortion, preterm delivery, macrosomia, concurrent pregnancy-induced hypertension (PIH) and polycystic ovary syndrome (PCOS), age equal to or greater than 25, a body mass index (BMI) equal to or greater than 25, and a family history of diabetes were identified as predictors of GDM. Likewise, individuals with a previous history of macrosomia and PIH exhibit odds ratios of 4 and 3, respectively, for increased insulin resistance, a result that aligns with the findings of the current study.[26,27] According to the research conducted by London MB et al, it is suggested that initiating foetal surveillance between 28 and 32 weeks of gestation may have the potential to prevent stillbirth, foetal compromise, and preterm delivery.[28] In their study, Kofinas et al,[29] recommended the utilisation of Doppler ultrasound as a clinical tool for monitoring foetal well-being in cases of gestational diabetes mellitus (GDM) accompanied by placental vascular compromise.

Normoglycemia was successfully attained in 24 mothers (20%) through the use of oral hypoglycemic agents (OHA) alone. In contrast, a combination of medical nutrition therapy (MNT) and insulin therapy was employed in 78 mothers (65%) to achieve normoglycemia. In addition to medical nutrition therapy (MNT), metformin was administered in 18

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cases, accounting for 15% of the total sample. In the study conducted by Sathiamma P K et al,[30] it was found that normoglycemia was attained through dietary interventions in 44 individuals, accounting for 32.8% of the sample. Furthermore, a combination of diet and insulin was required for 87 participants, representing 64.92% of the cohort. In only 3 cases, the addition of metformin to insulin therapy was necessary to achieve adequate glycemic control. The current investigation examined various maternal morbidities, including Hypertensive disorder of pregnancy in 40 cases (33.33%), Anaemia in 6 mothers (5%) with abnormal GTT, Polyhydramnios in 3 cases (2.5%), UTI in 22 cases (18.33%), and Hypothyroidism in 24 cases (20%). A total of three infants, accounting for 2.5% of the newborns, were diagnosed with foetal growth restriction (FGR) among mothers with gestational diabetes mellitus (GDM). Polyhydramnios, as observed in the study conducted by Sathiamma P K et al,[30] was found to be associated with various adverse outcomes, including macrosomia (2.9%), foetal growth restriction (FGR), urinary tract infection (UTI), and pregnancy-induced hypertension (PIH), with a prevalence of 11.9%. In the current investigation, it was found that 10% of the participants underwent operative vaginal delivery. A significant proportion of mothers diagnosed with gestational diabetes, specifically 45%, required a Caesarean delivery. A total of 45% of the participants experienced vaginal delivery as their chosen mode of delivery. Seventy percent of the cases required emergency caesarean delivery due to various factors such as non-reassuring foetal heart rates (NRFHR), failed induction, foetal growth restriction (FGR) with abnormal doppler patterns, cephalopelvic disproportion (CPD), impending eclampsia, and previous caesarean deliveries. Person B and their colleagues (B et al,[31] demonstrated that despite achieving optimal glycaemic control, there remained an elevated risk of maternal complications. According to Rasmussen et al,[32] it is not advisable to deliver before full term unless there is sufficient evidence of macrosomia, polyhydramnios, foetal growth restriction (FGR), and inadequate glycaemic control. The results indicate that 62.68% of the patients experienced spontaneous onset of labour, while elective termination was performed in 37.32% of the cases. In 41% of cases, the method of delivery utilised was the vaginal route. The rate of caesarean section procedures was found to be 59%, with 22% of these being elective and 78% classified as emergency caesareans.

CONCLUSION

It is important to highlight the identification of risk factors for gestational diabetes mellitus (GDM) in order to enable clinicians to identify individuals who are more susceptible to developing GDM. This early recognition allows for prompt diagnosis and the initiation of intensive lifestyle modifications and treatment. It is recommended that antenatal screening for gestational diabetes mellitus (GDM) be universally mandated for pregnant women with identified risk factors. This screening should employ the one-step method, which has been found to be effective.

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