



Gestational diabetes: How risky are the mothers of rural Bengal, India

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ABSTRACT

Early detection of gestational diabetes in antenatal mothers can improve both pregnancy and fetal outcome. A descriptive, cross-sectional study was conducted to find out the magnitude of gestational diabetes by selective screening using "American Diabetes Association (ADA) risk approach strategy" and distribution of risk factors of gestational diabetes among the mothers attending the antenatal clinic of Singur Rural Hospital. Pregnant women with gestational age between 24-28 weeks were interviewed using a predesigned schedule adapted from American Diabetes Association and WHO guidelines and their clinical and obstetrical examination was done. Mothers identified with at least 1 risk factor were advised for screening by Glucose Challenge test (GCT). Those with a positive result were confirmed by Glucose Tolerance Test. Out of 625 antenatal mothers, majority i.e. 60.32% of the mothers were exposed to low risk for developing gestational diabetes. Among 248 (39.68%) mothers who had at least one risk factor, 20.56% were GCT positive amounting to 8.16% of the total population. 11.69% of the mothers with positive risk factors were GTT positive amounting to 56.86% of GCT positive mothers. This accounted for 4.64% of the total study population. Thus this method of preliminary screening for risk factors of gestational diabetes undertaken in all antenatal mothers followed by confirmatory testing in those found to be risk factor positive can provide a feasible alternative in increasing the yield for detection of gestational diabetes particularly in a low resource setting.

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Conflict of Interest—none

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Keywords: Gestational Diabetes, risk, antenatal mothers.

INTRODUCTION

Gestational diabetes mellitus (GDM) is a form of diabetes which affects the mother in late pregnancy^[1]. Maternal diabetes can also affect the fetus leading to fetal macrosomia^[2, 3]. At birth the newborn may develop breathing problems and hypoglycemia can occur due to over production of insulin^[4,5]. GDM can present with symptoms similar to Type II Diabetes mellitus^[6].

However, women with gestational diabetes often exhibit no symptoms. Thus preliminary screening by glucose challenge test performed between 26-28 weeks can detect gestational diabetes at the earliest opportunity. Gestational diabetes is only a temporary phase; it disappears after pregnancy^[7]. But once the mother is diagnosed with gestational diabetes, the chances are 2 in 3 that it will return in future. It is projected that the number of people with diabetes worldwide is expected to increase at record levels through 2030. The prevalence of

gestational diabetes mellitus (GDM) varies in direct proportion with the prevalence of type 2 diabetes in a given population or ethnic group^[8]. Worldwide the prevalence of gestational diabetes is reported between 2% to 18% distributed among various countries with diverse ethnicity^[9, 10]. India has been hailed as the diabetes capital of the world. Several researchers in India have reported that the occurrence of GDM ranges from 3.8% to 18% with a greater prevalence in urban areas as compared to rural areas^[11, 12, 13].

Women with gestational diabetes can have favorable pregnancy outcome, if, they follow a proper treatment plan from their health care provider. The main aim of treatment is to keep blood glucose levels equal to those of normal pregnant women. It includes dietary modification, scheduled physical activity, and blood glucose testing and insulin injections if required. If gestational diabetes is managed properly, it reduces the risk of a caesarean section birth that high weight babies may require^[14].

OBJECTIVES

1. To find out the magnitude of gestational diabetes by selective screening using "American Diabetes Association (ADA) risk approach strategy" among the mothers attending the antenatal clinic of Singur Rural Hospital.
2. To find out the distribution of risk factors of gestational diabetes among them.

MATERIALS AND METHODS

A cross sectional, descriptive type of study was carried out during a period of six months in the antenatal clinic of Singur Rural Hospital, situated in the Hoogly district of West Bengal. The study population comprised of pregnant women with gestational age between 24-28 weeks. Exclusion criteria included the mothers with < 24 weeks & > 28 weeks of gestational age, those who were already suffering from overt diabetes, apparently healthy mothers without any complications but were unwilling to participate in the study.

Approval to conduct the study was obtained from the institutional ethical committee and from the Block Medical Officer of Health. The mothers who

met the above mentioned inclusion criteria were registered for the study, after explanation about the objectives of the study and obtaining their informed verbal consent. A predesigned, pretested, semi structured interview schedule was developed according to the American Diabetes Association (ADA) and WHO guidelines^[14, 15]. ADA policy states that screening may be omitted in low-risk women^[16]. Risk categorisation criteria of ADA were adopted in the present study [Table -1]. It was validated after consultation with the experts.

The mothers were interviewed on the basis of the predesigned schedule and detailed personal and family history was taken. The clinical and obstetrical examination of mothers was done. The maternal heights were measured, weights were noted from past record in the first trimester and their body mass index (BMI) was calculated. Mothers were thus identified for the presence of any risk factors. Those mothers, who had at least 1 risk factor, were advised for screening by Glucose Challenge test (GCT). Two step procedures as recommended by ADA were followed.

Step 1: A 50 g glucose challenge test (GCT) was used for screening without regard to the time of last meal or time of the day. **Step 2:** If 1 hour GCT value was more than 140 mg/dl, 100g Oral Glucose Tolerance Test (OGTT) was performed. Plasma glucose was estimated at 0, 1, 2 and 3 hours. Gestational Diabetes Mellitus was diagnosed (Carpenter and Coustan criteria) if any 2 values met or exceeded FPG > 95 mg/dl, 1 hr PG > 180 mg/dl, 2 hr PG > 155 mg/dl and 3 hr PG > 140 mg/dl^[17]. Thus the total number of mothers suffering from Gestational Diabetes was obtained. The mothers diagnosed to be suffering from Gestational Diabetes Mellitus were then counselled for diet restriction and maintenance of blood sugar level. Later the mothers were referred to Gynaecology & Obstetrics Department of the district hospital for further management.

RESULTS

A total of 650 mothers, attending the antenatal clinic in Singur Rural Hospital who fulfilled the inclusion criteria, were approached. 625 mothers consented for participation in the study.

Out of 625 antenatal mothers, 248 (39.68%) mothers had at least one risk factor. Out of these 248 mothers, 9.52 % mothers belonged to high risk category and rest 30.16% belonged to average risk category. Majority i.e. 60.32% of the mothers were exposed to low risk for developing

gestational diabetes. Among the 625 mothers, 8.16% were GCT positive and 4.64% were GTT positive, excluding the magnitude of gestational diabetes in the low risk category. The [Fig 1] flowchart summarises the findings.

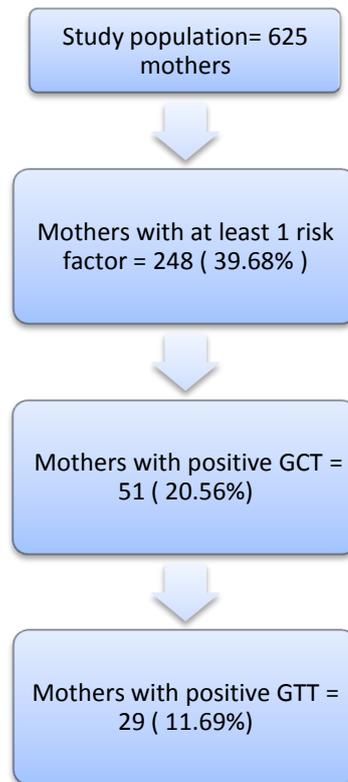


Figure 1 : Results of Screening for GDM

Gestational Diabetes was 32.4% in the age group of < 20 years and increased to 41.4% in age group 20-25 years. Out of 29 GTT positive mothers 72.4 % were above 30 years.

In the study population of 625 antenatal mothers, most of the mothers i.e., 94.2% belonged to age group of <25years. 48.3% of the mothers were teenage mothers. Only 4.4% of mothers belonged to age group of >30 years. Risk to develop

Table 1: Risk approach strategy^[15].

Classification of risk factor		
High Risk	Average risk	Low risk
Marked Obesity Personal history of GDM & Glycosuria Strong family history of Diabetes	Age >25 years Obesity before pregnancy Known diabetes in first-degree relatives History of abnormal glucose tolerance History of poor obstetric outcome Member of an ethnic group with a high prevalence of GDM*	Age <25 years Weight normal before pregnancy No known diabetes in first-degree relatives No history of abnormal glucose tolerance No history of poor obstetric outcome Member of an ethnic group with a low prevalence of GDM

* (Hispanic, African American, American Indian, South or East Asian, or Pacific Islander descent)^[16].

It was also found that, 47.99% mothers in the risk positive group were among the 20 – 25 years age group. Presence of risk factors increased with age from 15.7% in the age group 15 – 19 years to 32.1% in the age group of >30 years.

Total literacy rate among the study population was 86.24%. Educational status was found to be

significantly associated with the risk of developing gestational diabetes. Multipara women were found to have an increased risk of developing gestational Diabetes and the relationship was statistically highly significant. However, the other sociodemographic characteristics like religion, per capita income or maternal occupation were not found to be significant [Table 2].

Table 2: Socio-demographic variables related to risk factor of Gestational Diabetes (N=625)

Socio-demographic variables	Risk factor-Present (n1=248)	Risk factor-Absent (n2=377)	Total (N= 625)
Religion			
Hindu	168 (67.74%)	238 (63.13 %)	406 (64.96%)
Muslim	80 (32.26%)	139 (36.87 %)	219 (35.04%)
$\chi^2 = 1.40$ df = 1 p= 0.237			
Educational Status			
Illiterate	45 (18.14%)	41 (10.88%)	86 (13.76%)
Primary & Middle	149 (60.08%)	245 (64.98 %)	394 (63.04%)
Secondary & above	54 (21.78%)	91 (24.14%)	145 (23.2%)
$\chi^2 = 6.68$ df = 2 p=0.035			
Per capita income (Rs.)			
<500	30 (12.1%)	47 (12.48%)	77 (12.32%)
500 – 1000	155 (62.5%)	228 (60.47%)	383 (61.28%)
>1000	63 (25.4%)	102 (27.05%)	165 (26.4%)
$\chi^2 = 0.27$ df = 2 p= 0.873			
Maternal Occupation			
Homemaker	228 (91.93%)	345 (91.51%)	573 (91.68%)
Working	20 (8.07%)	32 (8.49%)	52 (8.32%)
$\chi^2 = 0.04$ df = 1 p= 0.851			
Parity of mother			
Primipara	100 (40.32%)	267 (70.82%)	367 (58.72%)
Multipara	148 (59.68%)	110 (29.18%)	258 (41.28%)
$\chi^2 = 57.41$ df = 1 p= 0.000..			

Mothers with a positive family history were identified as the commonest risk factor of

gestational Diabetes among the study population [Figure -2].

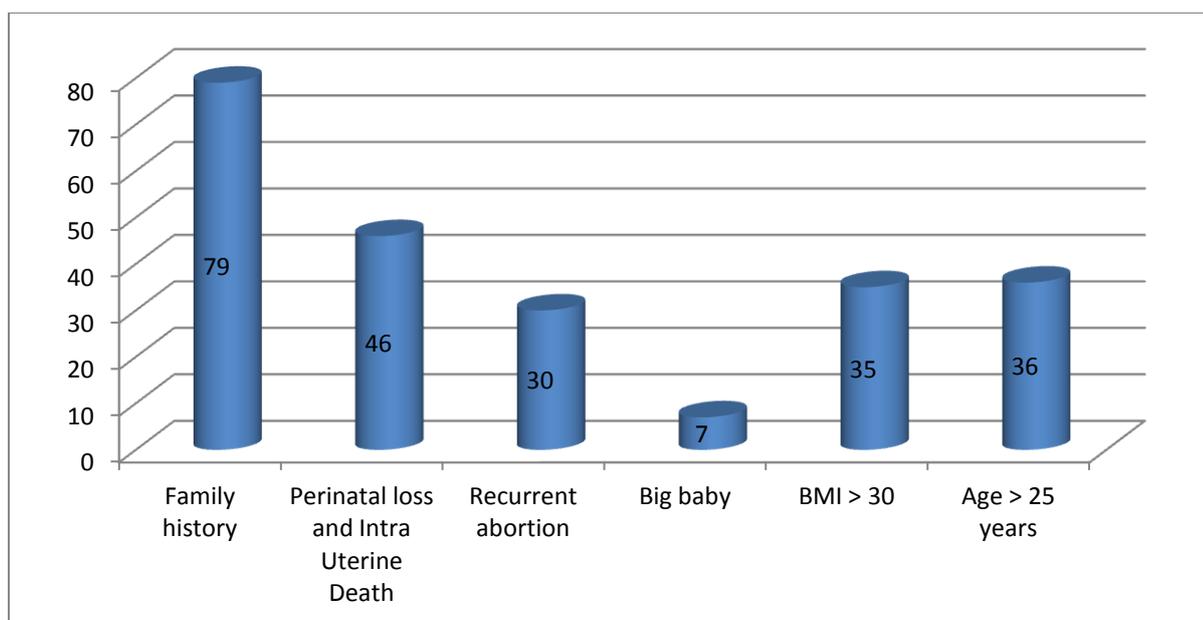


Figure 2: Distribution of risk factor for Gestational Diabetes among the mothers

DISCUSSION

The present study was conducted among the mothers, attending the antenatal clinic of Singur Rural Hospital, Singur. This study showed that 39.68% mothers had at least one risk factor, of which 11.69% had Gestational Diabetes, which was similar to the findings of Agarwal M but lower than Seshiah V. et al who found a prevalence of 12.9% and 18.9% respectively [11, 18]. Agarwal M reported that after applying the new IADPSG (International Association of Diabetes and Pregnancy study group) criteria to the same population studied by them the proportion of GDM increased to 37.7%. Thus IADPSG criteria increased GDM prevalence almost threefold compared with the ADA criteria. Though the IADPSG is superior in screening of larger proportion of true positives, but there is a possibility of burdening of the health expenditure due to the additional antenatal visits, further laboratory work up, and medications [18].

Other authors have reported that prevalence of gestational diabetes varied from 2.17% to 20.3% by screening of both general and high risk antenatal mothers for GDM [19, 20, 21].

There is debate regarding the preferred screening protocol for GDM. Some experts recommend universal screening, whereas others exempt women who are at low risk. ADA policy states that screening may be omitted in low-risk women [16]. Such a method may be more suitable in the context of low resource setting as in rural India. Aim of the present study was not to validate the targeted screening by comparison with the low risk group, rather our study focused on an alternative method of detection of GDM in pregnant women with at least one risk factor as in ADA criteria.

Many studies have been performed to identify risk indicators for GDM. In our study, mean age of mothers was 21.25 years, which was similar to the finding by V. Seshiah et al, which was 23±4 years [8]. Those mothers with abnormal Glucose Challenge Test result were among the 20 – 24 years age group. But our study showed that 47.99% mothers in the risk positive group were

among the 20 – 25 years age group. Presence of risk factors increased with age from 15.7% in the age group 15 – 19 years to 32.1% in the age group of >30 years, as showed by the current study.

Savvidou M et al highlighted the use of simple maternal demographic and clinical characteristics to predict gestational diabetes and reported that women, who developed gestational diabetes, were older, had greater body mass index, prior history of gestational diabetes and family history of type II diabetes^[22].

Risk negative mothers were found to be more literate than their counterpart (89.12% versus 81.86%). But Kieffer et al reported that on average diabetic mothers were older and with greater educational attainment than the nondiabetic mothers. This could be because the study was conducted in a developed country where most women are educated and higher educational status is related to increased age^[20].

In the present study, it was found that multipara mothers had increased risk of developing Gestational diabetes (59.68% were risk positive compared to 29.18% of risk negative group) Similarly Kieffer et al showed that on average diabetic mothers were multiparous than the nondiabetic mothers^[20]. However Savvidou M et al contradicted and stated that there were no relevant differences in parity of the mothers^[22].

The present study found that positive family history (31.85%), history of unexplained perinatal loss, intrauterine fetal death and stillborn (18.54%), history of recurrent abortion (12.09%) and higher BMI (14.11%) were the commonly observed risk factors among the study population. History of delivering big baby of >4 kgs contributed very little as risk factor (only 2.82%).

Savvidou M et al in their study identified higher age group, greater BMI, prior history of GDM and family history of type 2 diabetes as risk factors of

GDM, but there were no relationship with parity, smoking history, or method of conception^[22].

Leeuwen M V also reported similar finding as above, in addition they observed that increase in BMI between 22 and 30 kg/m², previous miscarriage and history of perinatal death as important contributor to the risk of gestational diabetes^[23]. Overweight and obese women are at increased risk for having decreased insulin sensitivity as compared with lean or average weight women. Because of the metabolic alterations during normal pregnancy, particularly the 60% decrease in insulin sensitivity, overweight and obese women are at increased risk of gestational diabetes, preeclampsia, and fetal overgrowth^[24].

Interestingly Das et al observed that, of all high risk factors, previous history of congenital anomaly, bad obstetric history (mainly recurrent abortions and previous still birth), maternal age \geq 30 years, BMI \geq 27 kg / m² and family history of diabetes were only statistically significant for gestational diabetes^[21].

CONCLUSION

The aim of the present study was not to define the best model but rather to assess the application of a simple and cost-effective method for detection of gestational diabetes in the community setting and to advance our findings toward possible clinical utility.

The present study found that risk for GDM can be usefully estimated in the first trimester of pregnancy from a mix of simple maternal demographic and clinical characteristics which can be further improved by simple biochemical markers. Thus yield for detection of gestational diabetes can be substantially increased in a low resource setting if preliminary screening for risk factors is undertaken in all antenatal mothers followed by confirmatory testing in those found to be risk factor positive.

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