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Original Research Article

COMPARATIVE STUDY OF LIPID PROFILE IN PREECLAMPTIC AND NORMOTENSIVE PREGNANT WOMEN: A CASE-CONTROL STUDY

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ABSTRACT

Background: Preeclampsia is a pregnancy-specific hypertensive disorder associated with maternal and fetal morbidity and mortality. Altered lipid metabolism has been suggested to play an important role in endothelial dysfunction and the pathogenesis of preeclampsia. **Aim:** To evaluate and compare the lipid profile parameters among preeclamptic pregnant women and normotensive pregnant women.

Materials and Methods: This hospital-based case-control study included 150 pregnant women attending the Department of Obstetrics and Gynaecology. Among them, 100 pregnant women diagnosed with preeclampsia were included as cases, while 50 normotensive pregnant women were included as controls. Serum triglycerides (TG), total cholesterol (TC), and high-density lipoprotein cholesterol (HDL-C) levels were analyzed and compared between the two groups. Statistical analysis was performed using mean ± standard deviation, Student's t-test, and p-value analysis. A p-value <0.05 was considered statistically significant.

Results: The mean age of preeclamptic women was 29.04 ± 4.8 years, while the mean age of controls was 28.73 ± 4.5 years. The mean serum triglyceride level in preeclamptic women was significantly higher (293.01 ± 68.4 mg/dL) compared to controls (190.41 ± 42.3 mg/dL). Mean total cholesterol was also elevated in cases (253.13 ± 29.6 mg/dL) compared to controls (203.96 ± 24.1 mg/dL). HDL cholesterol was significantly lower in preeclamptic women (41.71 ± 5.9 mg/dL) than in controls (61.18 ± 7.2 mg/dL). The differences were statistically significant ($p<0.001$).

Conclusion: Preeclamptic pregnant women demonstrated significant dyslipidemia characterized by elevated triglycerides and total cholesterol with reduced HDL cholesterol. Lipid abnormalities may contribute to endothelial dysfunction and disease progression in preeclampsia. Early assessment of lipid profile during pregnancy may help identify women at increased risk for preeclampsia.

Keywords: Preeclampsia, lipid profile, triglycerides, total cholesterol, HDL cholesterol, pregnancy, dyslipidemia.

INTRODUCTION

Preeclampsia is a multisystem hypertensive disorder of pregnancy and remains one of the leading causes of maternal and perinatal morbidity and mortality worldwide. It is characterized by the onset of hypertension and proteinuria after 20 weeks of gestation in a previously normotensive woman and may progress to serious complications such as eclampsia, HELLP syndrome, placental abruption, fetal growth restriction, renal failure, and maternal death. The global prevalence of preeclampsia ranges from 2–8% of all pregnancies and continues to represent a major public health concern, particularly in developing countries.[1,2]

The exact etiopathogenesis of preeclampsia remains incompletely understood; however, abnormal placentation, endothelial dysfunction, oxidative stress, inflammatory responses, and metabolic disturbances are considered central mechanisms involved in disease development.[3,4] During normal pregnancy, physiological hyperlipidemia occurs to meet the increasing nutritional and metabolic demands of the growing fetus and placenta. Nevertheless, exaggerated alterations in lipid metabolism may contribute to vascular endothelial injury and impaired placental perfusion, thereby predisposing pregnant women to hypertensive disorders.[5,6]

Several investigators have demonstrated a strong association between dyslipidemia and preeclampsia. Elevated serum triglycerides and total cholesterol along with decreased high-density lipoprotein cholesterol (HDL-C) have frequently been reported among women with preeclampsia.[7-10] Hypertriglyceridemia promotes lipid peroxidation and oxidative stress, leading to endothelial dysfunction and increased vascular sensitivity to vasoconstrictors.[11] In addition, low HDL cholesterol reduces antioxidant protection and impairs endothelial repair mechanisms, thereby worsening vascular damage.[12]

Previous studies by Enquobahrie et al., Belo et al., Clausen et al., and Gohil et al. observed significant alterations in maternal lipid profiles among preeclamptic women when compared with normotensive pregnant women.[5-8] Spracklen et al. further demonstrated through meta-analysis that maternal hyperlipidemia is significantly associated with increased risk of developing preeclampsia.[10] These findings suggest that lipid abnormalities may not only accompany preeclampsia but may also participate in its pathogenesis.

Therefore, the present study was undertaken to evaluate serum lipid profile parameters in preeclamptic pregnant women and compare them with normotensive pregnant women in order to better understand the role of dyslipidemia in the development of preeclampsia.

MATERIALS AND METHODS

Study Design

Hospital-based observational case-control study.

Study Setting

The study was conducted in the Department of Obstetrics and Gynaecology in collaboration with the Department of Biochemistry.

Study Duration

The study was conducted over a period of 12 months.

Study Population

Pregnant women attending antenatal clinics and admitted to the obstetrics ward were included in the study.

Sample Size

A total of 150 pregnant women were enrolled.

- Cases: 100 pregnant women diagnosed with preeclampsia
- Controls: 50 normotensive pregnant women

Inclusion Criteria

Cases

- Pregnant women diagnosed with preeclampsia after 20 weeks of gestation
- Blood pressure ≥140/90 mmHg
- Presence of proteinuria

Controls

- Normotensive pregnant women
- Singleton pregnancy
- Age-matched healthy pregnant women

Exclusion Criteria

- Chronic hypertension
- Diabetes mellitus
- Renal disease
- Thyroid disorders
- Liver disease
- Multiple pregnancy
- Women with pre-existing dyslipidemia

Data Collection

Detailed history, clinical examination, and laboratory investigations were performed. Venous blood samples were collected under aseptic precautions.

Biochemical Parameters Assessed

- Serum triglycerides (TG)
- Total cholesterol (TC)
- HDL cholesterol (HDL-C)

Statistical Analysis

Data were entered into Microsoft Excel and analyzed using SPSS software version 25. Quantitative variables were expressed as mean ± standard deviation. Student's t-test was used for comparison between groups. A p-value <0.05 was considered statistically significant.

RESULTS

Table 1: Demographic Characteristics of Study Participants

Parameter	Cases (n=100)	Controls (n=50)
Mean Age (years)	29.04 ± 4.8	28.73 ± 4.5
Rural Residence	68%	64%
Urban Residence	32%	36%

Table 2: Comparison of Lipid Profile between Cases and Controls

Lipid Parameter	Cases (Mean ± SD)	Controls (Mean ± SD)	p-value
Triglycerides (mg/dL)	293.01 ± 68.4	190.41 ± 42.3	<0.001
Total Cholesterol (mg/dL)	253.13 ± 29.6	203.96 ± 24.1	<0.001
HDL Cholesterol (mg/dL)	41.71 ± 5.9	61.18 ± 7.2	<0.001

The present study demonstrated significantly elevated serum triglyceride and total cholesterol levels among preeclamptic women compared to normotensive pregnant women. HDL cholesterol levels were significantly lower in the preeclamptic group.

These findings indicate the presence of dyslipidemia in preeclampsia and suggest its possible role in disease pathogenesis.

DISCUSSION

Preeclampsia is a complex multisystem disorder characterized by abnormal placentation, endothelial dysfunction, oxidative stress, and systemic inflammatory responses. Altered lipid metabolism has been increasingly recognized as an important contributing factor in the pathogenesis of the disease. The present study demonstrated significant dyslipidemia among preeclamptic pregnant women, evidenced by elevated serum triglycerides and total cholesterol levels along with significantly reduced HDL cholesterol levels compared with normotensive pregnant women.

The mean serum triglyceride concentration was significantly higher in preeclamptic women than in controls. Similar findings have been reported by Enquobahrie et al., Clausen et al., and Mikhail et al., who observed marked hypertriglyceridemia among women with preeclampsia.[5,7,12] Elevated triglyceride levels during pregnancy may enhance the formation of small dense low-density lipoprotein particles and increase lipid peroxidation, leading to endothelial cell injury and vascular dysfunction. Increased circulating triglycerides may also accumulate within uterine spiral arteries, contributing to placental ischemia and impaired uteroplacental blood flow.[2]

The present study also observed significantly increased total cholesterol levels among preeclamptic women. These findings are in agreement with studies conducted by Belo et al., Gohil et al., and Wiznitzer et al., who reported elevated cholesterol levels in hypertensive disorders of pregnancy.[6,8,11]

Increased cholesterol concentrations may aggravate oxidative stress and inflammatory responses, thereby contributing to endothelial dysfunction and vascular damage. Dyslipidemia during pregnancy has also been considered comparable to the lipid abnormalities observed in atherosclerosis, supporting the hypothesis that preeclampsia shares pathogenic mechanisms with cardiovascular disease.[9,14]

A significant reduction in HDL cholesterol levels was observed among preeclamptic women in the present study. HDL cholesterol possesses antioxidant, anti-inflammatory, and vasoprotective properties. Reduced HDL levels decrease endothelial protection and impair reverse cholesterol transport, thereby enhancing oxidative injury and endothelial dysfunction.[8,12,15] Similar reductions in HDL cholesterol have been documented in studies by Belo et al. and Gohil et al.[6,8]

The findings of the present study strongly support the concept that abnormal lipid metabolism plays a significant role in the pathophysiology of preeclampsia. Maternal dyslipidemia may contribute to endothelial injury through oxidative stress, lipid peroxidation, and vascular inflammation. These metabolic disturbances may further impair placental circulation and promote disease progression.

The present study highlights the potential clinical importance of lipid profile assessment during antenatal care. Early identification of abnormal lipid patterns may help recognize women at increased risk for developing preeclampsia and allow timely preventive and therapeutic interventions.

CONCLUSION

The present study concludes that preeclamptic pregnant women exhibit significant dyslipidemia characterized by elevated serum triglyceride and total cholesterol levels along with reduced HDL cholesterol levels when compared to normotensive pregnant women. These lipid abnormalities may contribute to endothelial dysfunction, oxidative stress, and vascular damage, thereby playing an important role in the pathogenesis and progression of preeclampsia. The findings of the study suggest that routine assessment of lipid profile during antenatal care may help in the early identification of women at increased risk for preeclampsia, allowing timely intervention and improved maternal and fetal outcomes.

Limitations of the Study

- Single-center study
- Limited sample size
- LDL and VLDL cholesterol were not evaluated
- Long-term maternal and fetal outcomes were not assessed

Recommendations

- Larger multicentric studies should be conducted.
- Lipid profile screening may be included in high-risk pregnancy evaluation.
- Early lifestyle interventions and nutritional counseling may help reduce disease severity.
- Further research is needed to evaluate the predictive value of lipid profile markers in preeclampsia.

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Conflict of Interest

The authors declare no conflict of interest.

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