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Original Research Article

2-hour 75 gm OGTT for screening and Rescreening at 32-34 weeks for diagnosing gestational diabetes-evaluation of maternal and neonatal outcomes

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ABSTRACT

Background: Gestational diabetes mellitus, most of which progress to type-2 diabetes mellitus is increasing worldwide. Identification of gestational diabetes and control of glucose can reduce such complications and improve maternal and neonatal health.
Methods: A hospital based cross sectional study was conducted to find out maternal and fetal outcome of gestational diabetes from January 2014 to September 2015. Data were collected from 500 antenatal women screened out of which 25 had gestational diabetes and 35 women had intermediate hypergylcaemia attending Sriram Chandra Medical College and Hospital Cuttack for delivery.
Results: In our study out of 500 patients, 25 mothers were diagnosed as GDM; its prevalence is 5% in our hospital. In GDM group 10 patients out of 25 had history of risk factors, which constitutes 40 % of the patients. The age group at risk of getting gestational diabetes in this study was between 20-35 years in 98.5%of cases. All the mothers with gestational diabetes were of low parity. In this study, nearly 56% of mothers with gestational diabetes had a body mass index of greater than 25. Significant numbers of cases were detected by rescreening at 32 to 36 weeks who are screen negative during the initial screening procedure (i.e. 10% in GDM group). Caesarean section rate was more in GDM group, mostly due to obstructed labour, fetal distress, hypertension, big baby. Complications like trauma to the baby, congenital anomaly, still birth of the baby were infrequent in this study.
Conclusions: Pregnancy thought to be the most vulnerable stage of women's life and protecting her health along with her fetus during this period yields a positive impact on the health of future generation. Particular attention should be given during antenatal period to initiate screening programme and treatment protocol for gestational diabetic mothers.

Keywords: Caesarean section, Gestational diabetes, Maternal and neonatal health, Screening

INTRODUCTION

Gestational diabetes mellitus is a common but controversial disorder. It is defined as "carbohydrate intolerance of varying degrees of severity with onset or first recognition during pregnancy irrespective of the treatment with diet or insulin".[1] Women with GDM differ from the background population in many other respects, such as obesity, age, and chronic hypertension.

Increased risk of fetal compromise comes from maternal hyperglycemia, which leads to fetal hyperglycemia and fetal hyperinsulinaemia. This gives rise to a variety of problems to the infant of diabetic mother like sudden

intra uterine death, respiratory distress syndrome, hypoglycaemia, cardiac anomalies, neonatal jaundice, impaired calcium and magnesium homeostasis, polycythemia and many more. Mother may develop pre-eclampsia, diabetic ketoacidosis. In the long term, she remains a potential candidate to develop type-II diabetes mellitus.[2] Detection and treatment of Gestational Diabetes Mellitus (GDM) not only reduces and eliminates the risks for the fetus, it also provides an opportunity to warn the mother to adopt preventive measures like controlled diet , exercise and achieve ideal body weight, to halt or delay the process of onset of overt diabetes.[3] The screening strategies were first developed to identify women at risk of developing diabetes later in life.[4] The degree of glucose intolerance varies considerably, from slightly impaired glucose tolerance (IGT) to overt diabetes requiring insulin treatment.

METHODS

The Indian women have 11-fold increased risk of developing glucose intolerance during pregnancy compared to Caucasian women.[5] The recent data on the prevalence of GDM in our country was 16.55% by WHO criteria.[6] There is a little knowledge about this particular disorder: therefore, many women go through their pregnancy without proper diagnosis and treatment. Without a proper treatment, medical and physical complications can occur. Thus, it is important to detect and treat the current disorder to help ensure a healthy, normal pregnancy and delivery. So, in the Indian context, screening is essential in all pregnant women for a proper management at a proper time.

To find out the incidence of carbohydrate intolerance in pregnancy in the form of GDM by using a simple 75gm OGTT between 24 -28 weeks and mothers who have some high-risk factor in their history were called for rescreening between 32-36 weeks of gestation. To see the effect of hyperglycaemia in pregnancy outcome to make a conclusion regarding the significance of screening. The objective of the study was to find out the incidence of carbohydrate intolerance in pregnancy in the form of GDM by using 75 gm oral glucose tolerance test as a single step procedure for both screening and diagnosis of gestational diabetes mellitus in pregnant women. To know the effect of hyperglycaemia on maternal and fetal outcome. This was a prospective cohort study. The study was conducted in OPD, IPD and Labour Room of Department of Obstetrics and Gynaecology, SCB Medical College, Cuttack. Women who had come to attend antenatal visits in Department of Obstetrics and Gynaecology, SCB Medical College, Cuttack were included. This study was carried out from January 2014 to September 2015.

Inclusion criteria

All women with singleton pregnancy were included in the study from a broad obstetric population regardless of presence or absence of classical gestational diabetes risk factors like maternal advanced age, parity, obesity, recurrent pregnancy loss, congenital malformations in previous pregnancy, intrauterine death, polyhydramnios, prolonged labour, obstructed labour, operative deliveries associated with macrosomic babies, still births and neonatal deaths and family history of diabetes.

Exclusion criteria

Multiple pregnancy, known case of diabetes mellitus, patient on drugs like corticosteroids, anticancer, ART.

Sampling procedure and data collection

All pregnant mothers who attended antenatal care (ANC) clinic and met the inclusion criteria were booked and FPG performed. Eligible mothers were interviewed using partially coded questionnaires with both open and close-ended questions regarding their family history, previous health status and obstetric outcome. Then 75gm OGTT was performed between 24-28 weeks of gestation irrespective of the last meal. Separate file was made for each mother for easy identification during the next visit. The WHO criteria for diagnosis of diabetes using a two-hour 75g oral glucose load and 2-hour postprandial plasma glucose value greater than or equal to 140 mg/dl was used as the cut-off value to diagnose GDM (WHO Consultation report 1999). In the morning of the visit, mothers booked for the test were identified from the data recorded on their files. Their weight, height and Blood pressure were recorded. Presence of anemia and pedal edema was noted. Sincere effort was made to get the maximum data from the mother as per our study proforma. Blood samples were taken from venous pricks of lower arm after cleaning the site using 95% alcohol antiseptic. The blood was analysed in auto analyser in our Regional Diagnostic Centre using glucose oxidase method and the results were recorded as fasting blood sugar. Each mother was then given 75g glucose (Glucone-D) dissolved in a glass of 200ml water to drink and two hours later more venous blood was obtained and analysed in the same way giving the results of a 2-hour postprandial blood glucose. The results were recorded in the study proforma.

Screen positive cases were mothers with 2-hour postprandial blood glucose levels >120 mg/dl. Among the screen positive mothers those having blood glucose levels >140 mg/dl were marked as having GDM, those having blood glucose levels <140 mg/dl were marked as having Intermediate hyperglycemia (IH).

The results of the blood test were made known to the mothers and their implications explained to them. Both the fasting and 2-hour post 75g oral glucose was interpreted using WHO criteria. The mothers having GDM were offered treatment and the mothers having Intermediate hyperglycemia were left as such. GDM patients with 2-hour hyperglycemia less than 200 mg/dl

(11.1 mmol/l) were given dietary advice in the form of medical nutritional therapy (MNT) initially for two weeks. The cases where MNT fails to achieve control i.e. (to maintain FPG =90mg/dl and/or 1 hr PPG =120mg/dl) then insulin was initiated. Those with 2-hour hyperglycemia greater than 200mg/dl were started on insulin after confirmation of the results with the help of diabetic physicians. The mothers who have some high-risk factor in their history were called for screening between 32-36 weeks of gestation. The same protocol was followed as in the initial screening procedure. All the screen positive mothers were followed up and encouraged to deliver in our hospital.

RESULTS

During the study 500 pregnant women were screened at 24-28 weeks of gestation after satisfying the inclusion criteria. Out of 500 patients screened with 2-hour 75 gm OGTT, 50 (10%) exhibited plasma glucose level of >120 mg/dl were declared as screen positive. Out of 50 patients 23 (4.6%) had abnormal values ≥140 mg/dl on OGTT and were diagnosed to have GDM, while rest 27 (5.4%) patients had values <140 mg/dl on OGTT were diagnosed to have IH.

All the patients who were screen negative and had high risk features of potential diabetes were advised to present again between 32-36 weeks for rescreening. Total number of patients who presented for re-screening were 250, out of whom 10 (4%) patients were again screen positive after 2 hours 75 gm OGTT. Out of 20 further 2 (.8%) cases of GDM and 8 (3.2%) cases of IH were detected. The overall incidence of GDM was 25 per 500 cases (5%) and that of IH was 35 per 500 cases (7%). The result is summarized in Table 1 and Table 2.

Table 1: Result of screening, re-screening by OGTT.

Result	Total Cases	Screen Positive		Screen Negative		GDM		IH	
		No.	%	No.	%	No.	%	No.	%
Cases picked up after initial screening by OGTT	500	50	10	450	90	23	4.6	27	5.4
Cases picked up after re-screening by OGTT	250	10	4	240	96	2	.8	8	3.2

Table 2: Overall incidence of GDM and intermediate hyperglycaemia.

Type of Abnormality	Cases picked up after initial screening			Cases picked up after re-screening			Incidence		
	Total	No.	%	Total	No.	%	Total	No.	%
GDM	500	23	4.6	250	2	0.8	500	25	5.0
IH	500	27	5.4	250	8	3.2	500	35	7.0

Table 3: Patients characteristics (age).

Age in years	Total cases	GDM	%	IH	%
≤19	5	--	--	--	--
20-30	382	22	5.76	25	6.54
31-35	110	3	2.72	9	8.1
>35	3	--	--	1	33.33
Total	500	25	5	35	7.00

A total of 382 (76.4%) cases were screened at the age of 20-30 years and 110 (22%) cases were between 31 to 35 years of age, 3 cases (0.6%) were more than 35 years of age. Only 5 cases (1%) were19 or less. Out of them 25 cases (5%) of GDM and 34 cases of IH (6.8%) were diagnosed at the younger age group between 20-35 years. No cases of GDM was seen below 20 years or above 35 years age group. Only 1 cases of IH (33.3%) out of 3 cases were detected above the age of 35 years. The mean maternal age of the patients with GDM was 30.42 years.

With regard to parity, 15 cases (5.3%) of GDM and 20 cases (7.1%) of IH were detected in primigravida, 10 cases (5.55%) of GDM and 13 cases (7.22%) of IH were detected in multi gravida and no case of GDM and 2 cases (5%) of IH were detected in grand multigravida.

Table 4: Patients characteristics (obstetric status).

Parity	Total cases	GDM	%	IH	%
Primigravida	280	15	5.3	20	6.95
Multi gravida	180	10	5.55	13	7.14
Grand multi gravida	40	--	--	2	6.66
Total	500	25	5	35	7.00

In this study 56% were primigavida, 8% were grand multigravida and about 36% patients were multi gravida. GDM was detected in 23 (4.6%) and IH in 27 (5.4%) out of 500 patients screened for the first time before 28

weeks of gestation, whereas after 28 weeks, 2 (0.8%) cases of GDM and 8 (3.2%) cases of IH were detected. Mean gestation of the patients with GDM and IH was 25.46 weeks and 27 weeks respectively. In our series 263 patients had a normal weight (BMI 18.5-24.9), 195 were overweight (BMI 25-29.9) and 37 patients were moderately obese (BMI 30-39.9), 5 patients were severely obese (BMI >40).

Table 5: Patients characteristics (screening in terms of gestational age).

Gestational Age	Total cases	GDM	%	IH	%
24 - 28 weeks	500	23	4.6	27	5.4
32 - 36 Weeks	250	2	.8	8	3.2
Total	500	25	5	35	7.00

These values were corrected for pregnancy and period of gestation. Out of 5 severely obese patients, no patients had GDM and 1 (20%) patients had IH. Amongst 37 over weight patients, 2 (5.4%) patients had GDM and 6 (16.21%) had IH. In our series, overall rate of obesity was 47-48%. Regarding education GDM and IH was more common in uneducated (6%, 14%) and those having higher education (18.66%, 10.66%), than women having low education. On occupational review housewife (4.7%, 7.05%) and professionals (20%, 13.33%) were more affected than self-employed group (4.44%, 4.44%). The patient's characteristics like age, parity, gestational age, BMI with degree of obesity, education and occupation of 500 patients are shown in Table 3, Table 4, Table 5, Table 6, Table 7 and Table 8.

Table 6: Patients characteristics (relationship of BMI with GDM and IH).

Obesity	Total cases	GDM	%	IH	%
BMI 18.5-24.9	263	11	4.18	10	3.80
BMI 25-29.9	195	12	6.15	18	9.23
BMI 30 –39.9	37	2	5.4	6	16.21
BMI >40	5	--	--	1	20.00
Total	500	25	5.00	35	7.00

Table 7: Patients characteristics (education).

Education	Total cases	GDM	%	IH	%
Illiterate	50	3	6.00	7	14.00
Primary	375	8	2.13	20	5.33
Higher	75	14	18.66	8	10.66
Total	500	25	5.00	35	7.00

Table 9 shows various complications seen during the present pregnancy in patients diagnosed to have GDM or IH. Vaginal candidiasis was present in 9 (36%) out of 25 cases of GDM in comparison to 2 cases (5.71%) in IH group. Hypertension was noticed in 6 (24%) out of 25 cases of GDM in comparison to 4 cases (11.4%) in IH group. Polyhydramnios 3 (12%) and APH (0%) were seen only in GDM. Preterm labour 2 (8%) and 1 (2.85%), prolonged labour 2 (8%) and 1 (2.85%), PPH 3 (12%) and 2 (5.71%) were seen in GDM and IH respectively. There was no abortion or APH in any of the pregnant mothers.

Table 8: Patients characteristics (occupation).

Occupation	Total cases	GDM	%	IH	%
Housewife	425	20	4.7	30	7.05
Self Employed	45	2	4.44	2	4.44
Professional	15	3	20	2	13.33
Others	15	--	--	1	6.66
Total	500	25	5.00	35	7.00

Table 9: Pregnancy complications associated with gestational diabetes.

Complications	GDM		IH	
	No.	%	No.	%
Vaginal candidiasis	9	36.00	2	7.14
Hypertension	6	24.00	4	11.40
Polyhydramnios	3	12.00	0	0
Preterm labour	2	8.00	1	2.85
Abortion	--	--	--	--
PPH	3	12.00	2	5.71
APH	--	--	--	--
Prolonged labour	2	8.00	1	2.85

Table 10: Various modes of delivery in gestational diabetes.

Mode of Delivery	GDM		IH	
	No.	%	No.	%
Normal vaginal Delivery	5	20.00	22	62.85
Operative vaginal delivery	6	24.00	2	5.71
Caesarean section	14	56.00	11	31.42

Table 10 shows the different modes of delivery occurred in GDM and IH mothers. Normal vaginal deliveries seen in GDM group 5 (20%) were less than IH group 22 (62.85%). Operative vaginal deliveries including instrumental delivery like application of ventouse and forceps were seen in 6 (24%) in GDM mothers and 2 (5.71%) in IH mothers. Caesarean sections were seen in 14 (56%) cases in GDM group and 11 (31.42%) cases in IH group. This implies operative vaginal deliveries were seen more frequently in GDM group.

Table 11 shows the various indications for which Caesarean section were done in both the groups. In GDM mothers Caesarean section was done for big baby 1 (4%), foetal distress 3 (12%), Obstructed labour 3 (12%),

Eclampsia / pre-eclampsia 4 (16%), previous scar 1 (4%), breech 2(8%), APH (placenta previa) 0 (0%) and oligohydramnious 0 (0%). In IH mothers Caesarean section was done for big baby 0 (0%), foetal distress 2 (5.71%), Obstructed labour 1 (2.85%), and previous scar 1 (2.85%) and Eclampsia/pre-eclampsia 1 (2.85%).

Table 11: Indications of caesarean section in mothers with gestational diabetes.

Indications	GDM		IH	
	No.	%	No.	%
Big Baby	1	4.00	0	0
Fetal distress	3	12.00	2	5.71
Obstructed labour	3	12.00	1	2.85
Breech	2	8.00	0	0
Eclampsia/Pre-eclampsia	4	16.00	1	2.85
Placenta previa (APH)	0	0	0	0
Previous scar	1	4.00	1	2.85
Oligohydramnios	0	0	0	0

Table 12 shows the fetal outcome in babies born to GDM and IH mothers. Among the babies born to GDM mothers normal babies were 15 (60%). Macrosomia in 5 (20%), hypoglycaemia in 1 (4%), IUGR in 1(4%) and Asphyxia in 1 (4%), neonatal jaundice requiring phototherapy in 1 (4%) and shoulder dystocia 1 (4%) cases were seen. Congenital anomaly was not seen in any of the babies.

Table 12: Present pregnancy fetal outcome.

Complications	Proportions of mothers whose babies experienced the described outcome			
	GDM		IH	
	No.	%	No.	%
Normal babies	15	60.00	33	94.2
Macrosomia	5	20.00	1	2.85
Still Birth	0	0.00	0	0.00
Shoulder dystocia	1	4.00	0	0.00
Hypoglycaemia	1	4.00	0	0.00
Trauma/Injury	0	0.00	0	0.00
Congenital abnormality	0	0.00	0	0.00
IUGR	1	4.00	1	2.85
Asphyxia	1	4.00	0	0.00
Jaundice requiring phototherapy	1	4.00	0	0.00

Among the babies born to IH mothers normal babies were 33 (94.2%), Macrosomia in 1 (2.85%) and IUGR in 1 (2.85%) cases. Shoulder dystocia, neonatal hypoglycaemia, congenital anomaly and still birth were not seen in the control group.

DISCUSSION

Pregnancy is a diabetogenic state manifested by insulin resistance and hyperglycaemia. In our study out of 500 patients, 25 mothers were diagnosed as GDM; its prevalence is 5% in our hospital. Similarly, diabetes complicates 3-4 % of pregnancies in most World Series, but where intensive screening has become a part of routine antenatal care; more cases are being detected with a range of 1-14%.[7] However, it varies among different populations of different geographical origins and ethnic backgrounds. Some of this variability may be ascribed to differences in diagnostic standards or screening methods employed.

Some of the local factors contributing to this high incidence are poverty and ignorance. People are usually not aware of nutritional and caloric values of food and its implication on body weight and health. Carbohydrate based food is cheap and taken as staple diet, whereas fat is used to add to the taste of the food. Moreover, lack of awareness regarding weight control puts them in the habit of excessive eating. The situation is further accentuated during pregnancy, where the women are customarily advised to take the food for 'two'. This leads to obesity and unfortunately, this is taken as a sign of beauty and health in most of rural population. These facts put our population at higher risk for the development of diabetes and the importance of intensive screening for the detection of pre-clinical disease.

The existence of a pre-diabetic state was postulated in these patients about 20 years back but remained disputed on grounds that a disorder causing such a measurable degree of morbidity cannot escape detection on routine blood sugar testing. Such high-risk factors were present in obstetric histories of most of our patients diagnosed to have GDM.

In GDM group 10 patients out of 25 had history of risk factors, which constitutes 40% of the patients. It is consistent with international studies, which report that only 45% of women found to have carbohydrate intolerance have defined features of potential diabetes. It signifies that accepted practice in antenatal clinics, of only performing a GTT on a mother if she has one of the features of potential diabetes is both time consuming and incomplete and 55-58% of the eases may be missed by that strategy.

So, universal screening will be more practical to overcome the burden. The age group at risk of getting gestational diabetes in this study was between 20-35 years in 98.5%of cases. This was similar to other studies where age was equal or more than 25 years and was considered as a high risk for screening.

In present study women over the age of 35 years were significantly less. It is because fewer women opt for pregnancy during the later years of life, although more of them develop overt diabetes mellitus. Age and obesity influence the likelihood of GDM. All the mothers with gestational diabetes were of low parity (that is, para 1-4). Similar studies have shown that increased parity was less

consistently associated with increased risk for developing gestational diabetes mellitus.

Most of our patients were basically from one community, so the community factor towards GDM was not properly studied, but the self-employed women were less likely to develop the condition than the other groups. This may be explained as they were health conscious and remained active even during the pregnancy period. In our study, it was seen that women in the uneducated group were more likely to develop GDM than their counter part. This can be explained as these groups are not health conscious and they don't know the right food pattern during pregnancy. In this study, nearly 56% of mothers with gestational diabetes had a body mass index of greater than 25. This finding confirms the earlier conclusions made by other studies that women who are obese were at high risk of getting gestational diabetes mellitus in pregnancy. Family history of diabetes and association with other disorders like hypertension was present in many cases as is reported in other studies.

In our study, significant numbers of cases were detected by rescreening at 32 to 36 weeks who are screen negative during the initial screening procedure (i.e. 10% in GDM group). It is because the glucose intolerance increases with advancing gestational age. The patients with healthier pancreas were detected after 32 weeks of gestation. These findings are consistent with international reports.[8] Likewise, mothers with gestational diabetes mellitus were two times more likely to have hypertension and four times more likely to have vaginal candidiasis than the controls. The high body mass index or obesity of women with gestational diabetes predisposed them to hypertension.

Most of these patients had chronic or essential hypertension with superimposed pre-eclampsia. It was difficult to establish how many of these women were hypertensive before pregnancy since most of the mothers did not know their pre-pregnancy blood pressure. Moreover, most of these women had attended antenatal clinic after twentieth week when it was difficult to differentiate chronic hypertension from pre-eclampsia. The increased incidence of vaginal candidiasis in women with gestational diabetes observed in this study would be explained by the increased spill of sugar in urine thus contaminating the genitalia leading to increased fungal infection. Secondly, diabetic state is generally associated with reduced immunity encouraging opportunistic infections to become prevalent. The mode of delivery was almost similar in both groups studied, but operative and instrumental vaginal deliveries like application of forceps and ventouse were more in GDM group than Control group. Caesarean section rate was more in GDM group, mostly due to obstructed labour, fetal distress, hypertension, big baby. Other studies had observed increased operative deliveries and Caesarean sections in gestational diabetics. Complications like trauma to the baby, congenital anomaly, still birth of the baby were infrequent in this study. Most studies during the past 15 years find no increase in the perinatal mortality rate in GDM. Congenital anomalies of babies were not observed in the cases in this study probably because of a small sample size. However, this was not surprising because even the fourth International Workshop Conference on gestational diabetes suggested that since the onset of hyperglycaemia occurs late in pregnancy when organogenesis is complete, it is not associated with increased incidence of congenital malformations.[9] Most of the GDM mothers 23 (92%) showed a good response to MNT, but a few 2 (8%) had required insulin during the period. This indicates the importance of MNT in GDM patients. Various national and international studies give the same view.

All mothers with gestational diabetes were followed up at 6weeks and 6 months postnatal with 2 hours 75 gm glucose but all were found to be normal. But there is a need to screen them yearly in order to arrive at a definite conclusion.

CONCLUSION

Gestational diabetes mellitus is prevalent in mothers attending antenatal care clinics in SCB Medical College, Cuttack and is associated with increased risk of maternal and perinatal complications. Hence there is a need to screen all the pregnant mothers who attend the antenatal care clinic. Asian women are ethnically more prone to develop glucose intolerance compared to other ethnic groups.

Our results suggest that a policy of universal screening for GDM should be adopted in all antenatal care clinics and 75gm OGTT has high predictive value. This single step procedure is simple, feasible and economical. It serves both the purpose of screening and diagnosis at the same time without regard to the last meal. So, looking towards the socio demographic characteristics of our patients, it should be followed in our region to achieve a better outcome. As in our study significant proportion of the cases was detected on repeat OGTT, it is emphasized that re-screening at a later gestation of 32 weeks or beyond must form an essential component of screening. It will not only improve the perinatal outcome but also enable us to identify women at risk of developing diabetes in future. The post-partum screening should also be at regular interval to detect the occurrence of future diabetes. These potential diabetic women can be warned of the future happenings and advised to adopt preventive measures to delay or stop that process. This will in turn decrease the load from health care resources responsible to take care of diabetic patients in the long run.

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