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Research Article

A study of prevalence and determinants of gestational diabetes mellitus

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ABSTRACT

Background: It is estimated that one out of every 200 pregnancies is complicated by diabetes mellitus and additionally that five in every 200 pregnant women will develop gestational diabetes. Risk factors of gestational diabetes mellitus may act directly or indirectly to facilitate the onset of diabetes, it is of utmost important to detect.
Methods: A hospital based cross-sectional study was conducted in the setting of department of Obstetrics and Gynaecology, JSS Medical College and Hospital, Mysore, Karnataka, India during the year 2006-2007. All antenatal pregnant women with 24-28 weeks of pregnancy attending the OBG department (both outpatients and inpatients) were included in the study. Women with history of pregestational diabetes (overt diabetes) were excluded from the study. Screening test of glucose challenge test (GCT) was done and those positive for GCT were subjected to oral glucose tolerance test (OGTT) to diagnose the gestational diabetes mellitus.
Results: Out of 800 antenatal pregnant women, two thirds of them were in the age group of 21-25 years (67.5%), 60% of the women were multigravida. The prevalence of GDM in this study was 5.25% (95% CI; 3.8%-6.9%). GDM was significantly associated with past history of macrosomia (OR: 28), GDM (OR: 8.2), abortions (OR: 8.2), family history of diabetes mellitus (OR: 8.0), obesity (OR: 4.7) and maternal age >25 years (OR: 3.5)
Conclusions: Overall prevalence of GDM was 5.5%. Increasing maternal age, family history of DM, past history of GDM, macrosomia, abortions and increasing maternal BMI were the important determinants of GDM.

Keywords: GDM, Prevalence, Risk factors

INTRODUCTION

Diabetes mellitus is a common medical condition complicating pregnancy. It is estimated that one out of every 200 pregnancies is complicated by diabetes mellitus and additionally that five in every 200 pregnant women will develop gestational diabetes.[1]

Pregnancy is considered to be a diabetogenic state characterized by exaggerated rate and amount of insulin release, associated with decreased sensitivity to insulin at cellular levels. Hormones like oestrogen, progesterone, human placental lactogen, cortisone and growth hormone are anti insulinogenic. These increase in mid pregnancy period and cause abnormal glucose tolerance in some women rendering them prone for gestational diabetes.[2]

It is important to identify a pregnant woman with gestational diabetes mellitus (GDM) because GDM is associated with significant metabolic alterations, increased perinatal mortality and morbidity, maternal morbidity and exaggerated long term morbidity among the mothers and their offspring.[3]

Universal screening of all pregnant women for GDM has been endorsed by both the American Diabetes Association Position Statement and by the First, Second, Third International Workshop conferences on GDM.[4-6]

American college of obstetricians and gynaecologists (ACOG) and the fourth International workshop conference on GDM have always emphasized on selective screening.[7,8]

The Objective of this study was to find out the prevalence of GDM among pregnant women coming to JSS hospital, Mysore, Karnataka, India. And to study the determinants of GDM among the pregnant women.

METHODS

A hospital based cross-sectional study was conducted in the setting of department of Obstetrics and Gynaecology, JSS Medical College and Hospital, Mysore, Karnataka, India during the year 2005-2006. All antenatal pregnant women with 24-28 weeks of pregnancy attending the OBG department (both outpatients and inpatients) were included in the study. Women with history of pregestational diabetes (overt diabetes) were excluded from the study.

During the one year study period, a total of 800 pregnant women attending OPD or admitted as inpatients at JSS hospital, Mysore, Karnataka, India were enrolled. Socio-demographic profile and data related to the risk factors were elicited by interview method. All enrolled women underwent detailed clinical examination and were subjected to screening test of glucose challenge test (GCT) and those positive for GCT were subjected to oral glucose tolerance test (OGTT) to diagnose the gestational diabetes mellitus.

Method of performing OGCT

50 gms of glucose is dissolved in 200 ml of water and the patient is asked to drink it over five minutes period, without regard to time of the day or time of the last meal. After one hour of time of ingestion venous blood is drawn. If the blood glucose value is ≥140 mg/dl, the screening is considered as positive and subjected for oral glucose tolerance test (OGTT).[9]

Method of performing OGTT

Patient should be fasting for 10-12 hours. Fasting blood sample is drawn, after which patient is asked to drink 100 gms of glucose dissolved in 200-400 ml of water. Subsequent blood samples are drawn at 1, 2, 3 hours. According to National diabetes data group the diagnosis of gestational diabetes is made when two or more values mentioned below are met or exceeded.[10]

Fasting: 105 mg/dl
1 hour: 190 mg/dl
2 hours: 165 mg/dl
3 hours: 145 mg/dl

All the patients with abnormal OGTT were followed till 6 weeks post-partum. Data regarding mode of delivery and outcome, perinatal mortality and morbidity were determined.

Statistical analysis

All the collected data was entered into an excel sheet and after appropriate data cleaning, the data was transferred and analyzed using SPSS software version 22. Appropriate descriptive statistics like percentages and mean, standard deviation are used to describe the socio-demographic, risk factor variables. The difference in the prevalence of GDM among various groups was tested using Chi-square test and p value of less than 0.05 was considered to be significant.

RESULTS

This A total of 800 antenatal pregnant women were included in the study where in two thirds of them were in the age group of 21-25 years (67.5%) followed by 26-30 years (20.4%) and less than 20 years age group (9.1%). 54% of the women were APL card holders and the rest of the women were APL card holders.

Table 1: Socio-demographic and obstetric profile of the study subjects.

Variable	Frequency	Percentage
Age group		
<20 years	73	9.1
21-25 years	540	67.5
26-30 years	163	20.4
>30 years	24	3.0
Total	800	100.0
SES*		
APL	488	61.0
BPL	312	39.0
Gravida		
Primigravida	324	40.5
Multigravida	476	59.5
Total	800	100.0

*SES-Socioeconomic status, APL-Above poverty line card holder, BPL-Below poverty line card holder.

Nearly 60% of the women were multigravida and remaining 40% were primigravida.The prevalence of GDM in this study was 5.25% (95% CI; 3.8%-6.9%). The prevalence of GDM increased as the age of the women increased where in the prevalence increased from 3.9% (95% CI; 2.5%-5.8%) in the age group of 21-25 years to 7.4% (95% CI; 4.2%-12.4%), to 37.5% (95% CI; 21.6%-57.2%) and this difference in the prevalence rates with respect to the age of the women was found to be statistically significant (p value: <0.001). As the age of the pregnant women increased the Odds of a pregnant women suffering from GDM also increased, where in pregnant women who were aged more than 30 years had 14.64 (OR) (95% CI; 5.5-37.1) times higher chances of suffering from GDM compared to rest of the age groups.

Table 2: Prevalence of gestational diabetes mellitus.

Variable	N	N	Prevalence rate (95% CI)	OR (95% CI)	p value
Overall prevalence	800	42	5.25 (3.8 - 6.9)	-	-
Age group					
< 20 years	73	0	0 (0)	-	-
21-25 years	540	21	3.89 (2.5 - 5.8)	1 (0.5 - 1.8)	0.99
26-30 years	163	12	7.36 (4.2 - 12.4)	1.96 (0.9 - 4.1)	0.06
> 30 years	24	9	37.50 (21.6 - 57.2)	14.64 (5.5 - 37.1)	0.00
Gravida					
Primi	324	14	4.32 (2.5 - 7.1)	1 (0.4 - 2.1)	0.99
Multi	476	28	5.88 (4.1 - 8.3)	1.38 (0.7 - 2.7)	0.33
Risk factors					
Age > 25 years	187	21	11.23 (7.2 - 16.3)	3.55 (1.8 - 6.7)	0.00
Past h/o fetal loss > 28 weeks	121	8	6.61 (3.3 - 12.5)	1.34 (0.5 - 2.8)	0.46
Past h/o abortions	57	14	24.56 (15.2 - 37.1)	8.26 (3.9 - 16.7)	0.00
Past h/o congenital anomalies	12	2	16.67 (4.6 - 44.8)	3.72 (0.5 - 15.9)	0.07
Past h/o GDM	10	3	30.0 (10.7 - 60.3)	8.2 (1.6 - 32.4)	0.00
Past h/o Macrosomia	5	3	60.0 (23.0 - 88.2)	28.66 (4.1 - 246.9)	0.00
Past h/o Prematurity	26	1	3.85 (0.6 - 18.8)	0.71 (0.03 - 3.9)	0.74
Past h/o unexplained neonatal loss	11	0	0 (0)	-	-
Family h/o DM	43	11	25.58 (14.9 - 40.2)	8.0 (3.5 - 17.2)	0.00
Obesity	15	3	20.0 (7.0 - 45.1)	4.76 (1.04 - 16.5)	0.01

Multigravida women had higher prevalence of GDM (5.8%) compared to primigravida women (4.3%) and this difference was not found to be statistically significant.

Pregnant women who had past history of macrosomia (60%, 95% CI: 23%-88%), past history of GDM (30%, 95% CI: 10.7%-60.3%), past history of abortions (24.5%, 95% CI: 15.2%-37%) and family history of diabetes milletus (25.5%, 95% CI: 14.9%-40.2%) had higher prevalence of GDM compared to who didn't had a similar history and this difference was found to be statistically significant. Pregnant women who were obese had higher odds (OR:4.7; 95% CI: 1.04-16.5) of suffering from GDM compared to non-obese women and this difference was found to be statistically significant.

However pregnant women with past history of fetal loss, congenital anomalies, prematurity and unexplained neonatal loss did not revealed any statistically significant association with GDM.

DISCUSSION

The national diabetes data group defined gestational diabetes mellitus (GDM) as carbohydrate intolerance of variable severity first diagnosed during pregnancy, and Metzger et al noted that the definition applies whether or not insulin is used for treatment or the condition persists after pregnancy.[5,10] There is evidence that pregnancy is an insulin-resistant state and it has been described the interaction of inherited risk factors (family history, ethnicity) and acquired risk factors (obesity, aging, pregnancy) will lead to development of insulin resistance and thereby to GDM and NIDDM.[11-13] Ezimokhai et al confirmed the influence of ethnic background on the prevalence of gestational diabetes in a multiethnic and multicultural society. Other studies have revealed that the Asian people have higher risk of GDM (11.9%) compared to rest of the groups and people of Indian origin have higher prevalence of GDM (16.7%) compared other ethnic groups.[14-16]

Use of different diagnostic criteria has led to difference in the prevalence rates of GDM among various studies conducted in India. In India, in a study done by Agarval et al the prevalence of GDM was found to be 2 per cent in 1982 followed by 7.62 per cent in another study done by Narendra et al[17,18] In a random survey performed in various cities in India in 2002-2003, the prevalence of GDM was 16.2 per cent in Chennai, 15 per cent in Thiruvananthapuram, 21 per cent in Alwaye, 12 per cent in Bangalore, 18.8 per cent in Erode and 17.5 per cent in Ludhiana.[19]

In our study 800 pregnant women attending the OPD/inpatient in JSS hospital, Mysore, Karnataka, India were screened with 50 gm glucose challenge test. 128 of them had abnormal screening test and were subjected to OGTT, out of which 42 patients had GDM. In our study the overall prevalence of GDM was 5.25% and this was inconsonance with other studies done by Vitorattos et al (4.98%), Kumar et al (5.5%) and Larijani et al (4.7%).[20-22] In another study done by Bhattacharya et al the prevalence of GDM was 3% which less compared to

our study and in another study done by Rajput R et al the prevalence was more compared to our study results and this difference may due the different geographical areas and difference in socio-demographic profile of the subjects.[23,24]

In our study, prevalence of GDM increased significantly with increasing age. A similar association has been seen in earlier studies.[24-27] In our study the odds of a woman >25 years developing GDM were 3.55 times than a woman <25 years of age. Seshiah et al reported an odds ratio of 2.1 for women >25 years of age.[26]

One of the important determinants for the development of GDM is obesity. Higher prevalence of GDM in women with higher BMI has also been observed in earlier studies. Similar association between GDM and higher BMI was observed in the present study. Some of the studies have showed that women with GDM had a significantly higher gain in weight compared to women without GDM.[24,29] This higher weight gain is attributed to hyperglycemia in pregnancy.

In our study an association between higher parity and GDM was not found to be statistically significant and this was inconsonance with the study done Rajput R et al and Jang et al.[24,31] However in few studies higher parity has been found to be associated with higher prevalence of GDM.[19,25]

In our study women had higher chances (odds) of having GDM who had family history of diabetes mellitus (OR: 25) and past history of GDM (OR: 30) and this association was found to be statistically significant. Similar observation was reported by other studies conducted elsewhere.[25-27,31,32]

In our study women had higher chances (odds) of having GDM who had past history of macrosomia (OR: 60) and past history of abortions (OR: 24) and this association was found to be statistically significant. Similar observation was reported by Jindal et al and Dixon DRD et al.[33,34]

CONCLUSIONS

Overall prevalence of GDM was 5.5% in our study. There many risk factors which directly or indirectly facilitate the onset of GDM among the pregnant women among which increasing maternal age, family history of DM, past history of GDM, macrosomia, abortions and increasing maternal BMI were the important determinants of GDM.

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