Original Article

Postnatal Oral Glucose Tolerance Test in Normoglycemic Women Delivering Macrosomic Babies

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ABSTRACT

Objective: To determine the frequency of diabetes by oral glucose tolerance test (OGTT) among normoglycemic women delivering macrosomic babies.

Study Design: Observation study.

Place and Duration of Study: This study was conducted at the MCH Unit II, Pakistan Institute of Medical Sciences, Islamabad from May 2015 to April 2017.

Materials and Methods: 100 normoglycemic woman with BMI of 19-25 Kg/m^2 and singleton pregnancy at 37-40 weeks of gestation who delivered macrosomic babies >4kg were included. Patients with twin pregnancy, type II diabetes, gestational diabetes and medical diseases were excluded. All OGTTs were performed after 24 hours of delivery and then six weeks postpartum in the morning after an overnight fast. Blood plasma glucose levels above 5.6mmol/l, fasting and 7.8 mmol/L (140 mg/dl) at 2 hours were categorized as diabetes.

Results: The mean age of total 100 women was 29.9 years and the mean gestational age was found 38. 6 weeks. The mean of birth weight was 4.48 (n=100). After 24 hours, diabetes was diagnosed by OGTT in 40 (40.0%) woman but there was no diabetes in 60 (60.0%) patients (total n=100). At 6 weeks diabetes was found in 27 (27.0%) woman who delivered macrosomic babies, whereas there was no diabetes in 73 (73.0%) patients.

Conclusion: Frequency of diabetes diagnosed by oral glucose tolerance test (OGTT) among normoglycemic women delivering macrosomic babies is high.

Key Words: Macrosomia, Gestational Diabetes Mellitus, Glucose Intolerance, OGTT, Growth Curve, Large for Gestational Age

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INTRODUCTION

Macrosomia is a term, used to describe a newborn whose birth weight is greater than 4–4.5kg.[1] This condition affects 3–15% of all pregnancies worldwide. The Center for Disease Control and Prevention has classified macrosomia as one of the major risk factors for Type II diabetes[2]**.** Macrosomia is known to be associated with various grave complications as operative delivery, postpartum hemorrhage, obstetric anal sphincter injury, shoulder dystocia, brachial plexus injury and birth fractures.[3,4]

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Pregnancy is universally recognized as a state of physiological insulin resistance[5,6]. It is expected that women who had a macrosomic infant are more likely to have elevated plasma glucose levels during pregnancy than those without. These women might have an underlying β-cell dysfunction and be likely to develop diabetes later in life**.** Along with diabetes other risk factors for macrosomia are maternal obesity, post term gestation, maternal birth weight > 3.7 kg and increased weight gain during pregnancy.[7-11]**.** To diagnosis GDM, the World Health Organization (WHO) has proposed using a 2-h 75g OGTT, with a threshold plasma glucose concentration of greater than 7.8 mmol/L at 120 min.[5] OGTT is performed at 24-28 weeks usually in pregnancy to diagnose GDM.[12] In woman in which antenatal OGTT has been missed due to late booking and who have given birth to macrosomic baby despite normal glycemic levels, postpartum abnormal glucose tolerance can be diagnosed by BSF, HbA1c and OGTT. The American Congress of Obstetricians and Gynecologists recommends a 2-hour, 75-g oral glucose tolerance test (OGTT) performed at 4–12 weeks' postpartum to screen for disorders of glucose metabolism, including DM in all women with a GDM-affected pregnancy.[13] GDM occurs more often in women from certain ethnic groups and is also

associated with macrosomia.[14] Rates of Type II DM diagnosed post-partum range from 2 to 12.5% within one year. Women with GDM are seven times more likely to develop Type II DM than women without GDM.[15,16] In a study, it was noted the rate of macrosomia neonates increased significantly from 8.5% in women with normal blood glucose values to 29.5% in women with higher values than normal.[17] Maternal insulin is known to be the primary hormone responsible for intrauterine fetal growth. During pregnancy, irregularity of maternal postprandial blood glucose levels and excessive insulin secretion, especially in the second- and third-trimester can cause fetal macrosomia.[18] Macrosomia and diabetes are vice and versa, the Hyperglycemia and Adverse Pregnancy Outcomes (HAPO) study identified a continuous relationship between maternal glucose and increasing birth weight.[19] However, approximately 60% of macrosomic fetuses are born to mothers without identifiable risk factors.[20] In our country, most women lack antenatal health care facilities and presents in late pregnancy when the time for OGTT has already passed so it is missed. For woman with gestational diabetes, it is known that fasting sugars should be checked at 13 weeks to exclude diabetes but for normoglycemic mothers with macrosomic infants there is no guideline available. We decided to determine the frequency of diabetes by oral glucose tolerance test among normoglycemic women who deliver macrosomic babies. This study will add in existing knowledge and will contribute some information for drawing conclusions for betterment of such mothers.

MATERIALS AND METHODS

The study was conducted at MCH unit-II, PIMS Islamabad from 1st May 2015 to 30th April 2017. One hundred postnatal normoglycemic women either non booked or late booked patient in which antenatal OGTT was missed, with BMI 19-25Kg/m2 and singleton pregnancy at 37-40 completed weeks delivering macrosomic babies (birth weight > 4 kg) were included in this study taking expected prevalence of diabetes in macrosomic delivery in non-GDM as 15.2%[1] using non-probability, purposive sampling. Women with gestational diabetes, Twin pregnancies, history of type II diabetes (overt diabetes)/cardiac/respiratory/hepatic and other medical disease, anomalous babies and preterm deliveries were excluded from the study. Woman blood sugar random were cheeked before recruiting them for study. After obtaining the informed consent, 75 g OGTTs were performed after 24 hours of delivery and then six weeks postpartum in the morning after an overnight fast. The plasma glucose was estimated in the central laboratory by the glucose oxidase peroxidase (GOD-POD) method. Blood plasma glucose levels above 5.6mmol/l at fasting and 7.8 mmol/l (140 mg/dl) at 2 hours were categorized as diabetes.

Data Analysis: The data was entered on the pre-formed pro forma for the analysis. Collected data was analysed through computer software SPSS 16. Mean and standard deviation were calculated for quantitative variables i.e. age, gestational age, parity and birth weight. Frequency and percentage were calculated for qualitative variables i.e. education, ethnicity and booking. Effect modifiers like booking status and education were controlled through stratifications and post-stratification chi-square was applied to see their effect on outcome. P-value ≤0.05 was taken as significant.

RESULTS

The mean age of total 100 women was 29.9 years, and the mean gestational age was found 38. 6 weeks. The mean of birth weight was 4.48 (n=100). Table I. Diabetes, by oral glucose tolerance test after 24 hours of delivery was found in 40 (40.0%) woman, whereas there was no diabetes in 60 (60.0%) patients (total n=100). Figure I. At 6 weeks diabetes was found in 27 (27.0%) woman who delivered Macrosomic babies by oral glucose tolerance test, whereas there was no diabetes in 73 (73.0%) patients as shown in Figure 2. The distribution of diabetes among different confounding variables is shown in the Table 2 which indicates that high frequency of diabetes was found in uneducated women. The stratification of diabetes with respect to the educational status described that the educational status factor did not contribute to any statistical difference in our study populace p = .157.

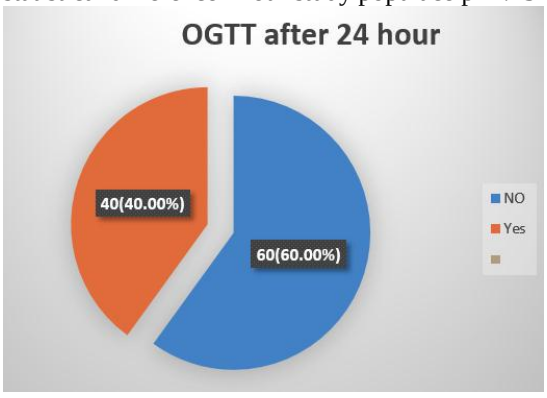

Figure No.1: Frequency of diabetes among women delivering macrosomic babies at 24 hours (n=100)

The women with non-booked status (n=64) reported high frequency of diabetes (18 +ve diabetes) than the women with booked status (n=36) reported (9 +ve diabetes). The stratification of diabetes based on booking status which showed no significant difference between booked and non-booked patients p=.735 (Table 2). The p-values of educational status and booking status (.157 and .735) which are more than alpha value (α= .05) show that there is no significant

association between educational status, booking status and diabetes.

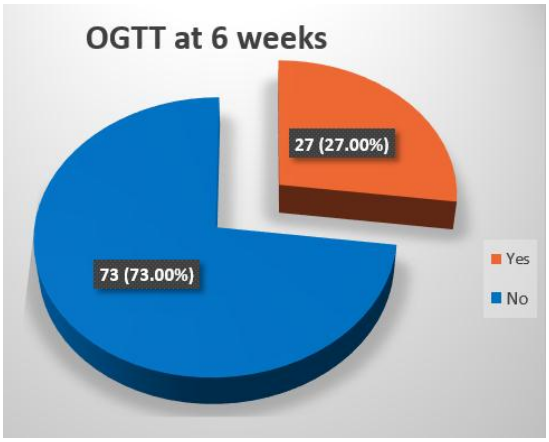

Figure No.2: Frequency of diabetes among women delivering macrosomic babies at 6 weeks (n=100)

Table No.1: Demographic data

Descriptive variable	N	Mean	Std. Deviation
Age	100	29.9	4.60
Gestational age	100	38.600	1.19
Birth weight	100	4.4759	0.42

Table No.2: Stratification of Diabetes with respect to educational and booking status. n=100

Confounding variable	Diabetes		p-value
	Yes	No	
Educated (56)	12 (21.42%)	44 (78.58%)	**0.157**
Un-educated (44)	15 (34%)	29 (66%)	
Booked (36)	09 (25.0%)	27 (75.0%)	**0.735**
Non-booked(64)	18 (28.13%)	46(71.87%)	

DISCUSSION

Normoglycemic mothers who deliver macrosomic babies has significant risk for developing diabetes later on in their life. In our study, diabetes by oral glucose tolerance test among women delivering macrosomic babies was found in 27 (27.0%) patients, as similarly observed by Kew S and cols where prevalence of diabetes in macrosomic delivery in non-GDM was 15.2% and in GDM was 9.1%.[21] In a study by Savona-Ventura Cv, it was noted that the rate of macrosomia neonates increased significantly from 8.5% in women with normal blood glucose values to 29.5% in women with higher values than normal.[17] Black recently demonstrated that the risk of adverse pregnancy outcomes differs between women with impaired fasting plasma glucose values (FPG) and abnormal glucose levels during the OGTT, providing evidence that women with elevated FPG particularly suffer from delivering large for gestational age(LGA) infants[21,22.] Similarly, Retnakaran and cols. found that FPG best predicts LGA risk, whereas post load glucose levels from OGTT predict postpartum pre diabetes or diabetes risks [23].

Our study demonstrates the risk of postnatal diabetes among normoglycemic women delivering macrosomic babies. In this quest we were able to identify 27 % of women with diabetes at six weeks postnatal, which is alarming considering the fact that our study included non-GDM cases as well. Our research highlights the need for having regular antenatal screening of all the women with an OGTT. This study also resonates with the previous NICE guidelines regarding diabetes in pregnancy which clearly stated that OGTT should be used as a screening test for diabetes in pregnancy in Asian ethnic population. The confounding factors featuring in this article including the booking status and education do not show any statistical significance although the non-booked women did have higher frequency of deranged OGTT. The much-feared shortcoming of this inquest was that we were not able to isolate the results pertaining to the number of women having diabetes with previous history of GDM. This process can be further improved by performing OGTT of women at their booking visits and then following them up to their delivery to assess the macrosomia. Further OGTT can be performed in non-diabetic women postnatal to assess the degree of glucose intolerance. Therefore, we think that by identifying the glucose tolerance of patients a better screening of the mother can be done in our subset of population and complications associated with glucose intolerance and macrosomia can be avoided in the next pregnancy.

CONCLUSION

Frequency of diabetes diagnosed by oral glucose tolerance test (OGTT) among normoglycemic women delivering macrosomic babies is high.

Author's Contribution:

Concept & Design of Study:	Hadia Aziz
Drafting:	Jaweria Faisal, Zeb un Nisa, Zeba Munzar
Data Analysis:	Ayesha Basharat, Sadia Kanwal
Revisiting Critically:	Hadia Aziz, Jaweria Faisal
Final Approval of version:	Hadia Aziz

Conflict of Interest: The study has no conflict of interest to declare by any author.

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