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ORIGINAL ARTICLE

Importance of Blood Glucose Monitoring in Pregnant Females

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ABSTRACT

Objective: To determine the frequency of gestational diabetes mellitus (GDM) among pregnant females.
Study Design: Cross-sectional study.
Place and Duration: Department of Gynecology and Obstetrics, and department of Pathology, Dow University of health sciences, From February 2021 to January 2022.
Methodology: Five hundred pregnant ladies with gestational age between 24-28 weeks with any parity were included. These women were challenged with 75 grams of oral glucose solution and blood glucose levels were estimated at one-hour post-prandial. The cut-off limit was set to 140 mg/dl and women with more than this value were subjected to a 2 hr 75 grams oral glucose tolerance test to confirm the diagnosis of GDM.
Results: Out of a total of 500 pregnant women, the mean age, gestational age and BMI were 26.4±4.3 years, 27.0±10.2 weeks and 27.6±4.3 kg/m2. There were 59 (11.8%) women who were found to have a positive glucose challenge test (GCT) while the remaining 441 (88.2%) had plasma glucose below 140 mg/dl. Furthermore, 59 OGTT results showed that 43 (8.6%) women had GDM. Women with GDM had significantly higher age (p<0.0001), higher BMI (p=0.0064) and multigravidity (0.0191)
Practical Implications: Oral glucose challenge test can be administered in all pregnant women particularly in high risk individuals.
Conclusion: The frequency of GDM was high. Pregnant ladies should be screened for GDM in time to prevent further complications during and after pregnancy.
Keywords: Blood glucose, gestational diabetes mellitus, post-prandial.

INTRODUCTION

Diabetes mellitus (DM) is a group of metabolic disorders involving carbohydrates, protein and fat metabolisms.[1] The DM is a common disorder occurring in both genders and can occur at any age. The DM is characterized by high blood sugar level or hyperglycemia over prolonged periods resulting either due to deficiency of insulin (relative or absolute) or tissue insensitivity to the action of insulin from defects in Insulin secretion or its utilization or both.[2] Insulin is a hormone produced by beta cells of pancreas and mainly controls the metabolism of glucose. Symptoms of high blood sugar include increased frequency of urination, thirst and hunger. The combination of insulin deficiency and insensitivity to tissues produces distinct clinical phenotypes varying in severity of disturbed metabolism, most commonly monitored by the degree of hyperglycemia.[3]

A state of insulin resistance and high insulin levels are usually seen in Pregnancy, which may predispose some women to the development of DM.[4] The gestational diabetes mellitus (GDM) occurs when the insulin secretion from pancreas is not enough to counter the diabetogenic environment of pregnancy.[5] The GDM is defined as the presence of poor glucoses tolerance in a woman during pregnancy which was not present or recognized before the pregnancy.[6] The prevalence rates in the United States, for GDM are higher in African American, Hispanic, American Indian, and Asian women as compared to the white women.[7] The prevalence of GDM in the United States ranges between 1.4%-14%.[7] The number of GDM cases may be directly proportional to the prevalence of type-2 DM (T2DM) in the respective community.[8] During the pregnancy, the insulin resistance may be due to number of factors like alterations in growth hormone, secretion of cortisol (antagonist of insulin), human placental lactogen (produced by placenta influencing fatty acid and glucose metabolism enhancing lipolysis and inhibiting glucose uptake by cells), insulinase produced by placenta (facilitate insulin metabolism), and estrogen as well as progesterone (interferes with insulin metabolism).[9] The other factors which participate in the state of relative glucose intolerance are increased maternal adipose deposition, lack of exercise and increased caloric intake.[10] The main risk factors for GDM are history of macrosomia with birth weight of more than 4000 grams, family history of T2DM, polycystic ovarian syndrome, essential hypertension or pregnancy induced hypertension, previous history of unexplained still births and spontaneous abortions, obesity with a pregnancy BMI > 30, history of GDM in previous pregnancy, persistent glucosuria and age more than 25 years.[11,12] The complications of GDM are both for the fetus and mother. The common one is pre-eclampsia, placental abruption, pre-mature birth, difficult labor due to macrosomia, neonatal hypoglycemia and perinatal death.[12-14]

Recent studies indicated that the morbidity and mortality associated with DM and its complications is preventable or at least the intensity can be reduced by early detection and appropriate management.[15] This study was planned to determine the frequency of GDM among pregnant females.

METHODOLOGY

This cross-sectional study was conducted at the outpatient department of Gynecology and obstetrics, Dow University of Health sciences Karachi from February 2021 to January 202. Inclusion criteria were pregnant women visiting outpatient department for routine check-up with gestational age between 24-28 weeks, irrespective of their parity status. Females who were already diagnosed as DM or GDM or those who were taking any medicines which can cause elevated blood sugar levels were excluded. Females having any co-morbid conditions or illnesses which can interfere with correct blood sugar monitoring were also excluded. Females having pregnancies with in vitro technique were also excluded. Non-probability purposive sampling technique was used after taking informed and written consents. Approval from "Institutional Ethical Committee" was acquired.

At the time of enrollment, women were enquired about family history of DM, parity, previous history of macrosomic babies, GDM or any past obstetrical intervention. All women were given 50 mg of oral anhydrous glucose in 250 ml of water to drink within five minutes without any dietary preparation irrespective of the time of the day and last meal. Two ml of venous blood was taken from a big peripheral vein of hand in grey topped sodium fluoride tubes. The samples were sent without delay to the clinical laboratory where the plasma glucose concentration was measured by hexokinase principle using Randox kit method on clinical chemistry auto analyzer Sysmex, Chemix 180. A cut off value of 140 mg/dl was used to define a positive GDM. Values below this level were considered negative for GDM while females with value above this

were subjected to OGTT of 75 gm oral glucose solution performed at a different sitting after overnight fasting of 8-14 hours. The females were labeled as GDM if their fasting and 2 hrs plasma glucose levels were 6.0 mmol/l (108 mg/dl) and 7.8 mmol/l (140 mg/dl) respectively.

The data was entered and analyzed by "Statistical Package for Social Sciences (SPSS), version 26.0. The frequency of GDM was calculated along risk factors for GDM. Variables like age, parity, gestational age, presence or absence of risk factors and BMI were analyzed. Descriptive statistics were used to calculate the frequency of GDM and frequencies of all risk factors. Chi-square test applied to compare the categorical data whereas independent sample t-test utilized for comparing numeric data considering $p<0.05$ as significant.

RESULTS

Out of a total of 500 pregnant women, the mean age, gestational age and BMI were 26.4±4.3 years, 27.0±10.2 weeks and 27.6±4.3 kg/m^2. There were 59 (11.8%) women who were found to have a positive glucose challenge test (GCT) while the remaining 441 (88.2%) had plasma glucose below 140 mg/dl. Furthermore, 59 OGTT results showed that 43 (8.6%) women had GDM (figure-1).

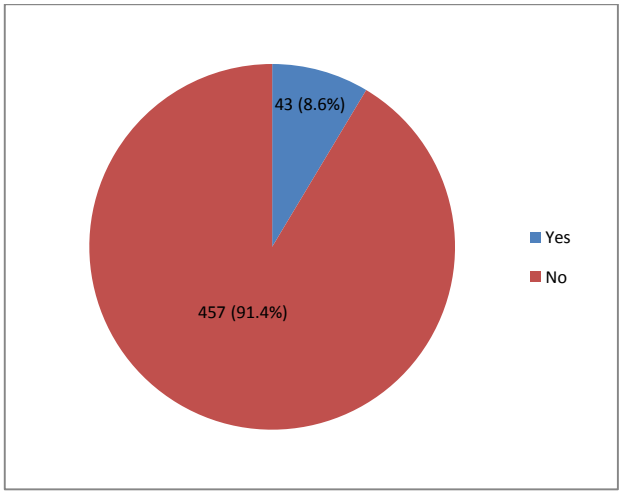

Figure-1: Frequency of GDM (n=500)

Mean age of GDM women was 28.8±4.4 years. Out of 43 women with GDM, 2 (4.6%), 4 (9.3%), 14 (32.5%) and 23 (53.4%) were less than 20 years, 20-24 and 25-29 and more than 30 years of age respectively. There were 10 (23.2%) women who were primigravida while n 33 (76.6%) were multigravida. Women with GDM had significantly higher age ($p<0.0001$), higher BMI ($p=0.0064$) and multigravidity (0.0191) as shown in table-2.

Table-1: Distribution of Pregnant Ladies with respect to GDM

Variables	Total (n=500)	GDM (n=43)	Normal (n=457)	P-Value
Age (years)	26.4±4.3	28.8±4.4	26.4±4.3	<0.0001
BMI (Kg/m^2)	27.6±4.3	29.2±0.6	27.4±4.3	0.0064
Gestational age (weeks)	27.0±10.2	26.9±0.9	27.0±10.6	0.9508
Primigravida	200 (40.0%)	10 (20.3%)	190 (41.5%)	0.0191
Multigravida	300 (60.0%)	33 (76.7%)	267 (58.4%)	
Family history of DM	42 (8.4%)	20 (46.5%)	22 (4.8%)	<0.0001

DISCUSSION

The GDM is one of the most important medical complications of pregnancy and carries a high risk of fetal and maternal morbidity and mortality. A large number of studies have been done to find out the incidence of GDM shows variable results. A multi ethnic population study in London UK demonstrated a 2% prevalence of GDM similar to a study in Danish population.[16] Fatima et al evaluating the incidence of GDM in Sindh, Pakistan was found it to be 11% as compared to 11.8% in our study.[17] In another local study by Hassan A et al on 1000 females in Abbottabad, Pakistan revealed the prevalence of GDM as 4.3%.[18] Family history of DM, increased maternal weight, multiparty and macrosomia, all predisposed to GDM. These observations are in line with a study conducted in Baqai Hospital Karachi which showed a direct relation of GDM with family history of 46.5% of GDM cases.[19] In the present study, we found increasing age, BMI and multigravidity to be lined with GDM. Sohail R et al also found similar results to what we noted.[20] Jamshed et al showed GDM in 6.7% women and had significant linkage with increased parity, obesity and family history of DM which is similar to our study.[21] A study conducted in Karachi, Pakistan showed 15.8% women with GDM while study done in Rawalpindi obtained a prevalence rate of 8% which is very close to what we observed.[22] A Cohort study in Qingdao, China showed the Incidence and age adjusted incidence of GDM as 17.4 and 17.5% respectively.[23]

Pakistan is a developing country with compromised health resources especially in rural areas and particularly far flung ones thus imprinting the importance in the awareness of this issue at all levels so to prevent the complications of this problem both for mother and child. Oral glucose challenge test can be administered in all pregnant women particularly in high risk individuals. OGCT as compared to OGTT is less time consuming, easy for patients and less costly. It is important to identify high risk mothers. This screening test may be helpful for the present and future pregnancies including the risk of development of DM.

Being a single center study, our findings need further evaluation at large multi-centric studies. Women with GDM should be followed up for fetal and maternal outcomes to know the risk of various conditions these women are exposed to.

CONCLUSION

The frequency of GDM was high. Pregnant ladies should be screened for GDM in time to prevent further complications during and after pregnancy.

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