



Study on Lipid Profile in Gestational Diabetic Patient and Normal Pregnant Women

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Abstract

Background: Gestational diabetes mellitus (GDM) is defined as any degree of glucose intolerance with onset or first recognition during pregnancy. Exposure of the fetus to maternal hyperglycemia can cause fetal malformations, as well as affecting fetal growth and glycemic regulation. GDM is also associated with considerable adverse outcomes for the mother and offspring in the short and long term.

Objective: The purpose of the study was to determine the changes in plasma lipids during pregnancy complicated by diabetes (Gestational diabetes mellitus) compared with non-diabetic pregnancy.

Methodology: This case control study was conducted in the department of Obstetrics and Gynaecology and outpatient department of BIRDEM and some selected private clinics from February 2016 to February 2017. A total 212 pregnant women were included in this study. The total number of subjects were divided into two groups. Group I consisted of 102 normal healthy pregnant women and 110 pregnant women who were diagnosed as GDM were listed in Group II. Gestational diabetes mellitus was diagnosed on the basis of a 2 sample OGTT (fasting and 2 hours after 75 g Oral glucose) following the WHO criteria as adapted in BIRDEM. Data were analyzed using statistical package for social science (SPSS) for windows version 20.

Results: Fasting plasma glucose levels and plasma glucose levels 2 hours after 75 gm oral glucose administration were significantly higher in patients with gestational diabetes as compared to controls (5.70 ± 1.5 vs 3.98 ± 0.61 and 8.72 ± 1.31 vs 5.75 ± 0.89). Triglycerides level was increased significantly in gestational diabetes mellitus (GDM) group than normal healthy pregnant women (210 vs 188.5) respectively (P value 0.01). There was also significant rise of LDL- Cholesterol level in GDM group compared with normal group (124.2 vs 114.0, $P=0.042$) But HDL-cholesterol was significantly lower in GDM women than normal healthy pregnant women (38.0 vs 41.0, $P=0.026$).

Conclusion: This study showed both triglycerides and LDL level were significantly elevated among women with GDM compared to those without GDM. On the otherhand HDL level decreased significantly in GDM subjects. These changes may have important implications for the development of atherosclerosis and long term cardiovascular health of women with diabetes.

Keywords: Gestational diabetes mellitus, Hyperlipidemia, Hemoglobin A1c.

Introduction

Gestational Diabetes Mellitus is “Carbohydrate intolerance of variable severity with the onset and first recognition during the present pregnancy”¹. It is a controversial clinical entity believed to be unmasking of a compensated metabolic abnormality characterized by relative insulin deficiency and increased insulin resistance. Moderate increase in blood glucose level particularly following ingestion of meal and changes in the levels of circulating free fatty acids, triglycerides, cholesterol and phospholipids. Diabetes is estimated to complicate 2-5% of all pregnancies of which 90% of those are detected during pregnancy i.e. Gestational Diabetes Mellitus and the rest are overt or pre-gestational i.e., Type 1 or Type 2 diabetes.^{1,2}

Gestational diabetes is associated with adverse maternal and neonatal outcome. These adverse outcome include increased likelihood of abortion, preterm birth, cesarean delivery, macrosomia, congenital abnormalities, pre-eclampsia, and hypertension and complications of infants of diabetic mother. The frequency of congenital malformation is 6-10%. Alteration in lipid profile is known to occur in gestational diabetes. Women with gestational diabetes have a significant risk of long-term morbidity and mortality due to cardiovascular disease (CVD), with heart disease being the leading cause of death³. This is a growing concern as women with GDM are increased risk of developing diabetes postpregnancy, in addition to hypertension, hyperlipidemia and coronary heart disease³⁻⁵.

Traditionally, gestational diabetes is considered as a disorder of carbohydrate metabolism; thus blood glucose levels have become the main key player for monitoring and directing treatment during pregnancy³. This focus on glycemic metabolism ignores the important role of other potential fetal fuels such as proteins and lipid in the pathophysiology of GDM.⁴ This study is done to determine the changes of plasma lipids in pregnancy complicated by gestational diabetes and compare to normal pregnancies.

Materials and methods

This case control study was conducted in the Department of Obstetrics and Gynaecology and outpatient department of BIRDEM and some selected private clinics on the basis of availability. A total of 212 pregnant women were included in this study. The total number of subjects divided into two groups. Group I consisted of 102 normal healthy pregnant women and 110 pregnant women who were diagnosed as GDM were listed in Group II. Gestational diabetes mellitus was diagnosed on the basis of a 2 sample OGTT (fasting and 2 hours after 75 g Oral glucose) following the WHO criteria as adapted in BIRDEM. The subjects were informed and consent was taken. Subject were requested to overnight fast of at least 8-10 hours. About 10 cc of blood were collected following all aseptic precaution from the ante-cubital vein using disposable plastic syringe. Anti coagulant was added for detection of HbA1c. Glucose level of the study subjects was measured by using Glucose Oxidase method (Randox, UK). Serum total cholesterol, triglycerides and HDL cholesterol were determined by enzymatic colorimetric methods using Randox Laboratories. LDL-cholesterol was calculated according to Friedwald's formula. Data were analyzed using statistical package for social science (SPSS) for windows version 20.

Results

Table 1: Clinical characteristics of the study subjects

Variables	Group I (n=102)	Group II (n=110)	P value
Average age (years)	25.01(18-35)	25.02(18-37)	0.212
Gestational weeks	26.5(10-34)	27.0(10.34)	0.810
Parity	2.0(1-04)	3.0(1-5)	0.001
SBP (mm of Hg)	106.67±9.98	113.09±8.46	0.001
DBP (mm of Hg)	68.63±8.33	73.89±7.27	0.001
MBP (mm of Hg)	81.31±5.98	87.14±5.72	0.001

Group I: Consisted of 102 normal healthy pregnant women

Group II: Pregnant women who were diagnosed with GDM

Table 2: Glycemic and insulinemic status of the study subjects

Variables	Group I (n=102)	Group II (n=110)	P value
Fasting glucose (mmol/l)	3.98±0.61	5.70±1.5	0.001
Glucose after 2 (mmol/l)	5.75±0.89	8.72±1.31	0.001
HbA1c(%)	5.25±0.43	5.96±0.78	0.001
HOMA% B	139.1 (66.1-339.4)	141.4(34.0-464.7)	0.001
HOMA%S	124.5(49.03-299.5)	64.3(25.7-90.5)	0.001

Group I: Consisted of 102 normal healthy pregnant women

Group II: Pregnant women who were diagnosed with GDM

Table 3: Lipidemic status of the study subjects

Variables	Group I (n=102)	Group II (n=110)	P value
TG (mg/dl)	188.5 (52.0-421.0)	210.0(63.0-453.0)	0.010
Cholesterol (mg/dl)	201.5 (100.0-354.0)	200.0(142.0-326.0)	0.810
HDL(mg/dl)	41.0(23.0-73.0)	38.0(19.0-69.0)	0.026
LDL(mg/dl)	114.0(42.2-24.6)	124.2(19.0-258.2)	0.042

Group I: Consisted of 102 normal healthy pregnant women

Group II: Pregnant women who were diagnosed with GDM

Discussion

Women with GDM are at high risk of maternal and fetal complications during pregnancy. Recent studies on experimental animals points towards an important role of intrauterine metabolic environment in the development of fetal malformation associated with GDM.^{5,6} Disturbances of maternal metabolism are well known factors affecting the growth of fetus. Diabetes produces changes in maternal metabolic fuels and diabetic pregnancy is often associated with complications but the effects of maternal diabetes on lipid metabolism are unclear.⁷

The plasma lipids and lipoproteins changes in diabetic pregnancy have been studied by many researchers.^{8,9,10} Women with GDM are significantly increased risk of developing metabolic dysfunction during pregnancy including hyperlipidaemia.¹⁰

The recent study was designed to observe the changes in lipid profile and glucose tolerance in normal health pregnancy (Group-I) and GDM subject (Group-II). In this study the glucose levels

in GDM patients were significantly high ($p < 0.001$) actual levels being (5.7 ± 1.5 mmol/l) when compared to group-I (3.98 ± 0.61 mmol/l). Similarly HbA1C a glycosylated hemoglobin fraction were done to know the previous 12 weeks glycemic status of the patients and poor glycemic control in diabetic patients have generally been found to have elevated serum lipid levels.¹¹ In a study conducted by NR Kilby et al in UK¹² found that HbA1C was significantly greater in type-I diabetic mellitus than non-diabetic pregnancies being 9.6 percent and 6.8 percent respectively. Another study done by Ersanali et al.⁹ on GDM associated with fetal macrosomia showed significant higher values of HbA1C in GDM subjects when compared to non-diabetic control. Results of this study showed mean levels of HbA1C was 5.25 ± 0.43 in group-II which are significantly higher ($p = 0.001$) than group-I (5.25 ± 0.43) These results are in accordance to other studies done on same subjects by Ersanali⁹ and Kilby.¹¹

Hyperlipidemia is a common feature in normal pregnancy and consist primarily of tryglycerides with smaller rises in cholesterol.¹⁴ Total cholesterol level was studied in normal and GDM pregnancies by Sobki¹⁴ and results reported showed a trend towards being higher in diabetic patients but no significant difference were encountered. In our study total serum cholesterol was elevated in group-II when compared to control group but the result is not significant. Regarding the triglycerides (T.G) women with GDM had higher level of triglycerides (210mg/dl) than non-diabetic pregnancy(188.5mg/dl) which showed a significant difference($P=0.010$) These results are similar with all the studies consulted for lipidemia of pregnancy.^{8,13}

LDL-cholesterol also elevates in pregnancy along with other lipids. A study done in by Mazukiewicz¹⁵ depicts changes in LDL-cholesterol where GDM patients failed to demonstrate significant a rise during pregnancy. Study results of Sobki¹⁴ showed non-significant rise of LDL in GDM patients when compared to

normal pregnancy. Montelongo¹³ reported significant increase in LDL-cholesterol in GDM groups in comparison of normal pregnancies.

This study also showed significant rise in plasma LDL level in GDM women compared to control group (124.2 vs 114.0 ,P=0.042) .This result did not agree with the results of Hollingsworth and Grundy¹⁶ where no significant difference was found in LDL values in GDM and normal pregnancy.

There is some evidence that not only TG and cholesterol are elevated but also the concentration of HDL-cholesterol is decreased in pregnant women. Hollingsworth studied HDL-cholesterol in GDM and values were found lower than normal pregnancy status. The result of this study also showed significantly lower (P<0.001) values of HDL in GDM group than normal pregnancy. Actual values being (41.0) and (38.0) in group-I and group-II respectively. From the above results it seems that diabetic subjects have lower HDL-cholesterol values which do not increase even under the influence of pregnancy induced hyperlipidemia.

Conclusion

This study conclusively shows that triglycerides and LDL level are significantly elevated during pregnancy in women with GDM compared to normal pregnant women. On the other hand HDL-Cholesterol level is markedly reduced in patients, which do not increase even under pregnancy induced hyperlipidemia. Estimation of lipid profile during pregnancy is strongly recommended as part of laboratory investigation so as to instill prompt management strategies to prevent deleterious effects of hyperlipidemia associated with pregnancy. Additionally, more research is needed to explore the role of dyslipidemia in pathogenesis of GDM and potential methods for treating GDM in women with elevated triglycerides during pregnancy.

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