GESTATIONAL DIABETES MELLITUS SELECTIVE VERSUS UNIVERSAL SCREENING

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ABSTRACT
Objectives: *To determine the frequency of gestational diabetes mellitus (GDM) in local obstetric population. To determine whether cases of GDM would be missed if screening is limited to high risk women.*
Study Design: *Cross-sectional, comparative study.*
Setting & Duration: *Mothercare Hospital, Karachi a private maternity home from 1st January to 31st December 2007.*
Methodology: *Our inclusion criteria were pregnant women of any parity, who booked in first trimester and had singleton gestation. Women with known diabetes were excluded from the study. Cases were defined as presence of at least one risk factor for diabetes. Controls did not have any risk factor. Screening was performed using oral glucose challenge test (OGCT) with 50gm glucose. All screen positive women were subjected to oral glucose tolerance test (OGTT) with 75gm glucose. Modified WHO criteria were used to define patients as normal, IGT (impaired glucose tolerance) or GDM (gestational diabetes mellitus). Data were entered and analyzed using SPSS version 15. Significance of difference in results was calculated using student t test, chi square test or Fisher exact test, where applicable.*
Results: *One hundred patients were studied in each group. 23% patients were screen positive in the high risk group, while 2% were screen positive in the low risk group. Overall frequency of abnormal glucose tolerance was 8%, with 6% having impaired glucose tolerance (IGT) and 2% having GDM. None of the patients without risk factors were found to have IGT or GDM. Amongst the high risk group, 32% women had a single, while 68% had multiple risk factors for GDM. The most common risk factor was diabetes in first or second degree relative, found in 90% of cases, followed by high pre-pregnancy body mass index in 69% cases.*
Conclusion: *The frequency of impaired glucose tolerance during pregnancy was 6%, while that of gestational diabetes was 2%. Selective screening of the high risk pregnant women is reliable in our population.*

KEYWORDS: *Gestational Diabetes Mellitus, Impaired Glucose Tolerance, Screening, Risk Factors*

INTRODUCTION

GDM is defined as carbohydrate intolerance with onset or first recognition during pregnancy. It affects 4-5% women in the UK[1], while the reported incidence in Asian population is 2-10%.[2] Uncontrolled GDM is associated with adverse pregnancy outcomes and long term consequences.[3] Screening, diagnosis and appropriate management are therefore essential for optimum perinatal outcomes. GDM has been linked to various risk factors. These include increasing age, multiparity, obesity, family history of diabetes mellitus and abnormal glucose tolerance, unexplained still birth, macrosomia in previous pregnancy,[4] as well as black race[5] and South East Asian population.[6]

Screening for GDM has remained a dilemma with no globally accepted agreements. Despite a lot of research, decision for universal or high risk selective screening is yet an unresolved issue[7]. There are considerable differences between published guidelines concerning screening for GDM, varying from "screening when clinically indicated " to "universal screening".[8] In UK and North Europe, the risk factor based screening is used.[9] The American College of Obstetricians and Gynecologists also recommends selective screening in high prevalence populations and with special risk factors.[10]

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The Australasian Carbohydrate Intolerance Study (ACHOIS) has demonstrated improved perinatal outcome in the treatment group of patients with IGT.[11] In order to achieve these outcomes, this study has suggested formal screening of whole obstetric population. A commentary on this trial published in British Journal of Obstetrics and Gynaecology 2006, also supports the recommendation.[12] Mares from St Mary's Hospital for Women and Children, UK, in his review article also suggests that in populations with a high prevalence of the condition such as South Asia, consideration should be given to universal screening.[4]

Failure to recognize GDM may harm the fetus, whereas too aggressive screening results in many false positive GDM diagnoses and subsequent unnecessary interventions, as well as psychological and economic consequences because of high risk protocols. At the fourth International Workshop- Conference on GDM, South or East Asian populations were reported to belong to a high risk group for GDM.[6] Poor resources and financial constraints are the main limitations to universal screening in these areas. This study was, therefore, conducted to find out whether selective screening would result in missing cases of GDM in the pregnant women with no known risk factors.

METHODOLOGY

This cross-sectional study was conducted from 1st January to 31st December 2007 at Mothercare Hospital, a private maternity home, where the author worked as consultant. This hospital is situated in Karachi city and caters medium socioeconomic group of people. Patients were selected from out-patient department, according to inclusion / exclusion criteria. Our inclusion criteria were pregnant women who booked in first trimester, singleton gestation and with any parity. Women with known diabetes were excluded from the study. Cases were defined as women with at least one risk factor for diabetes, ie. age > 35 years, pre-pregnancy body mass index (BMI) ≤ 23 kg/m^2, previous history of polycystic ovarian syndrome, impaired glucose tolerance, GDM, unexplained stillbirth, macrosomia and fetal anomaly and family history of diabetes mellitus. Controls did not have any risk factor. Screening was performed using oral glucose challenge test (OGCT) with 50gm glucose. Those with result > 140 mg/dl were considered as screen positive. All screen positive women were subjected to oral glucose tolerance test (OGTT) with 75gm glucose. Modified WHO criteria were used to define patients as normal, IGT or GDM.[13] Venous blood sample was used for these tests.

Data were entered and analyzed using SPSS version 15. Significance of difference in continuous variables was calculated using student t test, while significance of difference of screen positive, IGT and GDM amongst cases and controls was determined by chi square test or Fisher exact test, where applicable.

RESULTS

One hundred patients were studied in each group. Baseline characteristics of patients is shown in (Table I). 68% patients had multiple, while 32% had single risk factor. The most important risk factor was a family history, found in 90% of cases, followed by high pre-pregnancy body mass index (Table II). 23% cases were screen positive against 2% controls. Overall frequency of IGT was 6% and of GDM was 2%. Amongst high risk group, 12% had IGT and 4% had GDM while none was diagnosed in the control group (Table III).

DISCUSSION

Screening for GDM holds clinical validity on the basis of improved obstetric outcomes. There is debate on how to provide screening and whether entire populations should be screened. A variety of laboratory tests with varying criteria are globally available for screening and diagnosis of GDM. In this study we have used 2-step approach using OGCT, with a cut-off value of 140mg/dl, followed by OGTT with modified WHO criteria for screen positive patients. Pöyhönen-Alho, in a study in Finland, has also used 50gm OGCT for screening and 75gm OGTT for all high risk groups.[14] Sohail from Lahore has also used same criteria.[15] Miyakoshi has also used same tests but a cut-off of 130mg/dl for OGCT, in Japanese population.[2] American Diabetes Association recommends a cut-off point of either 130 or 140mg/dl for OGCT.[16] GDM is associated with a number of risk

Table I. Baseline characteristics of patients

Characteristic	Cases Mean ± SD	Control Mean ± SD	P-value
Age (years)	27.3 ± 4.6	25.5 ± 3.6	0.002
Parity	1.44 ± 1.3	1.1 ± 51.2	0.107
Pre-pregnancy BMI (kg/m^2)	26 ± 3.2	21.3 ± 1.9	0.000

Risk Factor	No.	%
Family H/O Diabetes	90	90
BMI ≥ 23kg/m^2	69	69
Previous Impaired Glucose Tolerance	6	6
Previous Gestational Diabetes	2	2
Previous In-utero Death	4	4
Previous Fetal Anomaly	1	1
Previous Macrosomia	8	8
Polycystic Ovarian Disease Syndrome	8	8

Table II. Frequency of various risk factors in high risk group (n=100)

factors. We have found the most significant risk factor to be a genetic predisposition, with diabetes in first or second degree relatives. Other important factors were a high pre-pregnancy BMI and abnormal glucose tolerance in a previous pregnancy. Senanayake H in his study in Sri Lanka pointed out first degree relative, maternal BMI 30kg/m^2, maternal age >35 years, previous birth weight > 3.5kg and previous unexplained stillbirth or fetal anomaly as risk factors for GDM.[17] Sohail also found family history to be the most common risk factor found in 62.7% cases.[15] Hassan found a positive family history in more than 80% of patients.[18] We have also used history of polycystic ovarian syndrome as a risk factor in our study, which was positive in 8% of patients. Data from South Asian women in the UK suggest that women with polycystic ovarian syndrome are at a greater risk of developing GDM.[19]

Overall frequency of abnormal glucose tolerance in this study was 8%, of which 6% were cases of IGT and 2% of GDM. This result matches the figure reported world wide. Hassan found GDM in 4.3% and IGT in 1.7% of her 1000 patients studied in Peshawar.[18] Shaheen from Rawalpindi found GDM in 3% and IGT in 6% women.[20] Some authors have reported higher figures, which could be due to differences in study populations and varying diagnostic criteria. Shaukat from Bahawalpur has reported 15.7% GDM amongst 709 patients studied.[21] Naheed from Karachi has found 24% patients with IGT in 50 high risk women.[22] In Sri Lanka, 27.7% women were diagnosed with GDM.[17] Seshiah from India reported GDM in 17.9% women in his study.[23] Friedman found GDM in 31.2% of black population in New York.[5]

Upon comparing frequency in the two groups i.e. high and low risk groups, we found that all of the cases of GDM were found in the high risk group and none in the low risk group. In study by Sohail 3% patients with risk factors were found to have GDM, while 0.5% patients without risk factors also had GDM.[15] She found that women with positive risk factors had six times greater chance of developing gestational diabetes as compared to those without risk factors, with 48% positive predictive value. She therefore suggests selective screening of our local population. Naheed has studied only high risk women in her study.[22] Senanayake has also used selective screening of patients in Sri Lanka.[17]

Conversely, Pöyhönen-Alho studied risk factors based screening in Finland and noted that 47% cases with GDM diagnosis were in the low risk group.[14] They, therefore recommend universal screening for GDM. Cypryk conducted a risk factor analysis in GDM and concluded that no risk factors were present in 12% of GDM patients.[24] They did not find any risk factor cluster which could be used in everyday practice to reliably identify patients at increased risk of GDM and therefore favour universal screening. Whichever selection criteria is used, it is essential to rely on a valid diagnostic test. Therefore, limiting formal screening to women with risk factors is an acceptable option for settings lacking in resources.[25] The weakness of our study was that it was performed in a small urban private setting, which was not representative of majority of Pakistani population. But still, it has shown that selective screening was sufficient. Attention should, however, be paid to identify the women at risk. In majority of public sector hospitals in Pakistan, the burden of patients is too high for universal screening to be practical and feasible. Therefore, selecting the high risk women and performing a standard screening test on them is expected to be an effective strategy.

CONCLUSION

The frequency of impaired glucose tolerance during pregnancy was 6%, while that of gestational diabetes

Table III. Comparative results of screening

Result	Cases (%)	Controls (%)	P-value
Screen positive	23	2	0.000
Impaired Glucose Tolerance	12	-	0.000
Gestational Diabetes	4	-	0.043

was 2%. Selective screening of the high risk pregnant women is reliable in our population.

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