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Original Research Article

A study on prevalence of gestational diabetes mellitus and its associated risk indicators in pregnant women attending antenatal clinic in a tertiary health centre

Vinoth N., Jaget Nirmala*, Sindhuja Sekar G., Priyanka R.

Department of Obstetrics and Gynecology, Sri Venkateswaraa Medical College Hospital and Research Centre, Ariyur, Puducherry, India

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***Correspondence:**
Dr. Jaget NIrmala,
E-mail: drnirmalajaget@yahoo.com

ABSTRACT

Background: Gestational diabetes mellitus (GDM) is defined as impaired glucose tolerance (IGT) with onset or first recognition during pregnancy it is associated with adverse maternal and perinatal outcome. The prevalence of gestational diabetes mellitus (GDM) has been increasing globally, with urbanization, sedentary lifestyle, physical inactivity and dietary changes as significant contributing factors. Hence this study was done to study the prevalence of GDM and its associated risk indicators.
Methods: This was a cross sectional study. During the study period, 164 antenatal women between on her first visit were screened for GDM using 50 gm glucose challenge test in all patients if normal it was repeated between 24- 28 weeks of pregnancy and then at 32 weeks. If abnormal 75 gm oral glucose tolerance test (OGTT) done and also repeated at 24-28 weeks of gestation and diagnosed to have GDM. Risk factors for GDM were noted.
Results: The prevalence of GDM in the study population was 23.78%. Prevalence of GDM cases was significantly associated with increased body mass index (BMI). BMI>25 kg/m^2 (0.001%) has strong association. Family history of diabetes, previous macrosomia/large for gestational age (LGA) baby and past history of GDM ($p<0.00001$) also has strong association. Maternal age >25 years (0.001) significantly associated with increased prevalence of GDM but parity was not statistically associated ($p=0.358$). Incidence of pre-eclampsia and polyhydramnios were significantly higher among GDM cases.
Conclusions: The prevalence of gestational diabetes mellitus (GDM) has been increasing globally, with urbanization, sedentary lifestyle, physical inactivity and dietary changes as significant contributing factors. Maternal age >25 years, BMI>25 kg/m^2, family history of diabetes, past GDM and previous LGA baby were important risk factors for GDM. Most of the adverse outcome are preventable by early detection and proper glucose control. Therefore, we recommend screening pregnant women for GDM and establishment of separate diabetic antenatal clinic with availability of diabetician and diabetic councillor.

Keywords: Cross sectional study, Gestational diabetes mellitus, Risk indicators, Glucose challenge test

INTRODUCTION

Gestational diabetes mellitus (GDM) is defined as impaired glucose tolerance (IGT) with onset or first recognition during pregnancy.[1] There are 2 types of diabetes during gestation overt (if FBS≥126 mg/dl or HbA1c≥6.5 or random blood sugar ≥200 mg/dl) and GDM (if FBS≥92 mg/dl but <126 mg/dl or 1 hour ≥180 mg/dl or 2 hours ≥153 mg/ dl).[1] Undiagnosed or improperly treated GDM can lead to significant maternal and foetal complications.[2] Maternal complication of GDM include polyhydramnios, pre-eclampsia, prolonged labour, obstructed labour, caesarean section, uterine atony,

postpartum haemorrhage, infection and progression of retinopathy. Foetus can develop congenital malformations, Intra-uterine growth restrictions (IUGR), macrosomia or other organ/growth problems, and even stillbirth/intra-uterine foetal death (IUFD).[2] In India prevalence of GDM is estimated to be 10-14.3%. The prevalence of GDM was noted to be 17.8% in the urban, 13.8% in the semi urban and 9.9% in the rural areas.[3] Maternal euglycemia has been the target for prevention of many of these complications.[4] Immediate and long-term clinical effects of GDM are important contributors for the increased burden of non-communicable diseases in many countries. This cross-sectional study was done to determine the prevalence and to identify associated risk indicators of GDM and to explore the GDM in the context of socio demographic status such as age, economic status, family history, parity, education, physical activity and diet.

METHODS

The study was conducted in Sri Venkateshwaraa Medical College Hospital and Research Institute, Ariyur, Puducherry, India from March 2021 to November 2022. The sample size was calculated based on 10% prevalence of GDM with confidence level of 95%. This was done in a rural setting and screening was carried out in antenatal patients at SVMCH and RC. This study involves screening 164 consenting eligible women during their visit to the hospital. It is a hospital based cross sectional study was designed for the collection of the data. The study design was purely quantitative and observational. The data was collected from only one hospital. The necessary information was collected from the participants through the prepared set of questionnaires.

After history and examination, gestational age calculated and informed consent was taken from the patients who are willing to participate in the study after fulfilling inclusion criteria. Detailed history was taken and a thorough general examination with systemic examination done along with routine basic investigation. Normal patients were served as controls.

Glucose challenge test was done on first visit in all patients. If GCT found normal, then it was repeated between 24-28 weeks of pregnancy and subsequently at 32 weeks of pregnancy.

Glucose challenge test was performed by giving 50 grams of glucose dissolved in one glass of water irrespective of fasting status. Blood was collected from the patients by venipuncture (2 ml), it was allowed to clot, and serum was separated by centrifugation at room temperature. The serum was stored at 2 to 8°C till its usage. The blood glucose level was estimated by using GOD-POD. The threshold blood sugar level of ≥140 mg/dl (more than or equal to 140) was taken as cut off for diagnosis of GDM.

If glucose challenge test was abnormal then 2-hour oral glucose tolerance test was done. Blood was collected after 8 hours of fasting. Testing was done then 75 gm oral glucose was given orally after dissolving in approximately 300 ml water and blood glucose was estimated after 1 and 2 hours. If vomiting occurs within 30 minutes of oral glucose intake, the test was repeated the next day. If vomiting occurred after 30 minutes, the test continued. The course of the pregnancy was monitored and recorded.

Statistical analysis

Statistical analysis was performed using chi-square test or Fisher's exact test (SPSS software version 23.0). For associated risk factors of GDM, logistic regression analysis was done with a backward model. In this analysis, the only dependent variable was GDM and all other associated risk factors for GDM were taken as independent variables. Results were shown as arithmetic mean±standard deviation for quantitative data, and percentage for qualitative data. Odds ratio (OR) (95% CI) in logistic regression analysis was used. Value of $p<0.05$ was considered as significant.

RESULTS

The study done in 164 randomly selected pregnant women visiting the tertiary health care institution. Out of all the pregnancies screened, the prevalence of GDM in the present study was 23.78% (Table 7). 62% of the study population belonged to the high-risk group of age ≥25 years and out of which GDM was recorded in 23.78% (Table 1).

Table 1: Age wise distribution of patients with GDM.

Age in years	No. of cases	No. of GDM cases	Percent
<20	6	0	0
21-24	57	6	3.65
25-29	52	12	7.32
30-34	34	15	9.15
>35	15	6	3.65
Total	164	39	23.78

Table 2: BMI wise distribution of patients with GDM.

BMI (kg/m^2)	No. of cases	No. of GDM cases	Percent
18.5-24.9	90	0	0
25.0-29.9	46	21	12.81
>30	28	18	10.98
Total	164	39	23.78

Normal BMI (18.5-24.9 kg/m^2) was recorded in 54.84% of the study population. BMI≥25 kg/m^2 was recorded in 45.16% and GDM was reported in 23.78% of the cases (Table 2). Multigravida patients comprised of 59.8% of the pregnant women, out of which 16.47% had GDM (vide Table 3). The family history of diabetes mellitus as a risk

factor for GDM was recorded in 21 (12.8%) pregnant women (Table 5).

Table 3: Gravida wise distribution of patients with GDM.

Gravida status	No. of cases	No. of GDM cases	Percent
Primigravida	66	12	7.32
Multigravida	98	27	16.47
Total	164	39	23.78

Table 4: Distribution of patients with associated risk factors for GDM.

Associated risks factors	No. of cases (n=164)	No. of GDM cases	Percent
Absent	138	10	6.11
Present	26	29	17.68
Total	164	39	23.78

Table 5: Distribution of patients with risk factors for GDM.

Risk factors	No. of cases (n=164)	Percent
Absent	138	84.2
Present	26	15.8
Family history of DM	21	12.8
Macrosomia / large for gestational age (LGA)	5	3.05
Past History of GDM	15	9.14
Unexplained fetal/ neonatal loss or still birth previously	3	1.8
Previous premature baby	2	1.3
Previous pregnancy with congenital anomalies	1	0.6

Table 6: Plasma glucose levels in the study population at 1 hour (mg/dl).

PG at 1 hour (mg/dl)	No. of cases	Percent
<140	128	78.05
≥140	31	18
>200	5	3.05
Total	164	100

Table 7: Fasting Plasma glucose levels in the study population (mg/dl).

FPG (mg/dl)	No. of cases	Percent
<92	130	79.26
92-125	29	17.68
>126	5	3.06
Total	164	100%

A total of 5 (3.05%) pregnant women showed LGA baby in the previous pregnancy (vide Table 5). History of GDM in the previous pregnancy was recorded in 15 (9.14%) (vide Table 5). A total of 3 (1.8%) of pregnant women had unexplained foetal/neonatal loss or still birth in the previous pregnancy (vide Table 5). 2 (1.3%) of pregnant women had previous premature baby in the previous pregnancy. 1 (0.6%) of pregnant women had previous pregnancy with congenital anomalies (Table 5). Maternal age ≥25 years was statistically associated with prevalence of GDM in this study, 101 (62%) patients were above 25 years of age out of which 39 pregnant women diagnosed with GDM (p=0.001). BMI>25 kg/m^2 has strong association with the prevalence of GDM. Of the 39 GDM cases, all the 39 (100%) cases had BMI>25 (p<0.001) in this study.

Family history of diabetes has strong association with the prevalence of GDM in the present study (p=0.00001). Previous macrosomia/LGA baby have strong association with the prevalence of GDM in the present study (p=0.00001). Past history of GDM has strong association with the prevalence of GDM in the present study (p=0.00001).

Table 8: Plasma glucose levels in the study population (mg/dl).

PG (mg/dl)	No. of cases	Percent
1 hour value <180	127	77.43
1 hour value >180	37	22.57
2 hours value <153	125	76.22
2 hours value >153	39	23.78

DISCUSSION

This study was conducted in Sri Venkateshwaraa Medical College Hospital and Research Institute, Ariyur, Puducherry, India wherein 164 pregnant women attending antenatal OPD on their first visit were recruited. Overt/pregestational diabetes patients were excluded from the study. A number of investigators have found that maternal age is highly correlated with the risk of GDM. It is expected that the prevalence of GDM in a population will depend on the age distribution of the study population. There is no general agreement on the age above which there is significant increased risk of GDM. Age <25 years is considered as low risk factor for GDM. Age >25 years is considered as risk factor for GDM.[1]

In the present study, 38% of the population was in the age group 20-25 years. 32% of the population was in the age group 26-30 years. 62% of the study population belonged to the high-risk group of age ≥25 years. Maternal age ≥25 years was statistically associated with increased prevalence of GDM in the present study, age ≥25 years has significant independent association with GDM (p<0.001). 33 (84.62%) out of the 39 pregnant women diagnosed to have GDM were ≥25 years of age. A community-based study in rural Haryana by Rajput et al found a prevalence

of gestational diabetes mellitus (GDM) as 13.9% and reported that maternal age greater than 25 years, were significantly associated with GDM.[6] Study conducted by Rajasekar et al in Vellore revealed hospital-based prevalence of GDM in 14%, and a significant rise in prevalence was noted with age and were associated with higher odds of developing GDM.[7] A hospital based study by Basu et al showed prevalence of GDM in 17.2% of the cases.[8] Maternal age were associated with raised risk of developing GDM. A community-based study by Kaliany et al on 300 showed the prevalence of GDM as 8.33%.[9] Occurrence of gestational diabetes mellitus was significantly associated with BMI and was also found to be associated with adverse pregnancy outcomes. In a community-based study by Seshiah et al using WHO criteria, reported significant increase in prevalence of GDM with the increase in age of patients.[23] The findings of the present study corroborated with earlier reports, with 84.62% of the women with GDM in the age group of ≥25 years.[8,9,23]

The resent study reported normal BMI (18.5-24.9) accounting for 54.84% and 45.16% of the pregnant women showed BMI≥25. Only 2% of the study population reported obesity with BMI>30. Prevalence of GDM (23.79%) was significantly associated with higher BMI in this study. A hospital-based study by Jali et al indicated that obese patient on high calorie diet especially non-vegetarian diet with less physical activity were highly prone for development of GDM.[22]

The family history of diabetes mellitus as a risk factor for GDM was recorded in 21 (12.8%) pregnant women and 16 (76.16%) GDM cases had family history of diabetes as a risk factor for GDM. 12 (80%) pregnant women out of which 15 of them had past GDM were diagnosed to have GDM in the present pregnancy (Table 5). Similar result was recorded in a community-based study in rural Haryana by Rajput et al wherein the prevalence of gestational diabetes mellitus (GDM) of 13.9% were positive family history of diabetes, and a history of having a macrocosmic baby (birth weight ≥4 kg) had a significantly higher prevalence of GDM.[6] A hospital-based study by Basu et al.[8] Prevalence of GDM estimated was 17.2% family history of diabetes associated with raised risk. A study conducted by Rajasekar et al revealed hospital-based prevalence of GDM 14% and a significant rise in prevalence was noted in women who are with family history of diabetes mellitus.[7] study of prevalence of gestational diabetes mellitus in an urban population of India. a hospital-based study by Jali et al.[22] The results of this study indicated that bad obstetrics history were highly prone for development of GDM. A systematic review and meta-analysis conducted by Lee et al, found a high prevalence of GDM among the Asian population and are associated with risk factors like history of previous GDM, congenital anomalies or macrosomia.[24]

This study showed that the prevalence of GDM is significantly associated with multiparity, wherein 27 of total 98 subjects were multiparous. Of all the independent risk factors for GDM, BMI was found to be a modifiable risk factor.[10]

The prevalence of gestational diabetes mellitus (GDM) has been increasing globally, with urbanization, sedentary lifestyle, physical inactivity and dietary changes as significant contributing factors.[10] India has a particularly high prevalence of GDM, ranging from 3.8 to 21% in different regions, with a higher prevalence in urban areas than in rural areas. This prevalence has increased from 2% in 1982 to 7.62% in 1991.[11] The World Health Organization (WHO) estimates that by 2025, there will be 300 million type II diabetes patients in India. The variation in GDM prevalence in different studies is attributed to differences in geographical area, sample size, demographic characteristics of the study population and diagnostic methods employed. In this particular study the prevalence of GDM was found to be 23.78%.

CONCLUSION

The prevalence of gestational diabetes mellitus (GDM) has been increasing globally, with urbanization, sedentary lifestyle, physical inactivity and dietary changes as significant contributing factors. India has higher prevalence of GDM, ranging from 3.8 to 21% in different regions. Diabetes in pregnancy is associated with severe adverse maternal and foetal outcome like miscarriage, anomalies, macrosomia, difficult deliveries, sudden infant death and still birth. Most of the adverse outcome can be prevented by early detection and proper glucose control. Therefore, the present study recommend a separate diabetes clinic, wherein all antenatal women can be screened, counselled regarding lifestyle modification, treated and monitored regularly for any adverse outcome.

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