Section: General Medicine

Research

CLINICAL STUDY OF PREVALENCE OF GESTATIONAL DIABETES MELLITUS AND ASSOCIATED RISK FACTORS: A TEACHING HOSPITAL BASED STUDY

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Abstract

Background: Gestational Diabetes Mellitus (GDM) patients are more likely to experience negative obstetric and perinatal outcomes. Using the 'Diabetes in pregnancy study group India' (DIPSI) criteria and related risk variables in pregnant women, this research was done to assess the prevalence of GDM. The aim and objective of this study is to use a single step procedure involving a 75gm glucose load to determine the prevalence of GDM in antenatal patients at a medical college teaching hospital in India and to investigate the associations between GDM and several risk factors, such as Maternal age, Obesity, family history of GDM, previous H/OMacrosomia, poor obstetric history, and prior H/O GDM. **Materials and Methods:** A total of 165 pregnant gestational women, between the gestational ages of 14 to18 weeks, who were either admitted as in-patients or who sought prenatal care at an OPD, were included in the study. No matter their parity, Pregnant women between 14 to 18weeksof gestational age, who met the inclusion requirements were included in the study. **Result:** In this investigation, the prevalence of GDM was 11.51%. Women with risk factors such as advanced age, high BMI, positive family history of DM, prior history of GDM, and macrosomia had higher prevalence rates. **Conclusion:** The prevalence of GDM was reported to be 11.51%, and a substantial correlation between the prevalence of GDM and risk factors was discovered. The DIPSI diagnostic process is an easy, affordable, and research-based test.

INTRODUCTION

Untreated Gestational Diabetes Mellitus (GDM) is a common metabolic condition during pregnancy that can have negative effects on the mother and the unborn child. Pregnancy is a complicated endocrine metabolic adaptation that can lead to Diabetes mellitus because it impairs cellular function and causes a mild increase in blood sugar, especially after meals.[1]Anti-insulinogenic hormones include oestrogen, progesterone, human placental lactogen, cortisone, and growth hormones. These changes intensify in the middle of pregnancy and make certain women more susceptible to Gestational Diabetes Mellitus by causing altered glucose tolerance. Any degree of glucose intolerance that begins or is first noticed during pregnancy, with or without remission, once the pregnancy is over, is referred to as Gestational Diabetes Mellitus (GDM). Diabetes is becoming more common worldwide, and this trend includes women with GDM. GDM is significant since it puts both the pregnant lady and her unborn child at danger. Preeclampsia, polyhydramnios, increased rates of surgical delivery, and preterm labour are maternal consequences of GDM. GDM is linked to the increased occurrence of Type 2 DM later in life. [2] Respiratory distress, Macrosomia, Polycythaemia, Hypoglycemia, Hypocalcaemia, and Congenital abnormalities are the main morbidities linked to infants of diabetic mothers. Poor maternal glycemic management is linked to perinatal outcomes that can result in perinatal mortality of up to 42.9%. Prompt diagnosis and correct treatment of GDM can lead to better maternal and perinatal outcomes. The clinician should be made aware of the need to

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provide additional care to this demographic segment, especially in developing nations, following these criteria. The prevalence of GDM varies significantly by ethnicity. It is more frequently seen in women from India and South Asian nations. Depending on the region and the diagnostic techniques employed, the prevalence of GDM ranges across India from 3.8% to 21%. It has been discovered that GDM is more common in urban than rural regions. In the random survey conducted in several Indian cities in 2002–2003, the overall prevalence of GDM was found to be 16.55%.[3] Another study conducted in Tamil Nadu found the prevalence of GDM to be 17.8% of women in urban regions, 13.8% in semi-urban areas, and 9.9% in rural areas. Western Rajasthan women had a 6.6% prevalence of GDM, according to Priyanka Kalra et al. GDM prevalence was determined to be 7.1% in a tertiary care hospital in Haryana by Rajesh Rajput et al.[4] Maternal age above 30 years, family history of DM, prior history of GDM, obesity (BMI 27 kg/m2), prior history of macrosomia, prior history of unexplained foetal death, and glycosuria are clinical risk factors for GDM. The statistics on the prevalence of GDM and the number of women who have been diagnosed are crucial for enabling sane resource allocation, planning, and future preventive measures. The gold standard for diagnosing GDM is the Oral Glucose Tolerance Test (OGTT). However, it is a time-consuming approach that calls for patient preparation such as a three-day normal diet before the test day, an overnight fast, and repetitive pricking. Because universal screening for GDM detects more instances than selective screening and improves maternal and neonatal prognosis, we used it in the current investigation. Since it is widely acknowledged that women of Asian origin, particularly those of ethnic Indian descent, are at a high risk of developing GDM and subsequent type 2 Diabetes Mellitus, universal screening for the condition is imperative.[5] The Diabetes in Pregnancy Study Group, India (DIPSI) recommendations were followed in our study for GDM screening. Due to the technical challenges of completing a glucose tolerance test in a fasting state, on pregnant patients, who are visiting an antenatal clinic for the first time, Diabetes in pregnancy study group, India (DIPSI) created a "one step procedure". Many of them do not come back, if requested, on another day in a fasting state. The DIPSI diagnostic criteria,is a modified version of WHO recommendations, in that WHO procedure requires woman to be in a fasting state, whereas the glucose reading in this criterion is taken 2hrs aftera 75 gm glucose load regardless of whether the woman is in fasting or non-fasting state. A reading of $\geq$140mg/dl, 2hrs after a 75 gm glucose load, is diagnostic of GDM. The present study was therefore carried out to investigate the prevalence of GDM in pregnant women attending a tertiary care teaching hospital and associated risk factors. The single step procedure has been approved by the Ministry of Health, Government of India, and has also been recommended by WHO.[6] The objectives of this present study were to ascertain the prevalence of GDM in antenatal patients at a medical college teaching hospital in India using a single step procedure of a 75 gm glucose load and to investigate the relationship between GDM and various risk factors, including maternal age, obesity, family history of GDM, previous h/o macrosomia, poor obstetric history, and prior h/o GDM.

MATERIALS AND METHODS

The present study was carried out in the Department of Obstetrics and Gynecology, at Nimra Institute of Medical sciences, Nimra Nagar, Jupudi, Ibrahimpatnam, Vijayawada, Andhra Pradesh, India during the period from July, 2021 to June, 2022. A total of 165 pregnant women between the gestational ages of 14 and 18 weeks, who were either admitted as in-patients or who sought prenatal care at an OPD were included in the study. After the institutional ethics committee approved the study, informed consent was taken from the study subjects. No matter their parity, pregnant women between 14- and 18-weeks gestation who met the inclusion requirements were included in the study. The study excluded all pregnant women with serious chronic conditions such cancer, tuberculosis, congestive heart failure, renal failure, and liver failure as well as those who had h/o DM prior to the start of their pregnancies. The enrolled ladies underwent thorough clinical examination and detailed historical interviews. Each woman filled out a proforma with general information such as age, parity, socio-economic situation, family history of DM in first degree relatives, prior history of GDM, and a thorough prior obstetric history. Both BMI and blood pressure were calculated. DIPSI tests were administered to chosen women. Regardless of when they last ate, women were given 75gm of oral glucose dissolved in 300ml of water. Women were instructed to consume it within 5 to 10 minutes, after which the passing of time was documented, they were instructed to relax for 2 hours, while refraining from physical activity. At two hours, a venous blood sample was taken, and plasma glucose was calculated using the glucose oxidize-peroxide (GOD-POD) method at the central laboratory.[7]

Diagnosis of GDM

The pregnant woman was diagnosed with GDM if the 2 hour venous plasma glucose measurement taken after a 75gm oral glucose load was $\geq$140 mg/dl (DIPSI criteria).[8] She was advised to repeat the test if the result was normal at 24-28 weeks and again at 32 weeks if the plasma glucose is below 140 mg/dl on the initial visit. At 32 weeks, if plasma glucose is still less than 140 mg, they were categorized under non-GDM group. The risk factors of GDM, such as advanced age >25, BMI >25,

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family history of the disease in the parents, poor obstetric history (h/o foetal loss after 20 weeks, unexplained perinatal loss, IUD), h/o macrosomia in prior pregnancy (B.W.>4000gm), and past h/o GDM, was investigated in the GDM and non-GDM groups, and the results were statistically analyzed.

Statistical Analysis

Numbers and percentages were used to represent the results. The acquired data was imported into Microsoft Excel and then analysed with the SPSS Software 20 package. Descriptive statistics and the chi-square test were the statistical methods used, and a "P" value of 0.05 was deemed statistically significant.

RESULTS

[Table 1] lists the baseline characteristics of the 165 participants that were tested for GDM using the DIPSI criteria. 19 of the 165 individuals had been identified as having GDM. So, in our study, the prevalence was 11.51%. The remaining 146 individuals (88.48%) were categorized as non-GDM group because they showed normal glucose tolerance. The risk factors for GDM were significantly correlated with one another. The majority of participants (141, 85.45%) were under the age of 30, and the largest number (65, 39.4%) belonged to the 20–25 year age group.

The relationship between the age and GDM are compared in [Table 2]. In comparison to 61 (41.78%) women without GDM, 14 (73.68%) of the women with GDM were over the age of 25, and this observation was shown to be statistically significant (P value 0.05).

The study population's BMI distributions are shown in [Table 3]. 37 women (25.34%) who did not have GDM despite having a BMI over 25 compared to 14 (73.68%) with a BMI > 25. GDM prevalence and participant's rising BMI were shown to be significantly correlated (P 0.01).

The results of the current study demonstrated that people with a history of diabetes in their families were more likely to develop GDM. [Table 4] demonstrates that 11 (57.89%) of the women with GDM had a family history (P value 0.01). It was determined that this observation was statistically significant.

In contrast to the non-GDM group, BOH (h/o foetal less after 20 weeks, unexplained loss, IUD), h/o macrosomia (B.wt> 4000gm), and prior h/o GDM were more prevalent in the GDM population. P-value for BOH, h/o macrosomia, and previous h/o GDM is 0.002, which indicates that these observations were statistically significant. 13 of the 19 women with GDM were diagnosed at the initial visit (14–18 weeks), and 6 more women with GDM were diagnosed at later visits.

Table 1: fundamental properties of the research population.

Variables		**No. of participants (%)**
Age in years	18-20	25 (15.2%)
	20-25	65 (39.4%)
	25-30	51 (30.9%)
	>30	24 (14.5%)
BMI (kg/m2)	<18.5	43 (26.06%)
	18.5-24.9	72 (43.6%)
	≥25	50 (30.3%)
Parity	Parity	66 (40.0%)
	2nd Gravida	62 (37.6%)
	3rd Gravida	23 (13.9%)
	4th Gravida and more	14 (8.5%)
Class	Upper Class	07 (4.24%)
	Upper middle	32 (19.4%)
	Lower middle	62 (37.6%)
	Upper lower	60 (36.4%)
	Lower	04 (2.42%)

Table 2: Age distributions of GDM and non-GDM are compared.

Age group	**GDM (n= 19)**	**Non-GDM (n= 146)**
<25 years	05 (26.31%)	85 (58.21%)
>25 years	14 (73.68%)	61 (41.78%)

Table 3: BMI distribution of the study's participants.

BMI	**GDM (n=19)**	**Non-GDM (n=146)**
<25	05 (26.31%)	109 (74.65%)
>25	14 (73.68%)	37 (25.34%)

Table 4: DM-free family in the research population.

Family history	**GDM (n= 19)**	**Non-GDM (n=146)**
Present	11 (57.89%)	38 (26.02%)
Absent	08 (42.1%)	108 (73.97%)

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Table 5: GDM prevalence based on previous obstetric history.

Variables	GDM (n= 21)	Non-GDM (n=20)
BOH	07 (36.84%)	09 (6.16%)
H/o macrosomia	06 (31.57%)	05 (3.42%)
Past h/o GDM	08 (42.10%)	06 (4.10%)

DISCUSSION

The most frequent medical problem associated with pregnancy is Gestational Diabetes Mellitus (GDM). Numerous maternal problems are more likely to occur in GDM-affected women, and both their infants' mortality and morbidity risks are increased. Globally, there is a broad agreement that the prevalence of GDM is rising. Globally, the prevalence of GDM has been estimated to range from 1.4% to 14%, with regional and ethnic differences. Compared to White women, the frequency is higher among Black, Latina, Native American, and Asian women.[9] In comparison to White women, women from the Indian subcontinent have a relative chance of acquiring GDM that is 11.3 times higher.[10] Few studies carried out in India have revealed rising prevalence patterns, from 2% in 1982 to 7.62% in 1991 to 16.55% in 2001, necessitating a national screening programme for GDM.[10,11] Compared to selective screening, universal GDM screening finds more instances and improves the prognosis for both the mother and the child. The most effective and preferred strategy for the identification of GDM, particularly in groups at high risk for GDM, appears to be universal screening. The test should be easy to administer and reasonably priced for universal screening. Because pregnant women may need to visit the antenatal clinic twice and have at least 3-5 blood samples drawn, which they dislike, and because the "no show" rate is high, the two-step procedure of screening with a 50gm glucose challenge test (GCT) and then diagnosing GDM based on an oral glucose tolerance test (OGTT) is not practical in a country like India.[12] These concerns make the function of a single step test—using a 75 gm glucose load—for the screening and diagnosis of GDM—regardless of the timing of the previous meal—more significant. A two-hour plasma glucose of more than or equal to 140 mg/dl after 75 grams of glucose is diagnostic of GDM, according to DIPSI standards, and it's a single step approach that functions as both a screening and diagnostic tool.[8] According to a recent theory, it is best to test for glucose intolerance at about 16 weeks of pregnancy since the foetal beta cell can detect and react to maternal glycemic levels as early as the 16th week of pregnancy.[13] If the screening is found to be negative at this point, it must be repeated at about the 24-28th and 32-34th weeks.[14] 165 pregnant women were screened for GDM in this study using DIPSI recommendations. We looked at the prevalence of GDM and the contributing factors. This study offers background data on the incidence and risk factors for GDM, which may be useful in developing early intervention strategies. In our study sample, GDM was prevalent (11.51%). There was no known diabetes among any of them. In our investigation, the prevalence of GDM was similar to the 12% reported by Seshiah V et al in Bangalore. The prevalence was found to be 16.2% in Chennai, 15% in Thiravanthapuram, 21% in Alwaye, 12% in Bangalore, 18.8% in Erode, and 17.5% in Ludhiana, according to a random survey conducted in different Indian cities in 2002-2003. Obesity, advanced maternal age, and diabetes in the family are recognized risk factors for GDM. In our study, the prevalence of GDM rose significantly as maternal age increased. Compared to 61 (41.78%) women without GDM, 14 (73.68%) of the women with GDM were over the age of 25. This results from metabolic changes brought on by ageing. According to Seshaiah et al., GDM and old age have a similar relationship. A key risk factor for the emergence of GDM is obesity. In our investigation, it was discovered that women with greater BMI had considerably higher GDM. Numerous studies that show that being overweight or obese at the beginning of pregnancy increases the risk of gestational diabetes support this. According to Gomez et al., 25–50% of women with GDM were obese.[15] In our study, a larger proportion of women with GDM (57.89%) had a positive family history of DM. It has been suggested that having DM in the family increases the risk of acquiring GDM.[16] In the current study, there was a strong correlation between prior GDM history and the development of GDM during the index pregnancy. In our study, a larger proportion of women with GDM had a problematic obstetric history. It is statistically significant that 7 (36.84%) of the women with GDM had BOH compared to 9 (6.16%) of the women without GDM. According to Kalra et al., 15.15 percent of GDM women had a history of prenatal losses. In our study, 31.57% of GDM women had previously had macrosomic kids (body weight > 4000 gm), which is close to a study by K. Sreekanthan et al. that found 58.33% of GDM women had previously given birth to children with big birth weights.[17] The investigated women with GDM most frequently had maternal age above 35, a high BMI of 25 or higher, a positive family history of diabetes, and a history of GDM. Many women with GDM have experienced past h/o foetal losses and delivered macrosomic infants. Obesity is one of the six risk variables identified in the current study that is modifiable.

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CONCLUSION

The current study shows that the prevalence of GDM was 11.51%; it was higher in women who were older, obese, had a family history of diabetes, and had previously experienced GDM. GDM is most frequent in Indian women among the South Asian nations. Therefore, there is a need for universal screening to detect GDM in order to avoid difficulties for both the mother and the foetus. DIPSI diagnostic process has the potential to be a standard testing approach for diagnosing because it is easy, affordable, and evidence-based. It serves as a screening and diagnostic method while causing the least amount of disruption to a pregnant woman's daily activities. The rising tendency of GDM in India has raised concerns among the general people. In order to lessen the likelihood of an unfavourable pregnancy outcome, prompt action should be taken to evaluate all pregnant women for glucose intolerance. It has been noted that BMI is a modifiable risk factor for GDM. Women with GDM are at a significant risk of later developing overt diabetes. They are the perfect group to focus on, for pharmacological or lifestyle changes to prevent or delay the onset of overt diabetes.

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