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ORIGINAL ARTICLE

Plasma Lipid and Lipoprotein Concentrations in Pregnancy Induced Hypertension

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ABSTRACT

Background and aim: Variation in serum lipid profile is associated with hypertension. Abnormal lipid profile directly affects the endothelial dysfunction and significantly associated with atherosclerotic cardiovascular diseases. Hypertension is the pregnancy toxaemia associated key feature which is considered to be caused by vasospastic phenomena in placenta, kidney, brain, and uterus. The current study aimed to assess plasma lipid and lipoprotein concentrations in pregnant women with hypertension (PIH).

Methods: This study was conducted on 66 (36 PIH cases, 30 control cases) age matched women in the Department of Obstetrics and Gynecology, Moulvi Ameer Shah Memorial Hospital, Peshawar from October 2021 to June 2022. The criteria for preeclampsia were proteinuria, and proteinuria after pregnancy, hypertension, edema, and reversal of hypertension. Subjects' fasting venous blood samples were collected. Plasma was isolated from heparine anticoagulated blood. In a preservative bottle (500 mg/1000 mL urine) of Na2B4O7, urine was collected after 24 hours. Urine and plasma were kept at -80°C until the assay. Total cholesterol levels, HDL-C, and triglyceride were enzymatically measured. The amount of spectrophotometric and malondialdehyde was measured for plasma lipid peroxidation. SPSS version 26 was used for data analysis.

Results: There was a significant increase in proteinuria, mean diastolic, and systolic pressure of preeclampsia patients than the control group. Total triglyceride, malondialdehyde (MDA), low density lipoprotein cholesterol (LDL-C), and apolipoprotein B (apo-B) in a study group were significantly higher as compared to control. Whereas the study group had lower high density lipoprotein cholesterol (HDL-C) than that of control group. The total cholesterol concentration, plasma protein, gestational age, apo-A, and hemoglobin had no statistical significance in both groups.

Conclusion: The present study suggested that abnormal lipid metabolism, high triglycerides, specifically LDL-C and lipid peroxides, and low HDL-C concentrations, may lead to the vascular dysfunction and preeclampsia is associated with oxidative stress. There are only minor differences in lipoprotein concentrations and serum lipid between PIH women and women with uncomplicated pregnancy.

Keywords: Plasma lipid, Lipoprotein concentration, Pregnancy-induced hypertension

INTRODUCTION

Severe physiological hyperlipidemia contributes to pregnancy in humans. Cholesterol and Serum triglyceride (TG) levels rise steadily during pregnancy. Gestational hormones are thought to mediate these changes [1-3]. Pregnancy-induced hypertension (PIH) and related disorders lead to various organ functional impairment involved in lipoprotein and lipid metabolism, predominantly kidneys and liver [2]. Numerous studies have been conducted on determining the physiological pregnancy-associated hyperlipidemia affected by hypertensive pregnancy [3, 4]. Edema, vasospasm, and proteinuria characterized the hypertensive pregnancy disorder usually referred to preeclampsia, which in turn causes neonatal and maternal mortality and morbidity [5, 6]. Factors such as hypertension, increased oxidative stress, multiple gestation, renal disease, and molar pregnancy have been associated with preeclampsia [7, 8]. Additionally, preeclampsia pathogenesis includes endothelial dysfunction and cell injury [9].

Endothelial function is directly affected by serum lipids. Lipid peroxides are naturally found in lipoproteins and appear to alter vascular tone via boosting arachidonic acid enzymatic pathways [10, 11]. Physiologic hyperlipidemia is related to pregnancy. This trait is not atherogenic in normal pregnancy and is thought to be under hormonal control [12]. Though there is little unanimity in the literature addressing HDL-C and LDL abnormalities in preeclampsia, implying that aberrant lipid metabolism is a symptom of preeclampsia, it actively implicated its etiology [13]. MDA, a plasma-detectable lipid peroxide metabolite, was utilized as a lipid peroxidation indicator [14, 15]. Thus, aberrant lipid metabolism appears to have a significant role in pregnancy-induced hypertension (PIH) pathophysiology. Clearly, the association between serum lipid profile and gestational proteinuric hypertension is strongly indicated to represent some novel diagnostic methods. Furthermore, hormonal imbalance is a major component in the etiology of PIH, and this endocrinal imbalance is strongly represented in changes in serum lipid profile.

METHODOLOGY

This study was conducted on 66 (36 PIH cases, 30 control cases) age matched women in the Department of Obstetrics and Gynecology, Moulvi Ameer Shah Memorial Hospital, Peshawar from October 2021 to June 2022. The criteria for preeclampsia were proteinuria, and proteinuria after pregnancy, hypertension, edema, and reversal of hypertension. Subjects' fasting venous blood samples were collected. Plasma was isolated from heparin anticoagulated blood. In a preservative bottle (500 mg/1000 mL urine) of Na2B4O7, urine was collected after 24 hours. Urine and plasma were kept at -80°C until the assay. Total cholesterol levels, HDL-C, and triglyceride were enzymatically measured. The amount of spectrophotometric and malondialdehyde was measured for plasma lipid peroxidation. The findings are reported as mean SEM values. To determine statistical significance, an independent t-test was utilized. A p-value of 0.05 was considered statistically significant. For statistical studies, the SPSS 26 was employed.

RESULTS

There was a significant increase in proteinuria, mean diastolic, and systolic pressure of preeclampsia patients than the control group. Total triglyceride, malondialdehyde (MDA), low density lipoprotein cholesterol (LDL-C), and apolipoprotein B (apo-B) in a study group were significantly higher as compared to control. Whereas the study group had lower high density lipoprotein cholesterol (HDL-C) than control. The total cholesterol concentration, plasma protein, gestational age, apo-A, and hemoglobin had no statistical significance in both groups. Clinical characteristics of both

preeclampsia and control cases are compared in Table-I. Table-II shows the comparison of lipoprotein concentrations and plasma lipids in preeclampsia patients and controls.

Table-1: Comparison of clinical characteristics of both preeclampsia and control cases

Clinical characteristics	PIH (N=36)	Control (N=30)	P-value
Age (yrs.)	29.62± 1.14	27.53 ± 0.94	NS
Birth weight (g)	2468 ±50.6	3234 ±53.8	< 0.01
Gestational age (wks.)	36.8 ± 1.6	37.9 ±1.04	NS
SBP (mm Hg)	155 ±4.7	120 ± 3.7	< 0.001
DBP (mm Hg)	105 ± 3.1	78±2.1	< 0.001

Table-2: comparison of lipoprotein concentrations and plasma lipid in preeclampsia patients and controls

lipoprotein concentrations and plasma lipid	PIH group N=36	Control group N=30	P-value
Hemoglobin	127 ±3.1	118 ± 2.9	NS
Plasma protein	67.4 ± 1.5	69.4±1.2	NS
Proteinuria	429 ± 36	71 ±6.6	<0.000
Triglyceride	3.08±0.21	2.68±0.14	< 0.03
Total cholesterol	6.38±0.36	5.78±0.36	NS
HDL-C	0.86 ±0.05	1.12 ± 0.06	<0.001
LDL-C	4.39±0.36	3.37±0.21	<0.0001
Apo-A1	1.21 ± 0.06	1.29 ± 0.05	NS
Apo-A1	1.06 ± 0.07	0.92 ± 0.06	<0.05
MDA	3.81 ±0.72	2.54±0.53	<0.001

DISCUSSION

The present study mainly investigated the plasma lipid and lipoprotein concentration in pregnancy induced hypertension and found that anomalies in lipid metabolism, high triglyceride levels, and low HDL-C levels, might all increase the vascular dysfunction. Lipoprotein concentrations and blood lipid levels alter relatively little between PIH and simple pregnant women. The present study revealed that Proteinuria, mean diastolic and systolic pressure were considerably greater in preeclampsia patients than in the control group. Total triglycerides, malondialdehyde (MDA), low density lipoprotein cholesterol (LDL-C), and apolipoprotein B (apo-B) levels were considerably higher in study group compared to the control group. In contrast, the study group exhibited lower levels of high density lipoprotein cholesterol (HDL-C) than the control group. Total cholesterol, plasma protein, gestational age, apo-A, and hemoglobin levels were not statistically significant in either group.

PIH patients were often hospitalized as an emergency. In several situations, drug therapy had already begun prior to blood samples that acquired lipid analysis. It is well recognized that antihypertensive affects lipoprotein concentrations and blood lipid. Though, in pre-treated instances, the medications had only been delivered, and the indications of PIH remained. Whole serum T G and, in particular, T R L - T G levels, on the other hand, show a significant postprandial rise. In a research including emergency cases, standardized blood samples following a 12-hour overnight fast was not possible. As a result, the validity of the total serum T G and T R L - T G values found in this investigation is restricted, and statistical analysis for these parameters was ignored [16-18].

Endothelial dysfunction in preeclampsia may be caused by oxidative stress as well as dyslipidemia. Many distinct enzymatic activities can produce free radicals. These are very active and create lipid peroxides with significantly longer half-lives by reaction with polyunsaturated fatty acids [19-21].

MDA increased levels discovered and have comparable outcomes to those identified in earlier studies [22, 23]. This MDA rise is tightly linked to induced oxidative stress that leads to lipid peroxidation, and it is likely to have an impact on a variety of organ systems and tissues. Oxidative stress on accessing certain limits, cellular damage occurs including cellular membranes structural damage, enzyme functioning impairment, and nuclear DNAs.

In the current investigation, apo-B concentrations were as high as LDL-C in the preeclamptic group. However, apo A1 levels and HDL were not contemporaneous. HDL levels were observed to be considerably lower in the preeclamptic group, although apo A1 levels remain stable significantly [24, 25].

In preeclampsia, the lipid peroxides production in preeclampsia is thought to begin in the placenta [26]. This might be due to ischemia and inflammatory processes during the interphase fetomaternal. Bartels et al, [27] suggests numerous cell death during cell cycles and reendothelization. Endothelial cell activation or damage has been demonstrated to cause the leukocytes activation lipid-laden foam cells creation, and platelets either directly or indirectly. As a result, our findings support the hypothesis that increases in maternal circulating lipids may contribute to suboptimal placental implantation and/or decreased placental perfusion in early pregnancy.

CONCLUSION

The present study suggested that abnormal lipid metabolism, high triglycerides, specifically LDL-C and lipid peroxides, and low HDL-C concentrations, may leads to the vascular dysfunction and preeclampsia is associated with oxidative stress. There are only minor differences in lipoprotein concentrations and serum lipid between PIH women and women with uncomplicated pregnancy.

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