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Original Research Article

Prevalence of gestational diabetes mellitus and its relationship with various risk factors in a tertiary care hospital in West Bengal with special reference to tribal population, India

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ABSTRACT

Background: Gestational diabetes mellitus (GDM) is the most common medical complication and metabolic disorder of pregnancy. The aim and objective of this study was to determine the prevalence of GDM and its relationship with various risk factors with special reference to tribal population.
Methods: The study was done in 200 patients between 24 and 28 weeks of gestation, attending antenatal outdoor in a tertiary care hospital of West Bengal. These patients were given 75gm oral glucose irrespective of the last meal and their plasma glucose was estimated at 2hours. Patients with plasma glucose values ≥140 mg/dl were labelled as GDM. Patients who were diabetic before pregnancy or whose pre pregnancy body mass index was not known or was in labour or had chronic disease, were not included in the study.
Results: Prevalence of GDM was 11% in whole population while it was 14.63% and 10.06% in tribal and non-tribal population respectively. Prevalence of GDM and its correlation with most of risk factors in previous pregnancies was found to be significant in both non-tribal and tribal population. Family history of diabetes mellitus was the most prevalent risk factor in both non-tribal (9.4%) and tribal population (14.63%). There was no single most common risk factor among GDM patients found as there were multiple risk factors present with same frequency in both tribal and non-tribal population.
Conclusions: The prevalence of GDM is 14.63% in the tribal population and 10.06% in non-tribal population which is not statically significant (P<0.407). The relation between the prevalence of GDM and risk factors was found to be significant for most of the risk factors.

Keywords: Gestational diabetes mellitus, Pregnancy, Prevalence, Risk factor

INTRODUCTION

Gestational diabetes mellitus (GDM) is defined as a glucose intolerance resulting in hyperglycaemia of variable severity with onset during pregnancy.[1] Prevalence of diabetes mellitus varies widely (3.8-21%) in different parts of India depending upon geographical location and methods of diagnosis used.[2-4] Virtually all new cases of diabetes during pregnancy are transient form of type 2 diabetes mellitus. GDM is a controversial clinical entity that is believed to be unmasking of compensated metabolic problem characterized by relative

insulin deficiency and increased insulin resistance.[5] GDM is a clinical entity associated with raised maternal and foetal morbidity.[6] Women with GDM are more prone to develop diabetes mellitus in future. Thus, diagnosis of GDM is an important public health issue.[7]

Indian data on GDM are scarce and do not give actual picture. Also, there is no ample data regarding status of GDM in tribal population. Hence the need of this study. It has been demonstrated that perinatal and maternal morbidity associated with GDM can be reduced to a great extent by predicting GDM by knowing the presence of risk factors in previous pregnancy and systemic approach for diagnosis and management of the disease.

METHODS

A cross sectional study to know the prevalence of GDM and its relationship with risk factors in a tertiary care hospital of West Bengal with special reference to tribal population was carried out for a period of approx. 1 year (from June 2014 to May 2015). The permission from institutional ethics committee was obtained.

Inclusion criteria

- The study included 200 pregnant patients in 24th-28th week of gestation irrespective of maternal age and gravidity, presence or absence of clinical or historic risk factors for GDM and irrespective of the time of last meal.

Exclusion criteria

- Patients who were known diabetic or whose pre pregnancy BMI is not known or patient in labour or patient with major chronic disease like tuberculosis, malignancy, renal failure, congestive heart failure and advanced liver failure, were excluded from the study.
- Detailed history of all patients was taken with emphasis on genetic and family history and history of previous pregnancies. All the patients were screened by the single step 75 gm 2 hrs oral glucose tolerance test (OGTT) as recommended by WHO.[8]
- In the antenatal clinic pregnant women after undergoing preliminary clinical examination were given 75 gm oral glucose load, irrespective of time of the last meal. A venous sample was collected at 2 hours for estimation of plasma glucose by glucose oxidase method. GDM was diagnosed if 2 hours PG is ≥140 mg/dl.

Statistical analysis

All data were collected recorded and compiled on Microsoft excel data sheet. The Statistical software namely "IBM SPSS statics version 22" was used for the analysis of the data and Microsoft word and Excel have been used to generate graphs, tables etc.

RESULTS

Out of total 200 patients in study population 22 were found to be having GDM. 41 (20.5%) patients of the study population were tribal and remaining 159 (79.5%) were non-tribal. Among 41 tribal patients 6 patients had GDM. So, the prevalence of GDM in tribal population was 14.63% and 10.06% in non-tribal population. The overall prevalence of GDM in the whole study population was found to be 11%.

The mean age of the whole study population was 23.15±3.9 yrs. Most of the patients in whole study population were in 21-25 years age group while 18-20 years age group in tribal population. The correlation between the increasing age and prevalence of GDM was very significant in whole study population (P-value=0.002). Prevalence of GDM was found to be increasing with age in the tribal population also but it is not statically significant (P-value =0.108).

110 (55%) of the patients were primi gravida and remaining 90 (45%) patients were multigravida in the study population. The prevalence of GDM was more in multi gravida than in the primi gravida in whole population. Prevalence of GDM in multi gravida was found to be 17.77 % (16/90) while it was only 5.45 % (6/110) in the case of primi gravida (Table 1).

Table 1: Parity wise distribution of gestational diabetes mellitus (GDM) patient in whole study.

Parity	GDM in total population	P value
Primigravida	6 (5.45%)	0.006
Multigravida	16 (17.77%)	

So, the prevalence of GDM increased with increase in parity in total population (P-value=0.006). In tribal population, 30 patients were primi gravida and remaining 11 patients were multigravida. Prevalence of GDM in tribal multi gravida was 27.2% (3/11) while the prevalence of GDM in tribal primi was only 10% (3/30). So, the prevalence of GDM increased with parity (P value=0.316) which shows that GDM prevalence increases with parity in tribal population also, but it was not statistically significant (Table 2).

Table 2: Parity wise distribution of gestational diabetes mellitus (GDM) patient in tribal population.

Parity	Tribal population	P value
Primigravida	3 (10%)	0.376
Multigravida	3 (27.27%)	

Mean body mass index (BMI) in previous pregnancy was found to be 24.06kg/m^2. Most of the patients in the study population were in the BMI group 18-25kg/m^2 which was

68.5% of total study population. The prevalence of GDM increased with BMI (p-value <0.000) (Table 3).

Table 3: Distribution of gestational diabetes mellitus (GDM) patient in various body mass index (BMI)groups in whole population.

BMI	Normal	GDM	P value
18-25	130	7	<0.001
26-30	41	11	
31-35	7	4	

The prevalence of GDM was maximum (36.3%) in the patients with BMI between 31 and 35. Most of the total tribal patients were in the BMI group 18-25 kg/m^2 (65.8%).

Table 4: Distribution of gestational diabetes mellitus (GDM) patient in various (body mass index) BMI groups in tribal population.

BMI	Normal	GDM	P value
18-25	27	2	<0.016
26-30	7	2	
31-35	1	2	
Total	35	6	

Prevalence of GDM in tribal population was maximum in the BMI group 31-35 (66.6%). So, prevalence of GDM increased with BMI in tribal population (p-value=0.016) (Table 4).

Only 4 patients out of 22 GDM had family history of (h/o) DM in first degree relative in whole study population while out of 6 GDM patients in the tribal population only 2 patients had family h/o DM in first degree relative. Prevalence of GDM was 14.63% in the tribal population as compared to non-tribal population (10.06%) (p-value=0.407).

This shows that the difference between the prevalence of GDM between tribal and non-tribal population is not significant. The most prevalent risk factor in both whole study population and tribal population was history of diabetes mellitus in the first degree relative (10.5% and 14.63% respectively) while least prevalent risk factors were congenital anomaly in previous pregnancy and history of GDM in previous pregnancy in both study population and tribal population (Table 5).

Most prevalent risk factor among GDM patients in whole population was history of abortion in previous pregnancy (31.8%) while the least prevalent risk factor was congenital anomaly in previous pregnancy (9.09%) (p-values <0.05). This indicates that there is significant association between the risk factors and development of GDM (Table 6).

Table 5: Prevalence of risk factors in whole study population and tribal population.

Risk Factor	Number of patients in whole study population	Number of patients in tribal, n=41
Abortion	9 (4.5%)	2 (4.8%)
Congenital anomaly	3 (1.5%)	0 (0%)
Preterm delivery	5 (2.5%)	1 (2.43%)
IUD	6 (3%)	2 (4.88%)
Macrosomia	6 (3%)	2 (4.88%)
Polyhydramnios	5 (2.5%)	2 (4.88%)
Obesity	17(8.5%)	3 (7.31%)
Previous H/O GDM	3 (1.5%)	0 (0%)
Family H/O DM	21(10.5%)	6 (14.63%)

Table 6: Prevalence of risk factors among gestational diabetes mellitus (GDM) patients in whole study population.

Risk factor	No. of screen negative patients (out of total 22 GDM)	No. of screen positive patients (percentage)	P-value
Abortion	15	7 (31.8)	0.000
Congenital Anomaly	20	2 (9.09)	0.008
Preterm Delivery	17	5 (22.7)	0.000
IUD (intra uterine death)	16	6 (27.27)	0.000
Macrosomia	16	6 (27.27)	0.000
Polyhydramnios	17	5 (22.7)	0.000
Obesity (BMI≥30)	17	5 (22.7)	0.011
Previous H/O GDM	19	3 (13.63)	0.000
H/O family H/O DM	18	4 (18.18)	0.213

Table 7: Prevalence of risk factors in GDM patients in tribal population.

Risk factor	Number of screen negative patients (among 6 GDM patients in tribal population)	Number of screen positive patients (percentage %)	P-value
Abortion	4	2 (33.33)	0.000
Congenital anomaly	0	0 (0)	-
Preterm delivery	5	1 (16.67)	0.014
IUD	4	2 (33.33)	0.018
Macrosomia	4	2 (33.33)	0.018
Polyhydramnios	4	2 (33.33)	0.018
Obesity	4	2 (33.33)	0.016
Previous H/O GDM	0	0 (0)	-
Family H/O DM	4	2 (33.33)	0.161

Most prevalent risk factors in GDM patients in tribal population were abortion, intra uterine death, macrosomia, polyhydramnios, obesity (BMI ≥30kg/m^2) and family history of diabetes mellitus (33.33% each) (Table 7).

DISCUSSION

The mean age of the pregnant women in the study was 23.15±3.90 years which is very similar to finding by Seshiah V et al, which showed mean age 23±4 years.[9] In this study prevalence proportion increased with age from 5.97%in the age group 18-20 years to 36.36% in the age group >30 years. (p-value-<0.002). So as the age increases the prevalence of GDM increases.

A study done by Rajput R et al, also showed that the prevalence rate was higher in women aged 26-30 and >30 year (11.57% and 34.8%, respectively) compared to women aged 16-20 and 21-25 year (4.54% and 4.53%, respectively) and this observation was found to be statistically significant (P<0.001). [10]

Seshiah V et al, have shown that the prevalence of GDM increases from 14.5% in age group 15-19 to 25% in the age group ≥30 years. [9]

In this study prevalence of GDM increased with age in tribal population also from 5% in the age group <20 years to 50% in age group >30 years. But this association was not found to be significant in present study. (P-value =0.108). This may be due to our small study population. But in large study this correlation may be significant. No significant data could be obtained regarding age distribution and GDM prevalence in tribal population.

Prevalence of GDM in tribal population was found to be 14.63%, while it is 10.06% in non-tribal population and 11% in whole study population.

In this study data on body mass index (BMI) showed that the prevalence of GDM increased with BMI. A significant relation between BMI and GDM prevalence was found in this study. GDM prevalence increased from 5.1% in BMI group 18-25 to 36.3% in BMI group >30kg/m^2. (P-value <0.000). In a study by Rajput R et al, a significant association was found between prevalence of GDM and increasing BMI of participants (P<0.001).[10] Women having BMI >25kg/m^2 had GDM 22% (11/50) compared to 4.7 % (11/232) in women with BMI <18.5 kg/m^2. In a study done in south India by Seshiah V et al, also showed increase in GDM prevalence from 16.4% in BMI group ≤20 to 33.3% in BMI group >30kg/m^2.[9]

Correlation between BMI and GDM was found to be same and statistically significant in tribal population. It increases from 6.9% in BMI group ≤25kg/m^2 to 66.6% in BMI group ≥30kg/m^2 (p-value = 0.016). More than half of (55%) of the patients in the study population were primi gravida.

A significant association was found between prevalence of GDM and parity. Prevalence of GDM increased with parity. It was 5.4% in primi gravida and 17.8% in multi gravida. (P-value= 0.006). The prevalence of GDM increased with parity in tribal population also from 10% in primigravida to 27.7% in multigravida. But this correlation between GDM and parity in tribal population was not found to be statistically significant. (P-value= 0.316).

Results about correlation between parity and GDM prevalence has been same in the other studies also. A study by Seshiah V et al.[9] The prevalence proportion of GDM increased with gravidity, from 16.3% (95% confidence limits: 12.7% -20.3%) in the primi gravidas to 25.8% (95% confidence limits:11.9%- 44.6%) in gravidas >4. However, Savvidou M et al, contradicted and stated that there were no relevant differences in parity of the mothers with GDM.[11]

Family h/o DM in first degree relative was the most common risk factor in both the study population and tribal population. Patients with family h/o DM in first degree relative were found to have increased prevalence of GDM. Total 10.5% (21) patients were found to have

family h/o diabetes mellitus. Out of 21 patients with family h/o DM 19.04% (4) found to have GDM and whereas out of 179 patients without family h/o DM 10% (18) patients developed GDM. Out of 22 GDM patients 18.18% (4) were found to have family h/o DM in this study which was statically not significant (P-value <0.213). This correlation may be significant in a study with big population.

Similarly, in tribal population 33.33% (2/6) GDM patients had family h/o DM in first degree relative which was found not to be statically significant. (P-value =0.161)

In a study by Rajput R et al, 8.25% of the study population had family h/o DM. 16.3% of women with GDM had family h/o DM compared to 7.6% women without GDM.[10]

A significant correlation was found to be present between most of the risk factors and GDM prevalence. But this correlation was not found to be significant statistically with family history of diabetes mellitus in both whole study population (p-value =0.213) as well as in tribal population-value (0.161). This may be attributed to poor literacy level here and minimal reliability of the data given by the patients regarding family history and habit of less frequent attending the health care facility.

Das V et al and Gomez HL et al, found that 25% and 50% of women with GDM, respectively, had obesity.[12,13] This may be due to increased demands on maternal metabolism during pregnancy from excess weight, resulting in imbalances in hormonal carbohydrate regulation mechanisms, and insulin.

The prevalence of GDM in this study with WHO recommended single step 75 gm. 2 hour method was found to be 11% which was similar to the findings of Agarwal MM et al, but lower than Seshiah V et al, who found a prevalence of 12.9% and 18.9% respectively.[9,14] In India GDM prevalence vary from 2.6%-20% in different studies. It may be attributed to difference in diagnosing methods and cut off values and different food habits, ethnicity, religion, cultural and social factors etc. Prevalence of GDM in present study was 14.63% in tribal population and 10.06% in non-tribal population. Statistically this difference was not found to be significant (P-value = 0.407).

There is no ample data regarding tribal population to compare this prevalence. The prevalence of GDM in other studies ranges from 2.5% to 18.9% like in study conducted by Carpenter MW et al, (4.8%), Xiong X et al, (2.5%), Wahi P et al, (6.94%), Rajput R et al, (7.2%) and Seshiah V et al,(18.9%).[9,10,15-17] while in present study the prevalence was 11%. Limitation of this study were the sample size of study was small. Only 200 pregnant patient of gestational age 24-28weeks were studied.

CONCLUSION

Prevalence of GDM was found to be more in tribal population as compared to total population but it was no found to be statically significant. Early diagnosis and treatment of GDM can decrease GDM associated perinatal morbidity and mortality.

Recommendations

The sample size was small hence require further population base study to evolve further.

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Ethical approval: The study was approved by the Institutional Ethics Committee

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