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Original article:

Lipid profile status in women with gestational diabetes mellitus

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ABSTRACT

Background: Gestational Diabetes Mellitus (GDM) is defined as carbohydrate intolerance of variable severity with first onset during pregnancy. The alterations in lipid metabolism that occur in GDM has been found to trigger irreversible vascular changes putting patients at a higher risk of cardiovascular disease in later life. An earlier evaluation of lipid parameters in women with GDM would help in predicting the fetal weight than glucose parameters, thereby would help in reducing fetal and maternal complications.

Aim: The aim of the study was to evaluate the parameters of lipid metabolism in women with GDM.

Methodology: This study was conducted in the department of Physiology in association with the department of Obstetrics and Gynaecology and department of Biochemistry at Coimbatore Medical College and hospital. The study group comprised of 100 pregnant women during second trimester of pregnancy with 50 women having GDM by 75 gm Oral Glucose Tolerance Test as GDM group and 50 pregnant women with normal OGTT as control group. The lipid parameters were analysed using enzymatic assay.

Results: Student 't' test was done and found to be significant ($p < 0.001$). The lipid parameters were found to be significantly higher in women with GDM compared to women with normal pregnancy.

Keywords : Gestational Diabetes Mellitus, Oral Glucose Tolerance Test, Lipid parameter

INTRODUCTION

"Pregnancy is a physiological process that invites a woman to yield to the unseen power behind all life where soul and spirit are stretched". But pregnancy has its own complications. Gestational diabetes mellitus is defined as carbohydrate intolerance of unpredictable severity with first onset during pregnancy [(1)]. The incidence of GDM is increasing globally and India is not an exception. The prevalence of GDM is 16.55% according to random national survey in India [(2)]. GDM causes detrimental health consequences to the mother and the fetus. During normal pregnancy, there occurs changes in carbohydrate and lipid metabolism to ensure a continuous supply of nutrients to the growing fetus. There is an enhanced insulin action in first trimester and more diabetogenic stress in second trimester. In second trimester synthesis of the placental hormones like human placental lactogen (HPL), estrogen, prolactin, and cortisol increases. These hormones causes lipolysis with liberation of free fatty acids which are

responsible for the insulin resistance and glucose intolerance[2]. Then there occurs synthesis of enzymes like placental insulinase by the placenta that increases the degradation of insulin . The hyperglycemic state which occurs due to the above reasons is to provide a continuous source of glucose to the fetus[3]. As a result the metabolic changes that occur under the influence of insulin and the anti-insulin hormones facilitate anabolism during post prandial state and catabolism during fasting state[2]. These metabolic changes are progressive and may be accentuated in women with GDM[4]. The hall mark of GDM is increased insulin resistance which is found to be associated with abnormalities in lipid metabolism[5]. The abnormalities in lipid metabolism may trigger irreversible vascular changes putting the women at a higher risk of cardiovascular disease[5].

AIMS AND OBJECTIVES

- To evaluate the following parameters of lipid metabolism in women with GDM and normal pregnancy - Total Cholesterol (TC), Triglycerides (TG), High density lipoprotein cholesterol (HDL), Low density lipoprotein cholesterol (LDL), Very Low Density Lipoprotein cholesterol (VLDL)
- To compare the lipid profile status between women with GDM and normal pregnancy.

MATERIALS AND METHODOLOGY

The study was Conducted in the department of Physiology in association with the department of Obstetrics and Gynaecology and department of Biochemistry at Coimbatore Medical College and hospital, Coimbatore. A total of 100 pregnant women during 24 to 28 weeks of gestation between the age of 20 to 35 yr and with Body Mass Index (BMI) of 18.5 to 24.99 kg/m^2 were selected. Ethical committee approval was obtained. Patients were enrolled after signing an informed consent. Fifty pregnant women diagnosed having GDM by oral glucose tolerance test (OGTT) were taken as GDM group. GDM was diagnosed with blood glucose value of $\geq$ 140 mg/dl after 2 hours of 75 gm glucose load irrespective of last meal according to WHO criteria[6]. Fifty pregnant women with normal glucose levels (<140 mg/dl) after OGTT were considered as control group. EXCLUSION CRITERIA: Known cases of Diabetes Mellitus, hypertension, cardiovascular diseases, thyroid disorders, dyslipedemia, Obese women (>25 kg/m^2), women with multiple pregnancies, H/o drug intake like steroids were excludes from the study.

Detailed history was taken which included age, parity, last menstrual period, gestational age, history of drug intake and dyslipedemia. General examination was done. Vitals were recorded. Obstetric examination was done to confirm weeks of pregnancy. Fetal heart sound was recorded using fetoscope. All systems were examined to rule out any systemic disorder. Blood samples were collected under strict aseptic precautions in fasting for estimation of lipid parameters. Total cholesterol, triglycerides, Low Density Lipoprotein cholesterol (LDL-c), Very Low Density Lipoprotein cholesterol (VLDL-c) and High Density Lipoprotein cholesterol (HDL-c) were estimated by enzymatic assay.

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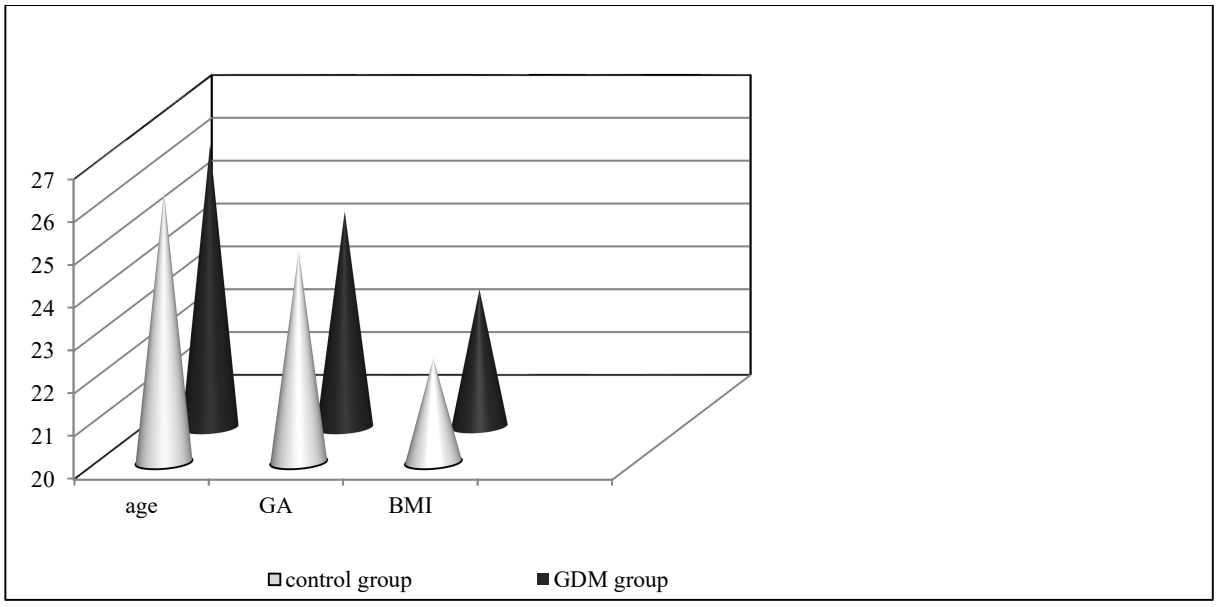
RESULTS

The results were analysed using unpaired Student's 't' test . A p value of <0.05 is considered significant.

FIGURE 1: ***Comparison Of Age, GA, BMI Between GDM Group and Control Group***



The mean age was 26.4 ±3.6 years in GDM group and 26.6 ± 3.2 years in control group, the mean Gestational Age (GA) was 26 .2 ± 1.8 in GDM group and 26 ± 2.0 weeks in control group, the mean BMI was 23.22±1.12 kg/m2 in GDM group and 22.42 ±2.61 kg/m2 in control group. The p value was not significant. There was no significant difference in mean age, mean gestational age and BMI between the GDM group and the control group.

TABLE 1 : ***Comparison of OGTT and Lipid Parameters between GDM Group and Control Group***

VARIABLES	GDM GROUP	CONTROL GROUP	p VALUE
OGTT(mg/dl)	194.62±8.8	102.44 ± 6.8	<0.001significant
Total cholesterol (mg/dl)	220.64±4.6	182.40± 6.4	<0.001significant
Triglycerides (mg/dl)	198.42±8.6	148.64± 4.8	<0.001significant
LDL-c (mg/dl)	134.92±6.4	104.28± 4.8	<0.001significant
HDL-c (mg/dl)	34.82±5.4	36.42±1.2	Not significant
VLDL-c (mg/dl)	40.98±2.2	31.72±1.8	<0.001significant

The results were analysed using unpaired Student's 't' test. The parameters of lipid metabolism like total cholesterol, triglycerides, LDL, and VLDL were found to be increased in women with GDM compared to normal pregnancy. The p value was < 0.001 and found to be significant. Though the mean HDL was found to be lower in women with GDM compared to normal pregnancy , there was no statistically significant difference in HDL levels between both the groups.

DISCUSSION

Pregnancy is a diabetogenic state due to increased maternal insulin resistance caused by the placental hormones which starts between 20 and 24 weeks of pregnancy[3]. The metabolic adaptations, during pregnancy are essential to ensure adequate growth and development of the fetus, to provide the fetus with adequate energy stores and substrates that are needed following birth, to provide the mother with sufficient energy stores and substrates to cope with the demands of pregnancy, labour and lactation.[7] The precise mechanisms causing GDM remain unknown. Certain pregnant women are unable to up-regulate insulin production relative to the degree of insulin resistance, and consequently become hyperglycaemic developing GDM[2]. In this study, the serum levels of triglycerides, total cholesterol, LDL and VLDL were found to be increased in women with GDM compared to women with normal pregnancy. These findings were consistent with the study done by khan et al., (2012), Ryckman et al., (2015) and McGrowder et al., (2009) which reported that serum triglycerides and total cholesterol levels were increased significantly in women with GDM compared to normal pregnant women[8,,9,10]. Asare -Anane et al., (2013) found that women with GDM had higher levels of lipid parameters like TG, TC, LDL and VLDL[11]. They also reported that HDL levels were found to be increased in normal pregnant women compared to GDM. But there was no significant difference in HDL levels between both groups in the present study. In a contrary to the above studies, they have also found no significant difference in lipid profile between the GDM group and control group[12].

The probable pathogenesis involved in GDM is that increase in placental hormones enhances insulin resistance which inturn causes increased lipoprotein lipase activity leading to increased lipolysis which further, leads to higher circulating levels of triglycerides, free fatty acids and lipoprotein[13]. The major destination of these lipolytic products released from maternal adipose tissue is the maternal liver. They are converted in the liver into acyl-CoA and glycerol-3-phosphate, to become partially re-esterified for the synthesis of triglycerides, which are transferred to native VLDL particles and released into the circulation[7]. So, as the triglyceride levels increase, the VLDL levels increase which then leads to elevation of LDL levels. It is well known that higher maternal glucose cross the placenta to reach the fetus causing fetal hyperglycemia which leads to fetal hyperinsulinemia that results in fetal macrosomia[14]. It has also been reported that hyperlipedemia predisposes to fetal macrosomia. Positive correlations between maternal basal plasma free fatty acids and triacylglycerols and birth weight have been reported in diabetic pregnancies, suggesting that lipid flux across the fetoplacental unit may contribute to macrosomia[4]. The concentrations of triglycerides has been found to be a stronger predictor of birth weight than glucose parameters[15]. Macrosomia increases the risks of shoulder dystocia, clavicle fractures, and brachial plexus injury and also depressed Apgar scores. In the pregnant women, there is an increased risk of caesarean delivery, risk of postpartum hemorrhage and vaginal lacerations[3]. The lipid abnormalities also predisposes the women to preeclampsia[16]. Studies

also have shown that these elevated lipid parameters would trigger an irreversible vascular changes putting the women at risk for cardiovascular diseases in future.

CONCLUSION:

As the concentrations of lipid parameters can predict the fetal birth weight other than the glucose parameters, an early evaluation of abnormalities in lipid parameters in women with GDM would help to reduce fetal and maternal morbidity and mortality. Hence, routine screening for lipid parameters in GDM would help in identifying fetus at risk. Earlier treatment with insulin, and diet and lifestyle modification would help in better maternal and fetal outcome.

LIMITATIONS OF THE STUDY:

1.Small sample size and cross-sectional nature of the study**.**

2.Needs followup study to find the fetal and maternal outcomes

REFERENCES

1. Leveno K, Bloom S, Hauth J, Rouse D, Cunningham F. Diabetes. Williams Obstetrics. 23rd edition. New York: McGraw-Hill, Medical Pub.Division; 2010. p. 1104–25.
2. Seshaiah V, Ganesan VS, Harinarayanan CV, Balaji V, Balaji M. Classification and Diagnosis of Diabetes Mellitus.Hand book of Diabetes Mellitus. 2nd ed. New Delhi: All India publishers And Distributors; 2004. p.14–16.
3. Mudaliar AL, Krishna Menon MK. Diabetes in Pregnancy. In: Gopalan S, Jain V, editors. Clinical Obstetrics. 11 th ed. Hyderabad: Universities Press (India) Private Limited; 2011. p. 48, 258 –262.
4. Butte NF. Carbohydrate and lipid metabolism in pregnancy :normal compared with gestational diabetes mellitus. American Journal of Clinical Nutrition, 2000. *71*(5), p 1256– 1261
5. Kjos SL, Buchanan TA,Montoro M, Coulson A, Mestman JH . Serum lipids within 36 months of delivery in women with recent gestational diabetes. Diabetes 1991. P 40, 142 -146
6. Seshaiah V. Fifth National Conference of diabetes in Pregnancy study group, India, Kolkata. J Assoc Physicians India; 2010; May 58, p 329 -330.
7. D.S. Mshelia and A.A. Kullima (October 3rd 2012). The Importance of Lipid and Lipoprote in Ratios in Interpretetions of Hyperlipidaemia of Pregnancy, Lipoproteins - Role in Health and Diseases, Sasa Frank and Gerhard Kostner, IntechOpen, DOI: 10.5772/46064. Available from: https://www.intechopen.com/books/lipoproteins-role-in-health-and-diseases/the-importance-of-lipid-and-lipoprote-in-ratios-in-interpretetions-of-hyperlipidaemia-of-pregnancy
8. Khan R, Khan Z, Ahmad T, & Ali K.. Lipid profile and glycosylated hemoglobin status of gestational diabetic patients and healthy pregnant women. Indian Journal of Medical Sciences; 2012 ; *66*(7), 149
9. Ryckman K, Spracklen C, Smith C, Robinson J, & Saftlas A. Maternal lipid levels during pregnancy and gestational diabetes: a systematic review and meta-analysis. *BJOG:* An InternationalJournalofObstetrics&Gynaecology.2015;*122*(5),643–651. http://doi.org/10.1111/1471-0528.13261

10. McGrowder D, Grant K., Irving R., Gordon L, Crawford T., Alexander-Lindo, R., & Pena Fraser, Y. Lipid Profile and Clinical Characteristics of Women with Gestational Diabetes Mellitus and Preeclampsia. Journal of Medical Biochemistry;2009. *28*(2)
11. Asare-Anane H., Bawah A, Osa-Andrews B, Adanu R., Ofori E, Bani S, Nyarko A. Lipid profile In Ghanaian Women with gestational diabetes mellitus. International Journal of Scientific and Technology ;2013; *2*(4), 168–175
12. Ghafoor S, Shaikh AW, Shaheena. Maternal lipids in pregnancies with Gestational diabetes mellitus; PJMHS 2012;6(1),p 81-84
13. Metzger BE. Biphasic Effects of Maternal Metabolism on Fetal Growth; Quintessential Expression of Fuel-Mediated Teratogenesis. Diabetes;1991;*40*(Supplement 2), 99–105
14. Donald, I. Diabetes mellitus. In R. Misra (Ed.), Practical obstetric problems. New Delhi: B.I Publications;2007. 6th edition, p. 127–147
15. Schaefer-Graf, U. M., Graf, K., Kulbacka, I., Kjos, S. L., Dudenhausen, J., Vetter, K., & Herrera, E. Maternal Lipids as Strong Determinants of Fetal Environment and Growth in Pregnancies With Gestational Diabetes Mellitus. Diabetes Care;2008. *31*(9), 1858–1863
16. McGrowder, D., Grant, K., Irving, R., Gordon, L., Crawford, T., Alexander-Lindo, R., & Pena Fraser, Y. Lipid Profile and Clinical Characteristics of Women with Gestational Diabetes Mellitus and Preeclampsia. Journal of Medical Biochemistry; 2009.*28*(2)

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