SCREENING OF PREGNANT WOMEN FOR GESTATIONAL DIABETES MELLITUS

Aisha Hassan

Department of Gynaecology, Ayub Teaching Hospital, Abbottabad

Background: Gestational diabetes mellitus is associated with significant fetal and neonatal morbidity and mortality. It is a definitive risk factor for the future development of type – II diabetes mellitus in the mother. Our objective was to evaluate the effectiveness of screening by 50gm oral glucose challenge test to detect the gestational diabetes mellitus and impaired glucose tolerance in pregnant women. **Methods**: This study was conducted in the Department of Gynaecology at Lady Reading Hospital, Peshawar. A total of 1000 women were screened in antenatal clinic by giving them 50 gm oral glucose solution and estimation of plasma glucose level 1 hour after glucose intake. Those with plasma glucose in excess of 130mg/dl (cut off value for screen positive) were subjected to 3 hours oral glucose tolerance test to confirm the diagnosis of gestational diabetes mellitus. **Result:** Out of 1000 cases tested, 43 were found to have Gestational Diabetes Mellitus and 17 cases had impaired glucose tolerance. The mean age of the patients ranged between 21 and 42 years. Most of the positive patients carried medical and obstetric historic risk factors for diabetes mellitus like obesity, advanced age and parity and bad obstetric history. They also had associated complications of gestational diabetes mellitus like pre eclampsia and polyhydramnios in current pregnancy. Also more than 80% of the patients had family history of risk factors like diabetics mellitus obesity, hypertension etc. **Conclusions**: 50gm Oral Glucose Challenge Test can be used in pregnant ladies from 24 weeks onward to detect the common disorders of Gestational Diabetes Mellitus and Impaired Glucose Tolerance.

Key Words: Gestational Diabetes Mellitus, Impaired Glucose Tolerance, Oral Glucose Challenge Test, Full Oral Glucose Tolerance test

INTRODUCTION

Gestational Diabetes Mellitus is the most common metabolic disorder affecting carbohydrates homeostasis.[1] It appears at ≥ 20 weeks gestation and disappears immediately or up to 6 weeks after delivery.[2] It is associated with high risk of fetal morbidity and mortality and also leaves the mother at potential risk of developing overt diabetes at an advanced age. Increased risk of fetal compromise comes from maternal hyperglycemia, which leads to fetal hyperglycemia and fetal hyperinsulinaemia. Fetal hyperinsulinaemia accelerates fetal growth, facilitated by rich pool of metabolic substrates in addition to glucose. In addition to tremendous fetal growth and organomegaly, hyperinsulinaemia also leads to biochemical abnormalities like anaerobic glucose metabolism, increased oxygen consumption, lactate production and fall in PH and oxygen tension. This gives rise to a variety of problems to the infant of diabetic mother like sudden intra uterine death, respiratory distress syndrome, hypoglycaemia, cardiomyopathies, neonatal jaundice, impaired calcium and magnesium homeostasis, polycythemia and many more[4].

Mother may develop pre eclampsia, hypoglycaemia due to stringent blood sugar control necessary in pregnancy or diabetic keto acidosis. In the long term she remains a potential candidate to develop type – II diabetes mellitus.

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 preventative measures like controlled diet, exercise and achieve ideal body weight, to halt or delay the process of onset of overt diabetes. [5]

Since GDM, is an asymptomatic disorder and needs some sort of screening tools for its detection, we endeavored to evaluate the applicability of 50gm of oral glucose challenge test (OGCT). This test has a sensitivity of 80% and a specificity of 90% and a positive predictive value of 85% which is superior to any other screening test[7]. Alternative screening protocols are based on blood include glycosylated haemoglobin (HBA_1c) estimation and timed random blood glucose estimation[8]. Glycosylated hemoglobin estimation is costly and has low sensitivity. Timed random blood glucose estimation is relatively cheap, and fairly specific but lacks sensitivity[9]. Our objective was to evaluate the effectiveness of screening by 50gm oral glucose challenge test to detect the gestational diabetes mellitus and impaired glucose tolerance in pregnant women.

MATERIAL AND METHODS

This study was carried out from March to December 1997. Patients 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, intrauterine death, polyhydramnios, prolonged difficult labour, operative deliveries associated with heavier neonates, still births and neonatal deaths, and family history of diabetes.

A total of 1000 pregnant women attending antenatal clinic in outdoors Department of Lady Reading Hospital, Peshawar, were tested between 24 -36 weeks gestation. All these women were counseled and booked before enrolling them into the study. They were explained about the risk of GDM and importance of its detection and treatment. After taking patient's consent, they were given 50gm oral glucose load, in the form of simple galaxose–D (Glaxo–Co.) dissolved in 250ml of tap water regardless of previous state of fasting.[6] Eight patients out of entire study group expressed unpleasantness and three could not swallow the solution because of nausea and vomiting and were excluded from the study.

Data was recorded in a proforma including patient's age, height, weight, gestational age, detailed menstrual, obstetric and medical history. Record of blood pressure, general physical and systemic examination and obstetric examination was also included. According to the standard height and weight and body mass index tables, women with weight < 80% of ideal body weight were regarded as under weight. Those with weight between 80 – 120% were normal and women with >120% were moderately obese and those with >150% were severely obese. A sample of blood drawn one hour after glucose ingestion was sent to the laboratory for blood glucose estimation by glucose oxidase hexokinase method. A blood glucose level of 130mg/dl was taken as cut off value for further evaluation of the patient by 100gm Oral Glucose Tolerance test (OGTT) and confirmation of the diagnoses of GDM or IGT. Before the OGTT patients were advised to have rich carbohydrate diet for at least three days and present at the morning of the test with an overnight 12 hours fast. Patients who had two or more abnormal glucose values equal to or exceeding the defined National diabetes data group criteria were labeled to have gestational diabetes and those with only one abnormal value impaired glucose tolerance.

Patients who were screen positive before 28 weeks but OGTT negative or screen negative but had historic high risk factors for GDM were re-screened at 28 weeks. The re-screened positive were subjected to repeat OGTT and those with positive results were reclassified to have GDM or IGT according to the report while rest were declared normal and followed in low risk antenatal clinic. Those diagnosed to have GDM or IGT were followed in high risk clinic for maternal blood glucose control in normal range of 80 – 120 mg/dl by diet alone, diet and exercise or insulin therapy and for strict fetal monitoring throughout the pregnancy. Mothers were watched for the development of complication like urinary and genital tract infection and pre-eclampsia. Fetal monitoring was done by fetal kick count record; serial ultrasound scans for fetal growth, biophysical profiles and amniotic fluid volume. Timing and mode of delivery of the patient was decided according to set protocols for diabetic mothers.

The detailed description of their follow up till the delivery and sixth week of puerperium is beyond the scope of study and is not included here.

RESULTS

Out of 1000 patients screened with 50gm OGCT, 266 (22.6%) exhibited plasma glucose level of ≥130mg/dl and were declared as screen positive. All the 266 patients were enrolled for a three hours 100gm OGTT. Out of 266 patients 37(16.3%) had two abnormal values on OGTT and were diagnosed to have GDM, while another 14(6.2%) patients had only one abnormal value on OGTT and were diagnosed to have IGT. All the patients who were screen positive before 28 weeks but OGTT negative and had high-risk historic features of potential diabetes were advised to present again at or after 28 weeks for re screening. Total number of patients who presented for re-screening were 70, out of whom 17(24.3%) patients were again screen positive after 50gm OGCT. They were again enrolled for 100gm OGTT and further 6 (35.3%)cases of GDM and 3 (17.65%) cases of IGT were detected. The overall incidence of GDM was 43 per 1000 cases (4.3%) and that of IGT was 17 per 1000 cases (1.7%). The result is summarized in Table-1 and Table -2.

Table-1: Result of screening, re-screening, OGTT & repeat OGTT

Results	Total Cases	Screen Positive		Screen Negative		GDM Two abnormal values on OGTT		IGT One abnormal value on OGTT	
		No.	%	No.	%	No.	%	No.	%
Cases picked up after initial screening & OGTT	1000	226	22.6	774	77.4	37	16.3	14	6.20
Cases picked up after re-screening & OGTT	70	17	24.3	53	75.7	06	35.3	03	17.65

Table-2: Over all incidence of GDM & IGT

Type of Abnormality	Cases picked up after initial screening & OGTT			Cases picked up after re-screening & OGTT			Incidence		
	No.	Total	%	No.	Total	%	No.	Total	%
GDM	37	1000	3.7	6	70	8.75	43	1000	4.3
IGT	14	1000	1.4	3	70	4.28	17	1000	1.7

Figure-1 shows risk factors identified in obstetric history of the patients diagnosed to have GDM or IGT. History of stillbirths was present in 7(41.3%) out of 17 cases of IGT and 12 (28%) out of 43 cases of GDM. Also more macrosomic babies, 4 (23.6%)out of 17 cases were detected in the past obstetric history of IGT group than 3 cases of macrosomia out of 43 cases (7%) of GDM vis-à-vis (23% versus 7%). History of neonatal deaths was present in 12 out of 43 (28%) patients of GDM and 3 out of 17 (17.7%) patients of IGT. Other risk factors noted in the patient's histories were prolonged labour (18.6%), operative and instrumental vaginal deliveries (9.3%), pre-eclampsia (9.3%) antepartam hemorrhage (4.65%), intrauterine deaths (2.35%) and polyhydramnios (2.35%).
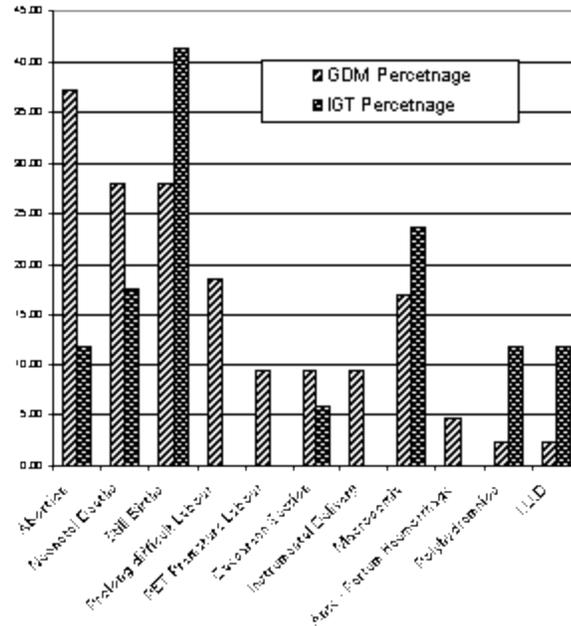
Fig-1: High Risk Factors in Previous Obstetric History of the Patients

A total of 750 (75%) cases were screened at the age of 20-30 years and 247 (24.7%) cases were more than 35 years of age. Only 3 cases (0.3%) were 19 or less. Out of them 37 cases (4.93%) of GDM and 14 cases of IGT (1.86%) were diagnosed at the younger age group of 20-35 years; whereas 6 cases (2.42%) of GDM and 3 cases of IGT (1.21%) out of 247 cases were detected above the age of 35 years. The mean maternal age of the patients with GDM and IGT was 30.42 years. With regard to parity 4 cases (1.29%) of GDM and 2 cases (0.64%) of IGT were detected in primigravida, 30 cases (5.45%) of GDM and 13 cases (2.36%) of IGT were detected in multigravida and 9 cases (6.42%) of GDM and 2 cases (1.42%) of IGT were detected in grandmultigrvida. In this study more than 75 % were multigravida, 21% were grandmultigravida and about 12 % patients were primigravida. GDM was detected in 28 (3.58%) and IGT in 13 (1.66%) out of 780 (78%) total patients screened before 28 weeks of gestation, whereas after 28 weeks, 15 (6.81%) cases of GDM and 4 (1.81%) cases of IGT out of total of 220 (22%) cases were detected. Mean gestation of the patients with GDM and IGT was 25.46 weeks and 27 weeks respectively. In our series 616 patients had a normal weight, 361 were moderately obese and 23 patients were severely obese. These values were corrected for pregnancy and period of gestation. Out of 23 severely obese patients, 5 (21.7%) patients had GDM and 2 (8.7%) patients had IGT. Amongst moderately obese 261 patients, 12 (4.6%) patients had GDM and 6(2.3%) had IGT. In our series overall rate of obesity was 38-40%. The patient's characteristics like age, parity, gestational age and weight distribution and degree of obesity of 1000 patients are shown in table-3.

Table-3: Patients characteristics

AGE	NO. OF CASES	GDM	%	IGT	%
19 or less	3	Nil	Nil	Nil	Nil
20 – 35 years	750	37	4.93	14	1.86
> 35 years	247	6	2.42	3	1.21
Total	**1000**	**43**	**4.3**	**17**	**1.7**

P a r i t y					
Primigravida	310	4	1.29	02	0.64
Multigravida	550	30	5.45	13	2.36
Grandmultigravida	140	09	6.42	02	1.42
Total	**1000**	**43**	**4.3**	**17**	**1.7**
Gestational Age					
29 – 36 weeks	220	15	6.81	04	1.81
24 – 28 weeks	780	28	3.58	13	1.66
Total	**1000**	**43**	**4.3**	**17**	**1.7**
Weight Distribution & Degree Of Obesity					
Moderate > 120%	261	12	4.6	06	2.3
Severe > 150%	23	5	21.7	02	8.7
Normal b/w 80 – 120%	616	26	4.2	09	1.4
Total	**1000**	**43**	**4.3**	**17**	**1.7**

DISCUSSION

In our study out of 1000 patients, 266 were screened positive in contrast to 60-63 per 1000 in most World Series. Similarly, diabetes complicates 3-4 per 1000 pregnancies in most World Series, but where intensive screening has become part of routine antenatal care; more cases are being detected with a range of 1 - 12 per 1000 obstetric cases. However, it varies among different populations of different geographical origins and ethnic backgrounds.[10,11]

In our study frequency of GDM was 43 per 1000 (4.3%) pregnancies and incidence of IGT was 17 per 1000 (1.7%) cases. Thus disorders of glucose intolerance can be regarded as diseases of developing countries.[12] 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 implications on body weight and health. Carbohydrate based food is cheap and taken as staple diet, whereas fats are 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, wherein 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 puts our population at higher risk for the development of diabetes and the importance of intensive screening for the detection of pre-clinical disease cannot be over estimated [11,12].

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 or IGT [14]. In GDM group 17 patients out of 43 and in IGT group 11 patients out of 17 had historic risk factors, which constitutes 36 – 42 % of the patients with the disease having historic risk factors. 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 cases may be missed[15].

Screening system is the system originally proposed by O'Sullivan and Mahan et al. They suggested that single OGCT is not reliable; re-screening must be done in patients after 28 weeks of gestation who had historic risk factors present[13]. In our series, re-screening yielded another 6 per 1000 (35.3%) cases of GDM and 3 per 1000 (17.65%) cases of IGT. Thus overall, rescreening yielded a greater percentage of cases of GDM (35.3% verses 16.3%) and IGT (17.65% verses 6.20%) in comparison with the initial screen. All these data are consistent with international studies.

The mean age of the patients detected to have GDM and IGT was 30.42 years in our study, which was consistent with most world studies in which it is regarded as the disease affecting the women at an advance age.[10,11] In our study women over the age of 35 years were significantly less. It is because less women opt for pregnancy during the later years of life, although more of them develop overt diabetes mellitus. In our series none of the patients was underweight and a high percentage of positive patients (21.7%vs 4.6%in GDM group and 8.7% vs 2.3% in IGT group) belonged to severely obese in comparison to moderately obese patients. Over all rate of obesity was 38 – 40%, which is quite high and is consistent with most world records[10,11]. In our study, significantly higher percentage (6.81% vs 3.58% in GDM group and 1.81% vs 1.66% in IGT group) of cases was detected at an advance gestational age beyond 28 weeks. It is because the glucose intolerance increases with advancing gestational age. The patients with healthier pancreas are detected after 32 weeks of gestation. These findings are consistent with international reports[15]. A higher percentage 6.42%(n = 9) of cases of GDM were grandmultigravida compared to 5.45 % (n =30) multigravida and only 1.29% (n= 4) primigravida. In IGT group percentage of multigravida is 2.36% (n = 13), which exceeds that of grandmultigravida of 1.42% (n =2). This effect is because the total number of patients with grandmultiparity was less in our series. These results are in accordance with international reports from highly prevalent areas [11,12,14]. Family history for a variety of risk factors and association with other disorders like pre-eclampsia was present in many cases as is reported in other studies.[15,16]

CONCLUSIONS

Our results suggest that a policy of universal screening for GDM should be adopted in all antenatal clinics and 50gm OGCT is a test with high predictive value. As in this study significant proportion of the cases was detected on re-screening and repeat OGTT, it is emphasized that re-screening at a later gestation of 28 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. These potential diabetic women can be warned of that future happening and advised to adopt preventive measures to halt or delay that process. This will in turn shed load from health care resources responsible to take care of diabetic patients in the long run.

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Address for Correspondence:

Dr Aisha Hassan, Department of Gynaecology, Ayub Teaching Hospital, Abbottabad. Ph: 0992 – 351-4716