Universal screening of gestational diabetes mellitus in antenatal women with 50 grams glucose challenge test

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ABSTRACT

Introduction: Indians belong to high-risk group, universal screening policy is applicable to Indian population. There is a two way approach for screening - one step and two-step. The two-step approach is cumbersome and inconvenient for the patients. **Aims:** To study the prevalence of gestational diabetes mellitus using 50gm 1 hour oral glucose challenge test (OGCT). To assess the need for universal screening and to compare the occurrence of GDM in normal antenatal cases with those patients who have risk factors for GDM. **Material and Methods:** This was a prospective study done over a period of one and half years. The study included 600 pregnant women of 24-32weeks gestation who underwent the 1 hour OGCT with 50 gm glucose followed by 75gms OGTT in positive individuals. **Results**: The mean age of study population was 22.99 years. Parity wise, 52.33 % were primigravida. The mean age of GDM patients was 26.1 Years. 19.6 of study population had risk factors for GDM. Past history of fetal loss beyond 20 weeks of gestation, age above 25yrs, family history of type 2 DM were the three most common risk factors being present in 17%, 1.66% and 1.66% cases. Positivity was more common in patients with risk factors for GDM compared to those without risk factors. Overall prevalence of GDM by the two step approach was 7% in our study population. Among 42 GDM patients 31 patients had one or more risk factors. Family history of diabetes (14.28%) and previous history of fetal loss (14.28%) were the two most prevalent risk factors. Only 35.7 % of GDM patients were >25yrs. **Conclusions:** For universal screening, we suggest 50gms OGCT which has 100% sensitivity, and 98.75 % specificity as observed in our study. This procedure is easily acceptable, economical, and feasible in the Indian context.

Key words: Oral glucose challenge test, Gestational diabetes, Antenatal.

Introduction

Gestational diabetes mellitus (GDM) is defined as any degree of glucose intolerance recognized for the first time during pregnancy.[1]GDM complicates approximately 4% of pregnancies. Women with GDM have approximately 50% risk of developing type 2 Diabetes over the next 10 years. [2]Pregnancy offers a unique opportunity to diagnose or possibly prevent diabetes among women at risk to develop type 2 diabetes in later life. The prevalence of GDM ranges from 1-14% of pregnancies depending on the ethnic or racial composition of the population studied and on the diagnostic criteria used.[3] GDM represents nearly 90% of all pregnancies complicated by diabetes. [2]The prevalence of GDM is increasing globally but there is lack of uniformity in screening policy to be used i.e., universal or selective, as well as the diagnostic criteria to be used. [1] The fourth international workshop-conference on GDM recommends universal screening for women in ethnic groups with high rates of carbohydrate intolerance during pregnancy and diabetes later in life and selective policy for women at low risk.[4]Since, Indians belong to high-risk group (11 fold increased risk when compared to white Caucasian women),

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universal policy is applicable to Indian population.[5] There is a two way approach for screening-one step and two-step. The two-step approach is cumbersome as it involves an initial glucose challenge test (OGCT) followed by a diagnostic oral glucose tolerance test (OGTT). The one-step approach is easier as it serves dual purpose of screening and diagnosing with a single test. In either of the approaches, the final diagnosis should be based on OGTT.[4]At present, GDM is regarded as a proven disease entity. There is controversy regarding the screening and diagnostic methods to be used, about ideal cut off blood glucose levels, and the treatment aspects.[6]Indian population falls under moderate to high risk group for GDM. In recent years there has been an increasing trend towards diabetes in India. Contributing factors could be sedentary life style, urbanization, and intake of a more westernised diet. With adoption of western life style, incidence of type 2 DM is on the rise in Indian population and also in the number of women with GDM is increasing.[7]Among south Asian countries, Indian women have the highest frequency of GDM.[8]Hence, this study was undertaken to look at the prevalence and risk factors of GDM in the local population. Universal screening during pregnancy has become important in our country. For this, we need a simple procedure that is easily acceptable, economical and feasible. Hence, in this study the easier one-step procedure to screen and diagnose GDM was used to see if it can be as effective as the cumbersome two-step method in detecting GDM.

Aims and Objectives

To study the prevalence of gestational diabetes mellitus using 50gm 1 hour OGCT. To assess the need for universal screening and to evaluate and compare the occurrence of GDM in normal antenatal cases with those patients who haverisk factors for GDM.

Material and Methods

This was a prospective clinical study carried out over a period of one and half years. The study included 600 randomly selected pregnant women of 24-32weeks gestation. The study group comprised of both out-door and indoor patients from department of Obstetrics and Gynecology, C.K.M. Government Maternity Hospital, Warangal.All pregnant women with singleton or multiple pregnancies between 24-32 weeks of gestation irrespective of presence or absence of risk factors for GDM were included. Individuals who had history of pre-gestational diabetes (Overt diabetes), history of intake of drugs that affect glucose metabolism like corticosteroids and patients who refused to undergo screening and diagnostic test for GDM were excluded from the study.

Procedure of the study

All pregnant women fulfilling the inclusion criteria underwent detailed clinical evaluation including detailed history taking and clinical examination. All the subjects were screened for GDM by 50gm, 1 hour oral glucose challenge test (OGCT). If 1 hour post-prandial glucose, PPG> 140 mg/dl, patient was tested by two step method i.e. with 75gms OGTT and individuals with venous blood levels more than 180 mg% were labelled as having GDM.

Method of performing 50 gm OGCT

Fasting was not a prerequisite.50gm of glucose was dissolved in 200ml of water and the patient was asked to drink it within 5 min. The time was noted. Venous blood was drawn after 1 hour. If the value was>140mg/dl, the patient underwent OGTT with 75gms glucose. The occurrence of GDM in the study population was evaluated.

Results

Among the 600 patients none had adverse effects of nausea and/or vomiting. All patients accepted the test readily.The prevalence of GDM in the study population was evaluated. Clinical profiles of the study group were categorized into two groups as with and without risk factors for GDM.According to parity, 314 (52.33%) were primigravida and hence these individuals could not be evaluated for risk factors in previous pregnancy and 286 (47.66%) were multigravida.

Table 1: Age distribution of study population

Age in years	No (%)
< 20	38 (6.33%)
> 20 < 25	466 (77.66%)
> 25 < 30	83(13.83%)

> 30 < 35	17 (2.83%)
> 35	2(0.33%)
Total	600

As per demographic characteristics, the mean age of patients was 22.99 years.

Table 2: Prevalence of various risk factors

Risk Factor	No (%)
Age > 25 years	102 (17%)
Family history of DM	10(1.6%)
Obesity(BMI> 27.5Kg/m2)	11(1.83%)
Past history of macrosomia	-
Past history of GDM	1 (0.16%)
Past history of fetal loss	10(1.6%)
Past history of congenital anomalies	3 (0.5%)
Past history of premature baby	5 (0.8%)
Unexplained neonatal loss	-
Any of the above	118(19.6%)
No risk factors	482 (80.3 %)

The study population showed one or more than one risk factor for GDM in 118 (19.6%) cases.

Table 3 Risk Factors in GDM cases which were OGTT Positive

Risk Factor	No of cases	Percentage
Age > 25 years	15	35.7%
Family history of DM	6	14.28%
Obesity(BMI> 27.5Kg/m^2)	5	11.9%
Past history of macrosomia	-	-
Past history of GDM	1	2.3%
Past history of fetal loss	6	14.2%
Past history of congenital anomalies	2	4.7%
Past history of premature baby	4	9.5%
Unexplained neonatal loss	-	-
No risk factor	11	26.19%

Among 42 GDM patients 31 (73.8 %) had one or more risk factors for GDM and 11 (26.19 %) of these had no risk factor. Family history of diabetes mellitus, obesity and previous history of fetal loss were the most common risk factors. The mean age of GDM patients was 26.1 years. Age distribution of the 42 GDM patients showed 27 (64.2 %) individuals less than 25 years. Only 15 (35.7%) were > 25years i.e, in the risk age group. Complications such as pregnancy induced hypertension and polyhydramnios were seen in 10 (23.80 %) and 4 (9.52 %) cases respectively. Dietary management alone was done for 15 (35.71 %) cases, whereas, 27 (64.28 %) cases were put on insulin treatment along with dietary modification. All these patients were under the care of endocrinologist. Insulin doses were fixed and titrated according to the endocrinologist's advice.

Results of 50 gm OGCT:

Among 600 study population, 49 patients (8.13 %) were diagnosed as positive i.e., GDM, according to WHO criteria of 1 hour 50 g OGCT value being > 140mg/dl. All 49 patients underwent OGTT with 75 gm glucose as per the two step method for diagnosing GDM. Individuals having blood glucose > 180 mg% were taken as definitely positive for GDM. By two – step method, 42 (7 %) patients were detected to have

GDM. There were 7 cases (14.28%) which had positive OGCT but negative OGTT.

Discussion

The discussion is based on observations and results of our study as compared to those obtained from the literature. A 1989 review of published controlled trials of gestational diabetes by Hunter et al [9] reported that the glucose tolerance test is poorly reproducible, that the perinatal complications associated with gestational diabetes have been given undue importance. The report also states that there is no population benefit as such which can be attributed to the screening, diagnosis, and treatment of GDM. The report had called for cessation of all forms of glucose tolerance testing. Contrary to this report, a 1996 survey by the American College of Obstetricians and Gynaecologists (ACOG) reported a favourable outcome by performing a 50 gm 1-hour screening test for GDM on their patients. [3]Long back in 1960 itself, O'Sullivan et al noted that women with undetected gestational diabetes were more likely to have stillbirths. [10]Pettitt et al. demonstrated a direct relationship between the plasma glucose level at 2 hours after a 75-gm glucose load and the perinatal mortality rate in a cohort of Pima Indian women ,though the results were not used in management.[11] Although both these studies are not perfect, and may have been affected bya number of factors, they still suggest that one should go ahead with the testing for GDM so as to reduce the perinatal mortality and complications. Clinical recognition of GDM is important because the therapy, dietary modifications, necessity of insulin and antepartum fetal surveillance can reduce the well described GDM associated perinatal morbidity and mortality. The frequency of GDM is highly variable and generally reflects the underlying pattern of type 2 diabetes in a particular population. Prevalence of GDM reported in different studies is 4 % [12]to as high as 13.9 %in a study by Rajput et al. [13] which compares well with the present study of 7 %.Coming to the presence of risk factors, prevalence of GDM in a study population will depend on various risk factors and degree of correlation of risk factors with GDM. We included the risk factors as recommended by the fourth international workshop conference on GDM with some modifications. As it was not possible to know the weight before pregnancy, we used the criteria of BMI >27.5kg/m2 during pregnancy. As for the demographic characteristics, a number of investigators[14] have found that maternal age is highly correlated with the risk of GDM. It is expected that prevalence of GDM in a population will depend on the age distribution of the population studied. In our study, out of 600 subjects, 102 (17 %) cases were above 25years. In the study by Bhattacharya et al,[15] the number of patients in the risk age group was 33.75 % and prevalence of GDM was 3 %. Jindal et al [16] have taken > 30 years as a criterion for risk factor and found a high prevalence of 9 % of GDM. In western studies majority of population falls in the risk age group. In a study by Dixon et al,[17]82.2 % subjects were more than 25 years age. In western studies a higher prevalence of GDM is expected. However, most of the studies have shown a prevalence rate of 3-5%. This may be because of ethnic variation. Out of 600 of our study population 19.6 % had one or more risk factors for GDM. This is very low as compared to the western studies because pregnancy is usually delayed in western countries and most of the pregnant women fall in the risk age group. Dixon et al[17] reported a very high percent 90.1 % of his subjects as having one or more risk factors. Bhattacharya et al[15] found 25 % and Jindal et al [16]reported 43.66 % of his subjects to have one or more risk factors. Migrant Indian communities in other parts of the world show very high prevalence of GDM. This can again be due to the fact that migrant Indians have pregnancy at a later age. Past history of fetal loss was present in 0.5 % and 14.66 % of the study groups as reported by Dixon et al [17]and Jindal et al[16] respectively. In the present study it was 1.66 %. It is the most common risk factor in Indian studies, including ours. However, this is unlikely to be a reflection of high prevalence of GDM in our population because there are multiple other causes responsible for fetal loss that are more common in our population. Another difference in comparison to western studies was low prevalence of obesity in our study population, which was 1.83 %, whereas, Dixon et al [17] found 47 % of their study group to be obese. Jindal et al [16] had 33.3 % subjects who were obese. This is likely due to the regional difference in different populations.

Table 4: Prevalence of risk factors in GDM patients in various studies

Risk factors	Dixon et al(%)	Bhattacharya et al (%)	Jindal et al(%)	Present study (%)
Age >25 years	90.4	66.66	44.11	17.00
Family h/o DM	22.7	33.33	22.22	1.60

Obesity	47	NA	33.3	1.83%
Past h/o macrosomia	29.2	0	29.6	0
Past h/o GDM	19.4	NE	22.2	0.16%
Past h/o fetal loss	2.7	8.33	44.4	1.66%
Past h/o prematurity	NE	NA	NE	0.83%
Total	97	66.66	88.9	19.66

We found that family history of diabetes, past history of fetal loss and congenital abnormalities were statistically more common in GDM population as compared to normal population. Similar findings have been reported by other authors. All studies have shown significantly higher proportion of GDM patients in the high risk age group. These findings were not reproduced in our study; however, the mean age of GDM population was significantly higher as compared to normal population in our study also.The GDM patients had more complications of pregnancy induced hypertension (PIH) and polyhydramnios.In our study, we encountered 10 (23.8 %) cases and 4 (9.52 %) cases respectively. Such complications can lead to significant perinatal mortality and morbidity.

Table 5: Screening test results for OGTT

	GDM Diseased	Non GDM
Positive Test	42 (a)	7(b)
Negative Test	0(c)	551 (d)

Sensitivity = (a/a+c) x 100=100%
Specificity= (a/b+d) x 100= 98.75 %

When compared to Ramachandran et al's[18]study, prevalence of GDM in the present study is high. The high prevalence was partly due to different diagnostic criteria i.e., WHO criteria [19] and may partly be due to original increasing trend in the prevalence of GDM.
There is a wide variation in the prevalence of GDM in different populations. A large multi-ethnic study in London by Dornhost et al [20] showed a high incidence of GDM in non-white women, with a relative risk of 3.1 % for blacks, 7.6 % for south Caucasians, and 11.3 % for Indian population.
The lower prevalence of GDM in our study population was partly due to lower mean age of pregnant women; compared to age of Asian women studied in the U.K. The other possible reasons are lower proportion (23.36%) of study population with risk factors. Evidence, that treatment, significantly reduces the perinatal morbidity and mortality support for a universal screening program. Screening for GDM and appropriate treatment reduce the maternal and fetal morbidity. Introduction of post- partum life style modification and patient education reduce the incidence of Type 2 DM in later life.
Universal screening during pregnancy has become very important. The two step procedure of screening with 50 gm OGCT and then diagnosing GDM based on the cut off values with 75 gm OGTT is not practical as the pregnant women have to visit the clinic at least twice and the number of blood samples drawn varies from 3 to 5 which cause lot of inconvenience to the patients. For universal screening, we suggest 50gmsOGCT as it is 100% sensitive, and 98.75 % specific as per the observation of our study. As this is a one-step procedure, it is easily acceptable, economical, feasible and applicable to the Indian context.

Conclusion

In the Indian context, screening is essential in all pregnant women. Indian women have an eleven fold increased risk of developing glucose intolerance during pregnancy compared to Caucasian women. GDM can be present in patients who do not have any risk factors. Hence, universal screening during pregnancy has become important. The two step procedure of screening with 50gmsOGCT and then diagnosing GDM based on the cut off values with 75 gms OGTT is not practical as the pregnant women have to visit the clinic at least twice and the number of blood samples drawn vary from 3 - 5 which women resent. For universal screening, we suggest 50gms OGCT which has 100% sensitivity, and 98.75 % specificity as

observed in our study. This procedure is easily acceptable, economical, and feasible in the Indian context.

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