

TO DETERMINE THE CORRELATION BETWEEN DYSLIPIDEMIA AND GLYCATED HAEMOGLOBIN IN GESTATIONAL DIABETES MELLITUS

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Abstract

Background: The aim is to determine the correlation between dyslipidemia and glycated haemoglobin in gestational diabetes mellitus. **Materials and Methods:** The study included 30 patients diagnosed with gestational diabetes mellitus (GDM) using the Diabetes in Pregnancy Study group India (DIPSI) criteria, as well as 30 pregnant women without GDM. Pregnant women were given 75 grams of anhydrous glucose, regardless of whether they had fasted or not. If a woman's blood glucose level was equal to or more than 140 mg/dl after 2 hours, she would be diagnosed with gestational diabetes mellitus (GDM). The Clinical Chemistry laboratory will collect approximately 3 ml of fasting serum samples and 1 ml of whole blood samples for the estimation of fasting glucose using the GOD-POD method. Additionally, 2-hour post glucose levels and HbA1c will be estimated using the HPLC method. The Lipids profile will be estimated using a fully automated IFCC approved clinical chemistry analyzer. The Friedewald formula (FF) calculates VLDL-C by dividing TG by 5. **Result:** There was a statistically significant difference in total cholesterol levels ($p = 0.05$), HDL ($p = 0.04$), LDL ($p = 0.04$), and 2-hour post-glucose levels ($p = 0.00$) between the GDM and control groups, with greater levels seen in the GDM group. There was no statistically significant difference seen between GDM and the ratios of lipids profiles, including HDL/LDL ($p = 0.55$), TG/LDL ($p = 0.61$), TG/HDL ($p = 0.18$), and TC/HDL ($p = 0.35$), as well as BMI ($p = 0.47$). A correlation study was conducted to examine the relationship between HbA1c levels and lipid profile, as well as their ratio, in individuals with gestational diabetes mellitus (GDM). The findings indicate that there is a positive association ($r = 0.45$) between HbA1c and LDL, whereas HDL shows a negative correlation. No link was seen between other characteristics, such as lipid ratio, and the outcomes. **Conclusion:** This research discovered a correlation between gestational diabetes mellitus (GDM) and lipid profiles in the GDM groups. Timely detection of lipid profile abnormalities mitigates the severity of maternal and neonatal problems. Early diagnosis and treatment of GDM groups would be beneficial.

INTRODUCTION

Gestational diabetes mellitus (GDM) presents substantial health hazards for both the mother and the child. It is defined by a reduced ability to tolerate glucose, which is initially seen during pregnancy.^[1-3] The worldwide incidence of this condition is on the increase, in line with the growing rates of obesity and sedentary behaviors among women in their reproductive years. Dyslipidemia and impaired glycemic control, shown by high glycated hemoglobin (HbA1c), are important variables that affect the health of both the mother and the fetus in cases of gestational diabetes

mellitus (GDM). Dyslipidemia in the context of GDM refers to alterations in lipid profiles, characterized by increased levels of triglycerides, total cholesterol, and LDL cholesterol, as well as decreased levels of HDL cholesterol.^[4] The presence of these lipid abnormalities worsens the development of insulin resistance and endothelial dysfunction, increasing the likelihood of experiencing negative pregnancy outcomes such as preeclampsia and macrosomia. Glycated hemoglobin (HbA1c) is a frequently used measure in clinical practice to assess long-term glycemic management in diabetes. It reflects the average blood glucose levels over the last 2-3 months. High

levels of HbA1c in GDM indicate inadequate glucose control and are linked to higher chances of fetal macrosomia, neonatal hypoglycemia, and cesarean delivery.^[5-7]

MATERIALS AND METHODS

This case-control research was conducted in Anugrah Narayan Magadh Medical College, Gaya, Bihar, a tertiary health care facility after clearance from the Institute Human Ethics committee and obtaining written informed consent from the study participants. Duration of study was from January 2023 to December 2023. This research was done on a sample of 60 pregnant women from a rural area. The study included 30 patients diagnosed with gestational diabetes mellitus (GDM) using the Diabetes in Pregnancy Study group India (DIPSI) criteria, as well as 30 pregnant women without GDM. Pregnant women were given 75 grams of anhydrous glucose, regardless of whether they had fasted or not. If a woman's blood glucose level was equal to or more than 140 mg/dl after 2 hours, she would be diagnosed with gestational diabetes mellitus (GDM). The research individuals belonged to the age range of 20 to 40 years. The Clinical Chemistry laboratory will collect approximately 3 ml of fasting serum samples and 1 ml of whole blood samples for the estimation of fasting glucose using the GOD-POD method. Additionally, 2-hour post glucose levels and HbA1c will be estimated using the HPLC method. The Lipids profile will be estimated using a fully automated IFCC approved clinical chemistry analyzer. The Friedewald formula

(FF) calculates VLDL-C by dividing TG by 5. Statistics Analysis: The data was examined using the statistical software tool SPSS 25. The data were provided as the mean plus or minus the standard deviation (SD). The significance between GDM and controls was determined using a student t-test for comparisons of means. The Pearson correlation test was used to assess the relationship between HbA1c and VLDL and LDL markers.

RESULTS

Following a thorough screening process, a total of 30 mothers with gestational diabetes mellitus (GDM) and an equal number of normal pregnant women were selected to participate in this research. The biochemical characteristics of the research groups are shown in Table 1. There was a statistically significant difference in total cholesterol levels ($p = 0.05$), HDL ($p = 0.04$), LDL ($p = 0.04$), and 2-hour post-glucose levels ($p = 0.00$) between the GDM and control groups, with greater levels seen in the GDM group. The levels of HDL drop in the group with gestational diabetes mellitus (GDM) compared to the group with normal pregnancy, however this difference is not statistically significant. The HbA1c values of pregnant women with GDM were shown to have statistical significance ($p = 0.05$). There was no statistically significant difference seen between GDM and the ratios of lipids profiles, including HDL/LDL ($p = 0.55$), TG/LDL ($p = 0.61$), TG/HDL ($p = 0.18$), and TC/HDL ($p = 0.35$), as well as BMI ($p = 0.47$).

Table 1: Mean and standard deviation of biochemical parameters in GDM.

Parameters	Non GDM (Mean \pm SD)	GDM (Mean \pm SD)	'p' value
Weeks	26.03 \pm 1.21	26.83 \pm 1.20	0.23
Fasting glucose (mg/dL)	72.87 \pm 6.95	74.41 \pm 8.54	0.32
Age	27.22 \pm 2.84	28.53 \pm 3.73	0.39
BMI	25.98 \pm 4.25	25.32 \pm 4.40	0.47
DIPSI (mg/dL)	162.34 \pm 10.03	120.14 \pm 10.23	0.00*
HbA1c%	5.10 \pm 0.5	6.58 \pm 1.11	0.05*
Total Cholesterol mg/dL	179.67 \pm 38.55	143.35 \pm 30.77	0.05*
Triacylglycerol mg/dL	173.74 \pm 40.72	183.56 \pm 37.64	0.35
HDL mg/dL	73.31 \pm 23.21	62.20 \pm 19.51	0.04*
LDL mg/dL	78.45 \pm 36.63	95.03 \pm 28.30	0.04*
VLDL	35.12 \pm 7.62	41.08 \pm 7.66	0.00*
HDL/LDL ratio	1.50 \pm 0.54	1.56 \pm 0.52	0.55
TG/LDL ratio	2.28 \pm 0.47	2.57 \pm 0.79	0.61
TG/HDL ratio	2.67 \pm 0.6	3.78 \pm 1.03	0.18
TC/HDL ratio	2.95 \pm 0.7	3.47 \pm 0.87	0.35

Table 2: The relationship between glycemic status and lipid profiles. A Pearson correlation analysis was conducted to determine the link between HbA1c and lipid profile in group 1 (GDM). The results indicated a positive correlation between HbA1c and LDL ($r = 0.36$), and a negative correlation between HbA1c and HDL ($r = -0.34$). There was no correlation seen among other markers.

HbA1c Vs	Biochemical Markers	r value	p value
	Total Cholesterol	0.488**	0.02
	TGL	0.02	0.65
	HDL	-0.344*	0.06
	LDL	0.45	0.02
	TC/HDL	0.20	0.29
	TGL/HDL	-0.07	0.65
	LDL/HDL	0.26	0.28

**Correlation is significant at the 0.01 level (2-tailed); *Correlation is significant at the 0.05 level (2-tailed).

A correlation study was conducted to examine the relationship between HbA1c levels and lipid profile, as well as their ratio, in individuals with gestational diabetes mellitus (GDM). The findings indicate that there is a positive association ($r = 0.45$) between HbA1c and LDL, whereas HDL shows a negative correlation. No link was seen between other characteristics, such as lipid ratio, and the outcomes. The results may be found in [Table 2].

DISCUSSION

The lipid profile and diabetes have been shown to be significant predictors of metabolic abnormalities, such as dyslipidemia, hypertension, and cardiovascular illnesses.^[7] The deviations in carbohydrate metabolism reported in gestational diabetes mellitus (GDM) may have an impact on other metabolic processes, particularly lipid metabolism. This research aimed to evaluate the changes in lipid profile in women with normal pregnancy and gestational diabetes mellitus (GDM), since insulin resistance is a key issue in the majority of GDM patients.^[8] The current research has shown that the levels of TC ($p = 0.05$), HDL ($p = 0.04$), LDL ($p = 0.04$), and VLDL ($p = 0.00$) are significantly elevated in the GDM groups, indicating a statistically significant difference. The GDM groups showed a statistically significant drop in HDL levels compared to the control groups ($p = 0.04$). According to Fredrick et al., Michel et al found that individuals with type 2 diabetes mellitus have a significant increase in total cholesterol (TC) levels and a decrease in high-density lipoprotein (HDL) levels. Our investigation has shown comparable findings, with the exception of TC, where LDL levels were notably increased. There were no significant differences in the HDL/LDL ratio ($p = 0.55$), TG/LDL ratio ($p = 0.61$), TG/HDL ratio ($p = 0.18$), and TG/HDL ratio ($p = 0.35$) between patients with gestational diabetes mellitus (GDM) and normal pregnant women. These findings align with the experiments conducted by Kalpana et al. The lipid profiles show a little rise, which may be attributed to the heightened oxidation of free fatty acids. This leads to higher quantities of acetyl CoA, which in turn surpasses the capacity of the liver's TCA cycle. Acetyl CoA is subject to regulation in the production of cholesterol, fatty acids, and triglycerides.^[9] The results of our investigation have shown a strong association between HbA1c levels and lipid profiles in the GDM groups. The study conducted by Samatha et al. demonstrates a significant association between HbA1c and different lipid profiles. Barbara V. Howard et al. in 1984 and James S. Reitman et al. have reported their findings.^[10] However, Baker et al. have noted a different discovery, where no link was found between the two groups. Schaefer-Graf et al. found

evidence that there is a substantial correlation between levels of triglycerides in the blood of pregnant women with gestational diabetes mellitus and improper development of the fetus.^[11,12] Which primarily increase the amounts of triglyceride synthesis, free fatty acids, and glucose. Our research demonstrates that the levels of TG (triglycerides) are significantly greater in the GDM (gestational diabetes mellitus) groups compared to the control groups. Insulin resistance and type 2 diabetes mellitus are linked to a group of interconnected abnormalities in lipid metabolism. These abnormalities include high levels of triglycerides, low levels of HDL cholesterol, and an abundance of LDL cholesterol particles.^[13] Furthermore, Bartha and colleagues found that the levels of total cholesterol and triglycerides in mothers were comparable between those with gestational diabetes mellitus (GDM) and those with a normal pregnancy. The results of our investigation indicate the presence of dyslipidemia in women with gestational diabetes mellitus. The majority of research have shown a statistically significant association between HbA1c levels and GDM categories. The current research report demonstrates that there is a statistically significant association between HbA1c and GDM ($P = 0.05$). The most reliable indicator in people with Diabetes is HbA1c, which is more predictive than fasting glucose levels and postprandial glucose levels. The number is 14. C. Capula et al. shown that HbA1c levels are a reliable indicator of negative pregnancy outcomes. The research was limited by a small sample size and the need to assess insulin resistance indicators in Gestational diabetes mellitus.^[14]

CONCLUSION

This research discovered a correlation between gestational diabetes mellitus (GDM) and lipid profiles in the GDM groups. Timely detection of lipid profile abnormalities mitigates the severity of maternal and neonatal problems. Early diagnosis and treatment of GDM groups would be beneficial.

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