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Oral Glucose Tolerance Test in Pregnancy: A Study of Its Effect on Pregnant Mothers Admitted To Midnapore Medical College and Hospital of Paschim Medinipore District of West Bengal, India

Biological Science

KEYWORDS : Oral glucose tolerance test, gestational diabetes mellitus, complications during pregnancy, macrosomal birth

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ABSTRACT

A cross sectional study was carried out for a duration of four years (2011 to 2015) on pregnant mothers being monitored for oral glucose tolerance test (OGTT) admitted to Department of Obstetrics and Gynaecology, Midnapore Medical College and Hospital, West Bengal to find out its influence during pregnancy on complications during pregnancy and labor along with foetal growth, newborn body weight (macrosomal birth), malformations and still-births. The frequency of pregnant women participating in OGTT tests significantly ($p<0.05$) increased from 20% to 50%. Percentages of pregnant mother suffering from gestation diabetes mellitus (GDM) increased from 2% to 8% ($p<0.05$) during the observed period though maternal complications, infant mortality, stillbirths along with other foetal declined during the same period. A significant ($p<0.05$) decline in the percentage (from 14.1% to 13.2%) of birth rate of macrosomal babies was also noted. Results concluded that regular measurements of glucose tolerance during pregnancy may prevent preterm birth, incidence of macrosomal newborns, and lower mortality rate with decreased foetal and maternal complication incidence during pregnancy and delivery.

Introduction

Pregnant women can develop gestational diabetes, which may be a risk to both mother and baby. An 'Oral **Glucose Tolerance Test'** is a common type of testing for identification of potential gestational diabetes during pregnancy following 'Glucose Challenge Screening' or 'higher glucose screening test' (Committee on Practice Bulletins—Obstetrics, 2013). Pregnant mother produces extra insulin to meet foetus's need during pregnancy, especially from five months, when foetus is growing rapidly that leads to development of gestational diabetes. Gestation impairs glucose tolerance that has direct impact on beta cell dysfunction and insulin resistance (Bergman et al., 2002). Excessive transferal of glucose from mother induces foetal hyperglycaemia, leading to foetal pancreatic islet hypertrophy and beta cell hyperplasia due to consequent rise in insulin secretion (Kousta et al., 2002). It doesn't always show noticeable signs, so continuous monitoring is important. If gestational diabetes isn't recognised and treated lately it may put mother and baby at risk as high blood sugar level of mother enhances macrosomal birth (grow large baby, defined as a birth weight at or above 4 kg, or when sex-specific birth weight for gestational age is above the 90th percentile of foetal growth curves), which may cause a difficult vaginal birth. Insulin secretion and resistance are the major factors of macrosomal infants, which increases the chance of birth trauma, pre-term birth, still births, shoulder dystocia, bone fracture or nerve palsy (Garcia Carrapato et al., 2003). It has direct influence on caesarean section, neonatal jaundice, respiratory complication and perinatal mortality (Phipps et al., 1993). Early detection of glucose intolerance can prevent all these complications in maternal and foetal outcomes (Gillman et al., 2003).

Materials and Methods

A cross sectional study was performed at the department of Obstetrics and Gynaecology of Midnapore Medical College and Hospital, West Bengal, to monitor the number of pregnant women performed with OGTT test on regular basis and foetal characteristics during the years 2011 to 2015. Total 930 pregnant mothers were included in the study for the total study durations. Data on age, body height, weight, body mass index (BMI) of included pregnant mother and their family history of diabetes mellitus (DM) or GDM, if any were recorded. Numbers of macrosomal baby, their foetal growth, preterm birth, congenital malformations, stillbirths and caesarean section defined the foetal characteristics. GDM was defined when more than two plasma glucose measurement were equal to or higher than the cut-off points following the criteria of American Diabetes Association (ADA) (fasting: 5.3 mmol/L, 1 hr: 10 mmol/L, 2 hr: 8.6 mmol/L, 3 hr: 7.8 mmol/L). All analyses were performed with the Statistical Package for Social Scientist, Ver. 19. Statistical significance level was assessed using student two-tail 't-test' and significant difference was recognised at the level of $p<0.05$.

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Results

An increase of thirty percent in the number of performed OGGT was noted during the studied period. There was also an increase in the number of pathological OGTT in pregnant women but with no differences in BMI (Figure 1, Table 1).

Table 1: Anthropometric parameters observed in respect to age variations over the study period in pregnant Women. Each column represents values in Mean ± SEM for each group. Values of each column with no superscript does not differ from each other significantly at the level of p>0.05.

Parameter	Commencement of experiment	End of experiment
Age (Years)	32.7±3	34.2±5
BMI (Kg/m^2)	26.3±2.1	27.2±2.3
Weight increase (Kg)	7±1.03	8.3±1.11

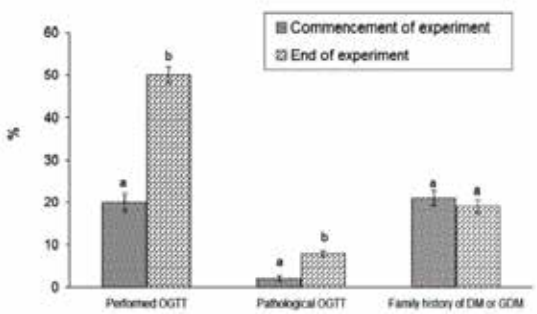

Figure 1: Oral glucose tolerance test performed on pregnant mother and pathological variation found in the said bio-marker of gestational diabetes mellitus over the study period in pregnant women. Each bar represents percentage values in Mean ± SEM for each group. Comparison performed following student two tail 't' test. Values of bar diagram with different superscripts (a, b) differ from each other significantly at the level of p<0.05. Values of bar diagram with same superscript (a) does not differ from each other significantly at the level of p>0.05.

Positive changes in all observed foetal characteristics during the same period were noted. A significantly decreased (p<0.05) state in the frequency of macrosomic infants, infants with faster growth and preterm births were observed over the observed period (Figure 2). Foetal malformations at the end of the study was found with decreased frequency in respect to the initial period but with insignificant (p>0.05) difference (Figure 2). Lower foetal mortality was also noted in the last studied year, but that difference was not statistically significant (Figure 2).

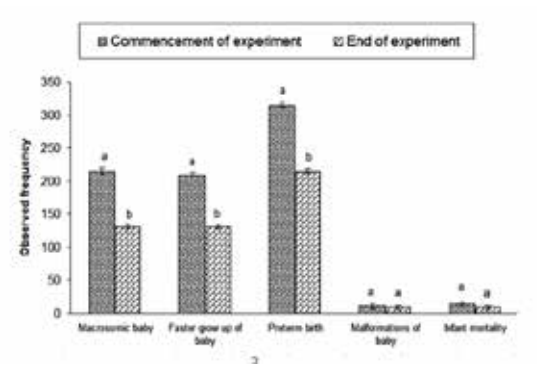

Figure 2: Newborn parameters over study period. Each bar represents percentage values in Mean ± SEM for each group. Comparison performed following student two tail 't' test. Values of bar diagram with different superscripts (a, b) differ from each other significantly at the level of p<0.05. Values of bar diagram with same superscript (a) does not differ from each other significantly at the level of p>0.05.

DISCUSSION

Poor nutrition during pregnancy may lead to permanent changes in insulin-glucose metabolism, may effect on foetal growth also. This effect on glucose tolerance is especially important in pregnant women who are obese (Ravelli et al., 1998). According to 'fuel-mediated teratogenesis' hypothesis, pregnant woman with GDM has long-term impact on the development of her offspring (Dabelea, 2010). In-utero exposure to maternal hyperglycaemia leads to foetal hyperinsulinaemia followed by increase in foetal fat cells. So, a feed-forward loop can exist of rising adiposity and hyperinsulinaemia throughout childhood, leading to obesity and diabetes in later life (Gillman et al., 2003). At the initiating year of observation number of performed OGTT was little with high preterm birth rate and accelerated foetal grow up but the number of performed OGTT was increased gradually. In the beginning there were 2% of women with GDM, with a constant increase in numbers of women with GDM during the observational period that rests at 8% at the end of observation. That is explained with more frequent controls of blood glucose during pregnancy.

IGT in the offspring is a long-term complication of maternal diabetes (Sobngwi et al., 2003). Excessive insulin secretion in utero is a strong predictor of IGT in child (Silverman et al., 1995). In our present study significant decrease in numbers of macrosomal infants and infants with faster growth were noted at the end of observation period among the observed foetal characteristics, supported by previous studies in selected populations suggest that hyperglycaemia in pregnancy may be an important risk factor for obesity and type-2 diabetes in their offspring (Boudou et al., 2003). For that reason laboratory screening for glucose intolerance is a standard element of the prenatal evaluation (Dabelea, 2010). The continued observation during pregnancy can improve foetal and maternal state and diminishing fatal and unwanted outcome during and after delivery (Silverman et al., 1995). Type-2 diabetes mellitus in family may raise the possibility of GDM (Ravelli et al., 1998). So, we also recorded the family history of diabetes mellitus, which was found with insignificant difference.

REFERENCES

1. Committee on Practice Bulletins--Obstetrics. (2013). "Practice Bulletin No. 137: Gestational diabetes mellitus". Obstet Gynecol. 122 (2 Pt 1):406-16.
2. Bergman, R.N., Ader, M., Huecking, K and Vancitters, G.(2002). "Accurate assessment of beta-cell function: the hyperbolic correction". Diabetes; 51: S212-S220.
3. Ravelli, A.C.J., vander Meulen, J.H.P., Michels, R.P.J., Osmond, C., Barker, D.J.P., Hales, C.N. and Bleker, O.P. (1998). "Glucose tolerance in adults after prenatal exposure to famine". The Lancet; 351: 173-177.
4. Silverman, B.L., Metzger, B.E., Cho, N.H. and Loeb, C.A. (1995). "Impaired Glucose Tolerance in Adolescent Offspring of Diabetic Mothers". Diabetes Care; 18: 611-617.
5. Sobngwi, E., Boudou, P., Mauvais-Jarvis, F., (2003). "Effect of a diabetic environment in utero on predisposition to type 2 diabetes". Lancet 2003; 361:1861–1865.
6. Gillman, M.W., Rifas-Shiman, S. and Berkey, C.S. (2003). "Maternal gestational diabetes, birth weight, and adolescent obesity". Pediatrics; 111: 221–226.
7. Whitaker, R.C., Pepe, M.S. and Seidel, K.D. (1998). "Gestational diabetes and the risk of offspring obesity". Pediatrics; 101-109.
8. Dabelea, D. (2010). "The diabetic in triamterene environment: short and

long-term consequences. Gestational Diabetes During and After Pregnancy". London: Springer. 227-239.

9. Kousta, E., Parker, K.H., Lawrence, N.J., Penny, A., Millauer, B.A., Anyaoku, V., Mulnier, H., Forster, D.C., MacDonald, I.A., Robinson, S., McCarthy, M.I. and Johnston, D.G. (2002). "Delayed metabolic and thermogenic response to a mixed meal in normoglycemic European women with previous gestational diabetes". J Clin Endocrinol Metab; 87: 3407-3412.
10. Garcia Carrapato, M.R. (2003). "The offspring of gestational diabetes". J Perinat Med.31:5-11.
11. Phipps, K., Barker, D.J.P., Hales, C.N., Fall, C.H.D., Osmond, C. and Clark P.M.S. (1993). "Foetal growth and impaired glucose tolerance in men and women". Diabetologia; 36:225-228.