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Original Research Article

Prevalence of gestational diabetes mellitus and perinatal outcome: a rural tertiary teaching hospital based study

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ABSTRACT

Background: Gestational diabetes mellitus is the commonest medical disorder in pregnancy. Women with GDM are at increased risk for adverse obstetric and perinatal outcome. Prevalence of GDM is known to vary widely depending on region of the country, dietary habits and socio-economic status. This study was undertaken to evaluate the prevalence of GDM and risk factors associated with it among women delivered in a rural tertiary teaching hospital in Telangana and further assess its impact on feto-maternal outcome.
Methods: A retrospective study was conducted at Mediciti Institute of Medical Sciences on GDM cases delivered from May 2015 to April 2017. GDM was diagnosed using 2 step procedure of screening with glucose challenge test followed by confirmation with oral glucose tolerance test using Carpenter and Couston criteria. Demographic data and details about perinatal outcome were obtained from medical records and analyzed.
Results: The prevalence was low (1.83%) compared to other studies. Majority of the women did not have risk factors. Preeclampsia is the commonest maternal complication seen (18%). Hypothyroidism is more often associated with GDM (15%). Caesarean section rate was high (62%). Though the NICU admission rate was high (76%), neonatal outcome was found to be satisfactory.
Conclusions: The low prevalence of GDM seen highlights the importance of carrying out studies in different population groups of India to know the exact prevalence of GDM in the country. Pregnancies in women with GDM continue to be at increased risk of maternal and perinatal complications.

Keywords: Fetomaternal outcome, Gestational diabetes mellitus, GCT, OGTT, Prevalence

INTRODUCTION

Diabetes Mellitus is one of the common medical condition complicating pregnancy. Gestational diabetes mellitus (GDM) is defined as any degree of glucose intolerance with the onset or first recognition during pregnancy with or without remission after the end of pregnancy.[1] It is important to identify a pregnant woman with GDM because of its association with significant metabolic alterations, increased perinatal and maternal morbidity and mortality leading to long term morbidity among the mothers and their offsprings.[2] Normal pregnancy is associated with altered maternal glucose haemostasis and metabolism. Pregnancy is considered to be a diabetogenic state. Pregnancy is characterised by increased amount of insulin release but decreased sensitivity to insulin due to increase in anti-insulinogenic hormones like oestrogen, progesterone, human placental lactogen, cortisone and growth hormone.[3]

The prevalence of GDM in India varies from 3.8 to 21% in different parts of the country, depending on the

geographical locations and diagnostic methods used.[4] In India it is difficult to predict any uniform prevalence levels because of wide differences in living conditions, socio-economic status, dietary habits and maternal age.

There is paucity of data on the prevalence of GDM in low middle-income countries. Most of the available data are derived mainly from urban areas with less data available from rural areas.

Data regarding prevalence of GDM is important for national health planning, resource allocation and to undertake preventive measures. As studies in different regions of India shows widely different prevalence rates, multiple regional studies are needed in different types of populations for quantifying prevalence data.

The primary aim of the present study was to assess the prevalence of GDM at Mediciti Institute of Medical Sciences (MIMS), a rural tertiary teaching hospital in Telangana State, India. The secondary aim was to study the risk factors associated with GDM and to assess the perinatal outcome.

METHODS

A retrospective study was carried out at Mediciti Institute of Medical Sciences, a rural tertiary teaching hospital located 35 km from the city of Hyderabad in Telangana state, India. All women diagnosed with GDM during the period from May 2015 to September 2017 were included. Women without GDM served as controls.

GDM was diagnosed using 2 step procedures as per American Diabetic Association (ADA) recommendation. All pregnant women between 24-28weeks of gestation were screened for GDM using Glucose Challenge Test (GCT) and those positive for GCT were subjected to Oral Glucose Tolerance Test (OGTT) to diagnose the gestational diabetes mellitus. 50 grams of glucose is dissolved in 200 ml of water and the patient is asked to drink it over 5 minute periods, irrespective of time of the day and of the last meal.

After one hour, venous blood is drawn. If the blood glucose is more than 140mg/dl, the screening is considered as positive and subjected for OGTT.[5]

For performing GTT, patient should be fasting for 10-12 hours. Fasting blood sample is drawn and patient is asked to drink 100gms of glucose dissolved in 200-400 ml of water. Blood samples are drawn at 1, 2 and 3 hours. According to Carpenter and Couston Criteria the diagnosis of gestational diabetes is made when 2 or more values mentioned below are met or exceeded.[6]

- Fasting: 95 mg/dl
- 1 hour: 180 mg/dl
- 2 hour: 155 mg/dl
- 3 hour: 140 mg/dl

Using each woman's unique medical record number, case files were obtained and data was obtained on demographic variables, risk factors such as obesity, previous h/o GDM, previous h/o fetal loss etc. and associated complications such as pre-eclampsia, polyhydramnios etc. Gestational age was obtained by last menstrual period and confirmed by dating scan.

First trimester dating ultrasound was used where date of last menstrual period was not known. Preeclampsia was defined as hypertension after 20 weeks combined with proteinuria and/or edema.[7] Polyhydramnios was defined as AFI > 24 cm.[8] Preterm labor was defined as labor before 37 completed weeks of pregnancy.[9]

Data regarding mode of delivery, gestational age at delivery, weight of the baby, Apgar score at 1 minute and 5 minutes, NICU admissions were recorded. Weight of the baby was measured with digital scale.

Statistical analysis

Data was collected and tabulated as shown in results. Statistical analysis was done using Microsoft Excel. Frequency and percentage of each parameter was calculated and analyzed. The risk estimates were analyzed between the cases and controls by calculating the odds ratio. 95 % confidence interval and p value were calculated. p value of <0.05 was considered significant.

RESULTS

A total of 3871 women deliveries occurred at Mediciti Institute of Medical Sciences from May 2015 to April 2017 and 71 women were diagnosed with GDM using American Diabetic Association (ADA) recommended 2 step procedures of GCT followed by OGTT. The prevalence rate is 1.83%.

Table 1 shows demographic characteristics of the women with GDM. The mean age of the women was 25.5 years.

Most of the women were from low socioeconomic status and were from rural background. Sixty percent of the women were multigravida. Family history of diabetes mellitus was found in 20% of women.

Table 2 illustrates the past obstetric performance of women with GDM. Previous history of abortion was seen in 25% of women and previous history of GDM in 5% of women.

Almost 50% of women were managed with diet alone, while 20% of women needed tablet metformin and 28% of women required insulin for control of blood sugars.

Table 1: Socio-demographic profile of the women participants.

Parameters	Cases No (%)	Controls No (%)	Odds Ratio	C.I	value
Age					
<20 yrs	9 (12.6)	7 (11.3)	2.96	1.05-8.3	0.038
21-25 yrs	29 (39.8)	89 (59)	0.47	0.26-0.84	0.01
26-30 yrs	25 (35)	39 (26)	1.54	0.84-2.84	0.16
>30 yrs	9 (12.6)	5 (3)	4.2	1.35-13.07	0.01
Gravidity					
Primi	29 (40.8)	50 (33)	1.38	0.77-2.47	0.27
Multi	42 (59.1)	100 (66)	0.72	0.40-1.29	0.27
Family H/o D.M	14 (19.7)	Data not available			

Table 2: Analysis based on past obstetric performance of women with GDM.

	Frequency	%
H/o fetal loss	2	2.81
H/o abortion	18	25.3
H/o prev cong anamolies	1	1.4
H/o GDM	4	5.63
H/o Macrosomia	2	2.81
H/o prematurity	0	0

Table 3 shows the distribution of complications associated with GDM.

Fifteen percent of women had associated hypothyroidism. Pregnancy induced hypertension developed in 18% of women.

Table 4 shows characteristics of mode of delivery and neonatal outcome.

Eighty percent of women delivered at term gestational age and Caesarean section rates were higher (62%). Low birth weight babies accounted for 45% of cases. Only 7% of women had macrosomic babies. Babies required admission in 76% of cases.

Table 3: Distribution of associated complications in women with GDM and without GDM.

Complications	Cases No. (%)	Controls No. (%)	Odds Ratio	C.I	p value
Hypothyroidism	11 (15.4)	*			
PIH	13 (18.2)	27 (18)	1.02	0.49-2.12	0.95
Oligohydraminos	5 (7.04)	7 (4)	1.54	0.47-5.05	0.46
PROM	4 (5.63)	16 (10)	0.5	0.16-1.55	0.23
PPROM	3 (4.22)	7 (4)	0.90	0.22-3.59	0.88

*Data not available for the controls.

Table 4: Mode of delivery outcomes among women with and without GDM.

Variables	Cases No. (%)	Controls No. (%)	Odds Ratio	C.I	P value
Vaginal delivery	27 (38)	66 (44)	0.78	0.43-1.39	0.40
Elective. LSCS	20 (28.1)	33 (22)	1.39	0.72-2.65	0.31
Emergency. LSCS	24 (33.8)	51 (34)	0.99	0.54-1.8	0.97

Table 5: Fetal outcomes in women with and without GDM.

Variables	Cases No (%)	Controls No (%)	Odds Ratio	C.I	P value
Birth Weight (in kgs)					
VLBW (<1.5)	2 (2.73)	12 (8)	0.33	0.07-1.53	0.157
LBW (1.5-2.5	30 (42.4)	56 (37)	1.22	0.69-2.18	0.48
AGA (>2.5)	35 (49.39)	82 (55)	0.80	0.45-1.41	0.455
NICU Admission	54 (76)	60 (37)	4.76	2.52-8.99	<0.0001
Sex					
Male	36 (50.6)	89 (56)	0.82	0.46-1.43	0.48
Female	37 (49.3)	71 (44)	1.36	0.77-2.38	0.277

DISCUSSION

The prevalence of GDM was 1.83%, which is very less compared to other studies done in India. The prevalence of GDM was 16.2% in Chennai, 15% in Thiruvanthapuram, 21% in Alwaye, 12% in Bangalore, 18.8% in Erode and 17.5% in Ludhiana.[10] This difference in various geographical areas is due to different sociodemographic profile and criteria used for screening and diagnosis of GDM.[11,12] Studies also revealed that Asian people have higher risk of GDM (11.9%) compared to rest of the groups.[13]

The WHO Ad Hoc Diabetes Reporting group noted lowest rates of diabetes (<1%) in rural Indians in women between the ages 20 and 39 years.[14] Advanced maternal age and pregnant women who belong to low socioeconomic status are associated with high rates of GDM. When compared to women in twenties, the risk of developing GDM increases from 2% to 7% in those more than 35 years.[15-17] The low prevalence rate seen in the present study may be explained by the fact that 76% of women were less than 39 years of age and get married soon and conceive at an early age. In present study, age more than 30 years and less than 25 years was significantly associated with increased risk of GDM (p value of 0.01).

In the present study, 59% women were multigravida. Few studies have shown high parity to be associated with high prevalence of GDM.[10,18] The increased prevalence may be because of undiagnosed glucose intolerance in previous pregnancies and detected in the index pregnancy. Previous history of GDM was noticed only in 5.6% cases in the present study. In a systematic review, the pooled GDM recurrence rate was found to be 48%.[19] Interestingly, family history of Diabetes mellitus was found in 20% of cases though in the study by Schwartz et al family history of Diabetes Mellitus was not associated with a greater risk of GDM recurrence.

McGuire et al, observed an odds ratio of 23 for women with prior GDM.[19,20] GDM predisposes women and fetus to a variety of complications during pregnancy and later in life. There is higher prevalence of PIH and preeclampsia in women with GDM. PIH is common in these pregnancies because of the formation of free radicals from protein glycosylation and glucose autooxidation. The present study observed PIH in 15.4% cases similar to a study by Thomas B et al (14.4%). This significantly increases perinatal and maternal morbidity and mortality.[21] In present study, the risk of complications were not significantly different between the study group and controls. This may be because of the low prevalence of GDM in our population.

Poor glucose control predisposes women to develop complications for both mother and the infant. Glucose should be regulated as strictly as possible. Medical nutrition therapy in women who develop GDM focuses on controlling blood sugar levels and prevent the metabolic effects of hyperglycemia on the mother and fetus. As part of medical nutrition therapy, foods with low glycemic index produce a more steady release of glucose are which advisable. In the present study, 38 women were managed with dietary modifications. Metformin was required in addition to dietary modification in 14 women. Metformin is an insulin sensitizer, which inhibits gluconeogenesis and hepatic glucose output while increasing muscle glucose uptake.[22] Insulin was needed in 19 women along with diet manipulation. This treatment is considered to be the gold standard for the management of GDM.

The primary objective in the management of labor and delivery in GDM is to avoid fetal death in uterus and shoulder dystocia associated with fetal macrosomia. As a result, caesarean section rates for women with gestational diabetes in most parts of the world are >50%.[23] The present study showed ceasarean rates to be 62%. Similarly, Alberico et al, found caesarean rates to be high (50%).[24]

With respect to mode of delivery, significant difference was not found. Ours being a tertiary hospital cesarean rate was high even in non GDM cases. Fetal gender has an impact on maternal glucose metabolism in early pregnancy.[25] Though a recent systematic review showed that carrying a male fetus has a 4% higher risk of developing GDM compared to carrying a female fetus, our study had equal number of male and female fetuses.[26]

NICU admission is required in infants with hypoglycemia, RDS, jaundice, preterm birth and when there is need for intravenous fluids, exchange transfusion for polycythaemia. NICU admissions for various reasons were required in 76% of infants of GDM mothers. Overall, neonatal outcome was satisfactory because of better antenatal care, supervision of delivery attended by the pediatrician and care of the newborn. In present study, the NICU admissions was significantly higher (p= <0.0001) in cases compared to the controls.

CONCLUSION

The low prevalence of GDM seen in a rural tertiary teaching hospital highlights the importance of carrying out prevalence studies in different population groups of India to know the exact prevalence of GDM in the country. Pregnancies in women with GDM continue to be at increased risk of maternal and perinatal complications. As PIH was the most common complication seen, women with GDM need monitoring of blood pressure. Hypothyroidism is more often associated with GDM.

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