Section: Obstetrics and Gynecology

Original Research Article

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

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## Abstract

**Background:** Patients with gestational diabetes mellitus (GDM) are more likely to have poor perinatal and obstetric outcomes. This study was conducted to determine the prevalence of GDM using the "Diabetes in pregnancy study group India" (DIPSI) criteria and related risk factors in expectant mothers. The purpose of this study is to determine the prevalence of GDM in antenatal patients at a medical college teaching hospital in India using a single step procedure involving a 75gm glucose load. It also aims to investigate the relationships between GDM and a number of 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 study comprised 296 pregnant women who were either admitted as in-patients or who sought prenatal treatment at an OPD and were between the gestational ages of 14 and 18 weeks. All pregnant women between the ages of 14 and 18 weeks who satisfied the inclusion criteria were included in the study, regardless of their parity. **Result:** The prevalence of GDM in this study was 11.48%. Higher prevalence rates were seen in women with risk characteristics as advanced age, high BMI, a positive family history of DM, a prior diagnosis of GDM, and macrosomia. **Conclusion:** It was found that risk factors significantly correlated with the prevalence of GDM, which was reported to be 11.48%. The DIPSI diagnostic procedure is a quick, inexpensive test that is supported by research.

## INTRODUCTION

Gestational diabetes mellitus (GDM), a common metabolic disorder during pregnancy, can harm both the mother and the unborn child if left untreated. Due to cellular dysfunction and a slight rise in blood sugar, particularly after meals, pregnancy is a challenging endocrine metabolic adaptation that might result in diabetes mellitus.[1,2] Oestrogen, progesterone, human placental lactogen, cortisone, and growth hormones are examples of anti-insulinogenic hormones. Due to decreased glucose tolerance brought on by these changes, certain pregnant women become more vulnerable to gestational diabetes mellitus. Gestational diabetes mellitus refers to any degree of glucose intolerance that manifests during pregnancy, whether or not it goes into remission after the pregnancy. The prevalence of diabetes is rising worldwide, and women with GDM are part of this trend. GDM is significant since it endangers both the expectant mother and her unborn child. The maternal effects of GDM include preeclampsia, polyhydramnios, a rise in surgical deliveries, and preterm labour. GDM is associated with a rise in Type 2 DM later in life.[3] The main morbidities associated with babies of diabetic mothers are respiratory distress, macrosomia, polycythaemia, hypoglycemia, hypocalcaemia, and congenital abnormalities. Perinatal outcomes associated with poor maternal glycemic control can result in perinatal death of up to 42.9%. Better maternal and neonatal outcomes can result from early diagnosis and appropriate GDM treatment. The need for increased care for this demographic group, especially in poor countries, should be brought to the clinician's attention using these criteria. By ethnicity, the prevalence of GDM varies greatly. South Asian and Indian women are more likely to experience it. In India, the prevalence of GDM varies between 3.8% and 21% depending on the location and the diagnostic methods used. GDM has been found to be more prevalent in urban

than rural areas. The total prevalence of GDM was reported to be 16.55% in the random survey that was carried out in numerous Indian cities in 2002-2003.[4,5] According to a second study done in Tamil Nadu, GDM affects 17.8% of women in urban areas, 13.8% of women in semi-urban areas, and 9.9% of women in rural areas. According to Priyanka Kalra et al., the prevalence of GDM in women in Western Rajasthan was 6.6%. Rajesh Rajput et al. found that the frequency of GDM was 7.1% in a tertiary care facility in Haryana.[6,7] Clinical risk factors for GDM include maternal age greater than 30 years, familial history of DM, prior history of GDM, obesity (BMI 27 kg/m2), prior history of macrosomia, prior history of unexplained foetal mortality, and glycosuria. It is essential to obtain accurate data on the prevalence of GDM and the number of women who have received a diagnosis in order to plan and allocate resources wisely and develop preventive strategies in the future. The Oral Glucose Tolerance Test is the most accurate way to diagnose GDM. (OGTT). However, it requires extensive patient preparation, including an overnight fast, a three-day normal diet before the test, and repeated pricking. We adopted universal screening for GDM in the current experiment because it detects more cases of the condition than selective screening and enhances the prognosis for both the mother and the newborn. Universal screening for the illness is essential since it is well known that women of Asian heritage, particularly those of ethnic Indian descent, have a greater chance of developing GDM and subsequently type 2 Diabetes Mellitus.[8] In our study, GDM screening was conducted in accordance with the recommendations of the Diabetes in Pregnancy Study Group, India (DIPSI). The Diabetes in pregnancy study group, India (DIPSI) developed a "one step procedure" in response to the technological difficulties of performing a glucose tolerance test on pregnant patients who are visiting an antenatal clinic for the first time. When asked to return on a different day while fasting, many of them refuse. The WHO protocol requires a woman to be in a fasting condition, but the glucose reading in this criterion is taken two hours after a 75 gm glucose load whether the woman is fasting or not. This makes the DIPSI diagnostic criteria a modified version of the WHO standards. GDM can be diagnosed by a value of >140 mg/dl two hours following a 75 gm glucose load. In order to ascertain the prevalence of GDM and related risk factors among pregnant patients at a teaching hospital providing tertiary care, the current study was conducted. The WHO has also suggested the single step technique, which has been authorised by the Ministry of Health, Government of India.[9] The goal of the current study was to determine the prevalence of GDM in antenatal patients at an Indian medical college teaching hospital using a single step procedure involving a 75 gm glucose load and to examine the associations between GDM and various risk factors, such as maternal age, obesity, family history of GDM, prior h/o macrosomia, poor obstetric history, and prior h/o GDM.

## MATERIALSANDMETHODS

The Department of Obstetrics and Gynecology at the World College of Medical Sciences Research and Hospital in Jhajjr, Haryana, India, conducted the present study. The study comprised 296 pregnant women with gestational ages ranging from 14 to 18 weeks who were either hospitalized as in-patients or who sought prenatal treatment at an OPD. Informed consent was obtained from study participants once the study was authorised by the institutional ethics committee. Pregnant women between 14 and 18 weeks gestation who met the inclusion criteria were included in the study, regardless of their parity. All expectant women with major chronic illnesses such cancer, tuberculosis, congestive heart failure, renal failure, or liver failure as well as those who had h/o DM before the beginning of their pregnancies were not included in the study. A complete clinical examination and in-depth historical interviews were performed on the enrolled women. Each woman completed a proforma with general information, including her age, parity, socioeconomic standing, prior history of GDM, family history of DM in first degree relatives, and comprehensive past obstetric history. Blood pressure and BMI were computed. Selected ladies had DIPSI tests. Women were given 75gm of oral glucose dissolved in 300ml of water, regardless of when they had previously eaten. Women were asked to eat it within 5 to 10 minutes, after which the passage of time was recorded, and then to unwind for 2 hours without engaging in any physical activity. A venous blood sample was obtained at the two-hour mark, and plasma glucose was determined in the central laboratory using the glucose oxidise-peroxide (GOD-POD) method.[10]

GDM diagnosis: If the pregnant woman's 2 hour venous plasma glucose measurement following a 75gm oral glucose load was >140 mg/dl, she was diagnosed with GDM. (DIPSI criteria).[11] If the results were normal at 24-28 weeks and again at 32 weeks if the plasma glucose was less than 140 mg/dl on the initial visit, she was advised to repeat the test. If plasma glucose was still less than 140 mg after 32 weeks, individuals were classified as belonging to the non-GDM group. The risk factors for GDM were investigated in the GDM and non-GDM groups, and the results were statistically analysed. These risk factors included advanced age >24, BMI >25, 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.

Statistical analysis: Numbers and percentages were used to represent the results. Data was gathered, inputted in microsoft excel, and then further


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examined with the SPSS Software 20 package. Descriptive statistics and the chi-square test were the statistical techniques used, and a "P" value of 0.05 was deemed statistically significant.

## RESULTS

The baseline characteristics of the 296 participants who underwent DIPSI criteria-based GDM testing are listed in [Table 1]. 34 of the 296 participants had been diagnosed with GDM. Therefore, the prevalence in our sample was 11.48%. Because the remaining 262 people (88.51%) had normal glucose tolerance, they were classified as the non-GDM group. There was a strong correlation between the GDM risk variables. A total of 252 participants, or 85.13 percent, were under the age of 30, with the majority 116 (39.18%) falling into the 20–25 age range.

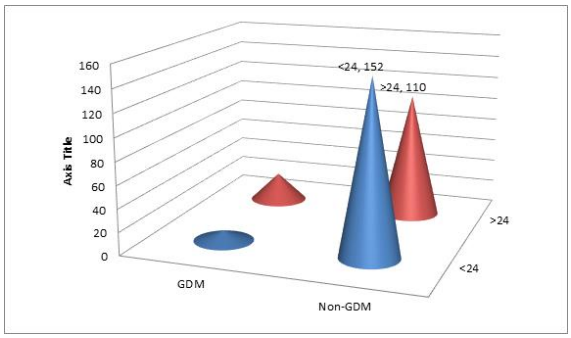


**Figure 1: The ages of those with and without GDM are compared.**

**Table 1: Shows the Essential Characteristics of the study's Participants.**

| Variables | Parameters | No. of participants (%) |
|---|---|---|
| Age in years | 18-20 | 46 (15.54%) |
| | 20-25 | 116 (39.18%) |
| | 25-30 | 90 (30.40%) |
| | >30 | 44 (14.86%) |
| BMI kg/m2 | <18.5 | 79 (26.68%) |
| | 18.5-24.9 | 129 (43.58%) |
| | >25 | 88 (29.72%) |
| Parity | Primi | 119 40.2(%) |
| | 2nd Gravida | 109 (36.82%) |
| | 3rd Gravida | 39 (13.17%) |
| | 4th Gravida and more | 29 (9.79%) |
| Class | Upper class | 12 (4.05%) |
| | Upper middle | 59 (19.93%) |
| | Lower middle | 110 (37.16%) |
| | Upper lower | 108 (36.48%) |
| | Lower | 07 (2.42%) |

Age and GDM are related in [Table 2]. In comparison to 110 (41.98%) women without GDM, 27 (73. 52%) of the women with GDM were over the age of 24, and this observation was shown to be statistically significant (P value <0.04).

**Table2: The Ages of Those with and without GDM are compared.**

| Age group | GDM (n=34) | Non-GDM (n=262) |
|---|---|---|
| < 24 years | 09 (26.47%) | 152 (58.01%) |
| >24 years | 25 (73.52%) | 110 (41.98%) |

GDM prevalence and participant's rising BMI were shown to be significantly correlated (P <0.02). The study population's BMI distributions are shown in [Table 3]. In comparison to 67 women (25.57%) who did not have GDM despite having a BMI over 25, 27 (79.41%) had a BMI > 25.

**Table 3: Shows the participants' BMI distribution in the study.**

| BMI | GDM (n=34) | Non-GDM (n=262) |
|---|---|---|
| < 25 | 07 (20.58%) | 195 (74.42%) |
| >25 | 27 (79.41%) | 67 (25.57%) |

Our research revealed that people with a history of diabetes in their families were more likely to develop GDM. [Table 4] demonstrates that 20 (58.82%) of the women with GDM had a family history (P value <0.02). It was determined that this observation was statistically significant.

**Table4: Shows the family in the study population without diabetes.**

| Family history | GDM (n=34) | Non-GDM (n=262) |
|---|---|---|
| Present | 20 (58.82%) | 69 (26.33%) |
| Absent | 14 (41.17%) | 193 (73.66%) |


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BOH (h/o foetal less after 20 weeks, unexplained loss, IUD), h/o macrosomia (B. wt> 4000gm), and past h/o GDM were more prevalent in the GDM population compared to the non-GDM group, as indicated in Table 5. P value for BOH, h/o macrosomia, and past h/o GDM is less than 0.04 and these observations were statistically significant. 34 women were found to have GDM; 25 were diagnosed at the initial appointment (14–18 weeks) and 9 at subsequent visits.

**Table 5: Shows the family in the study population without diabetes.**

| Variables | GDM (n=34) | Non-GDM (n=262) |
|---|---|---|
| BOH | 13 (38.23%) | 16 (6.10%) |
| H/o microsomia | 12 (35.29%) | 09 (3.43%) |
| Past H/o GDM | 14 (41.17%) | 11 (4.19%) |

P value for BOH, h/o macrosomia, and past h/o GDM is less than 0.04 and these observations were statistically significant. 34 women were found to have GDM; 25 were diagnosed at the initial appointment (14–18 weeks) and 9 at subsequent visits.

## DISCUSSION

The most frequent medical problem associated with pregnancy is gestational diabetes mellitus. 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 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.[12,13] In comparison to White women, women from the Indian subcontinent have a relative chance of acquiring GDM that is 11.3 times higher.[14] A few studies undertaken in India have revealed rising prevalence patterns, from 2% in 1982 to 7.62% in 1991 to 16.55% in 2001, necessitating a nationwide screening programme for GDM in that country.[14-16] Compared to selective screening, universal GDM screening finds more instances and improves the prognosis for both the mother and the child.[17] 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.[18,19] 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 less than 140 mg/dl after 75 grammes 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.[20] The foetal beta cell can detect and respond to maternal glycemic levels as early as the 16$^{th}$week of gestation, according to a recent theory, making this the best time to check for glucose intolerance.[21] If the screening is found to be negative at this point, it must be repeated at about the 24-28th and 32-34th weeks.[22,23] Using DIPSI recommendations, we have evaluated 296 pregnant women for GDM in this study. 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 (11.48%). There was no known diabetes case among any of them. In our investigation, the prevalence of GDM was similar to the 12% reported by Seshiah V et al in Bangalore.[6] 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.[6] Obesity, advanced maternal age, and diabetes in the family are recognised risk factors for GDM. In our study, the prevalence of GDM rose significantly as maternal age increased. Compared to 110 (41.98%) women without GDM, 27 (73. 52%) women with GDM were older than 24 years of age. This results from metabolic changes brought on by ageing. According to Seshaiah et al., GDM and old age have a similar relationship.[7]An key risk factor for the emergence of GDM is obesity.[7] According to our findings, GDM is much more common in women with higher BMI. Numerous studies that show that being overweight or obese at the beginning of pregnancy increases the risk of gestational diabetes support this.[7] According to Gomez et al., 25–50% of women with GDM were obese.[24] In the current study, a notably greater proportion of women with GDM (58.82%) had a positive family history of DM. It has been suggested that having DM in the family increases the risk of acquiring GDM.[25] In the current study, there was a strong correlation between prior GDM history and the development of GDM during the index pregnancy. In the current study, a disproportionately greater proportion of women who had GDM had a problematic obstetric history.[9] It is statistically significant that 13 (38.23%) of the women with GDM had BOH


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compared to 16 (6.10%) of the women without GDM. According to Kalra et al., 15.15 percent of GDM women had a history of prenatal losses.[8] In this study, 35.29 percent of women with GDM had previously given birth to macrosomic infants (body weight > 4000 gm), which is comparable to a study by K. Sreekanthan et al. that found 58.33% of GDM women had previously given birth to infants with enormous birth weights.[26] 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 prior h/o foetal losses and delivered macrosomic infants. Obesity is one of the seven risk variables identified in the current study that is changeable.

## CONCLUSION

The prevalence of GDM in the current study is 11.48%, and it is more common in women who are older, obese, have a family history of diabetes, or have had GDM in the past. In South Asian nations, Indian women experience GDM the most frequently. 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 acts as both a screening and a diagnostic technique while causing the least disruption to a pregnant woman's daily routines. The rising tendency of GDM in India has raised concerns among the general people. In order to minimise the likelihood of an unfavourable pregnancy outcome, prompt action should be taken to screen 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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