



## EVALUATION OF SERUM LIPID PROFILE, URIC ACID, AND SERUM CALCIUM LEVELS AS PREDICTORS OF PREECLAMPSIA SANT BABA GURU GHASI DAS JI MEMORIAL GOVT. HOSPITAL, RAIGARH (C.G.): A CASE-CONTROL STUDY.

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**ABSTRACT** **Background:** - Preeclampsia is a multisystem hypertensive disorder of pregnancy associated with significant maternal and fetal morbidity. Early biochemical predictors may aid in timely diagnosis. **Methods:-** This hospital-based observational case-control study included 120 pregnant women (60 preeclamptic and 60 normotensive). Serum lipid profile, uric acid, and calcium levels were estimated using standard biochemical methods and compared between groups. **Results:-** Preeclamptic pregnant women showed significantly higher systolic and diastolic blood pressure ( $p < 0.001$ ). Total cholesterol, triglycerides, LDL-C, and VLDL-C were significantly elevated ( $p < 0.001$ ), while HDL-C was lower (not significant). Serum uric acid ( $p = 0.020$ ) and calcium ( $p = 0.006$ ) were significantly increased as compared to normotensive. **Conclusion:-** Altered lipid profile, elevated uric acid, and calcium levels may serve as potential biochemical markers for early identification of preeclampsia.

**KEYWORDS :** Preeclampsia, Lipid Profile, Uric Acid, Calcium.

### INTRODUCTION

Preeclampsia is a pregnancy-specific hypertensive disorder characterized by the development of hypertension with proteinuria after 20 weeks of gestation and remains a leading cause of maternal and perinatal morbidity and mortality worldwide [1]. It is a multisystem disorder involving the cardiovascular, renal, hepatic, and haematological systems, resulting in significant adverse maternal and fetal outcomes [2]. Abnormal placentation plays a central role in its pathophysiology. Inadequate remodeling of spiral arteries leads to reduced uteroplacental perfusion, placental ischemia, and hypoxia, which stimulate the release of inflammatory mediators and anti-angiogenic factors, causing endothelial dysfunction and hypertension [3].

Altered lipid metabolism has been strongly associated with preeclampsia. Women with the condition often exhibit elevated triglyceride levels, abnormal lipoprotein profiles, and increased lipid peroxidation, contributing to endothelial injury [4–6]. Elevated serum uric acid levels are also linked to disease severity and poor pregnancy outcomes, primarily due to reduced renal clearance and increased oxidative stress [7–9]. Calcium plays an essential role in vascular tone and blood pressure regulation. Reduced serum calcium levels may lead to vasoconstriction and increased blood pressure, suggesting its involvement in the development of preeclampsia [10]. Multifactorial etiology of Preeclampsia, evaluation of serum lipid profile, uric acid, and calcium levels may provide valuable insights into early prediction and disease severity. Therefore, this study aims to assess these biochemical parameters as predictors of preeclampsia among pregnant women attending a tertiary care centre.

**Aim:-** To evaluate and compare serum lipid profile, uric acid, and calcium levels in patients with Preeclampsia and normotensive pregnant women from 20 weeks of gestation until term.

### Objectives

1. To estimate serum lipid profile, uric acid, and calcium levels in patients diagnosed with Preeclampsia.
2. To estimate serum lipid profile, uric acid, and calcium levels in normotensive pregnant women.
3. To compare these biochemical parameters between preeclamptic and normotensive pregnant women.

### MATERIALS AND METHODS

#### Study Design and Setting

This hospital based observational case-control study was conducted in the Departments of Biochemistry collaborated with department of Obstetrics & Gynaecology at Sant Baba Guru Ghasi Das Ji Memorial Government Hospital, affiliated with Late Shri Lakhiram Agrawal Memorial Government Medical College, Raigarh (C.G.)

### Study Duration

The study was carried out over 18 months, from April 2024 to September 2025.

### Study Population

A total of 120 pregnant women with gestational age  $\geq 20$  weeks were enrolled and divided into two groups:

- Cases ( $n = 60$ ): Women diagnosed with Preeclampsia
- Controls ( $n = 60$ ): Normotensive pregnant women

### Eligibility Criteria

**Inclusion Criteria:** Pregnant women aged 21–30 years, gestational age  $\geq 20$  weeks, and BMI 18.5–24.9 kg/m<sup>2</sup>.

**Exclusion Criteria:** History of chronic hypertension, diabetes mellitus, renal or systemic diseases, antepartum haemorrhage, or unwillingness to participate.

### Ethical Considerations

The study was approved by the Institutional Ethics Committee (IEC No: - 17 date 28/05/2024) of Late Shri Lakhiram Agrawal Memorial Government Medical College, Raigarh (C.G.).

### Data Collection and Sample Processing

After obtaining written informed consent, demographic and clinical details were recorded using a structured standard proforma. Under aseptic precautions, 5 mL of overnight fasting venous blood was collected from each participant. Samples were centrifuged at 3000 rpm for 5 minutes, and serum was separated for analysis of biochemical parameter lipid profile (Total Cholesterol-cholesterol oxidase & peroxidase, TG-Glycerol phosphate oxidase & peroxidase, HDL-Phosphotungstic Acid precipitation method, LDL & VLDL estimated by Friedewald equation) uric acid-uricase-peroxidase & calcium Arsenazo III by biochemical autoanalyzer with standard laboratory protocols.

### Outcome Measures

The primary outcome was comparison of serum lipid profile, uric acid, and calcium levels between cases and controls.

### Statistical Analysis

Data were entered into Microsoft Excel and analyzed using SPSS version 23. Quantitative variables were expressed as mean  $\pm$  standard deviation. The independent sample t-test was used to compare groups. A  $p$ -value  $< 0.05$  was considered statistically significant.

### RESULTS

A total of 120 pregnant women were included, comprising 60 normotensive controls and 60 cases of Preeclampsia.

**Hemodynamic Parameters:-** In this study mean systolic blood pressure (SBP) vs diastolic blood pressure (DBP) were significantly higher in the preeclampsia group compared to controls (SBP:  $167.3 \pm 12.5$  vs.  $115.0 \pm 8.4$  mmHg; DBP:  $108.5 \pm 9.1$  vs.  $75.7 \pm 6.6$  mmHg;  $p < 0.001$  for both).

**Anthropometric Parameters:-** Symphysiofundal height ( $33.5 \pm 4.1$  vs.  $31.6 \pm 3.6$  cm;  $p = 0.009$ ) and abdominal girth ( $94.8 \pm 6.5$  vs.  $89.8 \pm 6.3$  cm;  $p < 0.001$ ) were significantly higher in preeclamptic women.

**Biochemical Parameters:-** A significantly altered lipid profile was observed in the preeclampsia group, with higher levels of total cholesterol ( $255.8 \pm 37.8$  vs.  $211.2 \pm 37.7$  mg/dL), triglycerides ( $206.7 \pm 34.4$  vs.  $160.8 \pm 47.1$  mg/dL), LDL-C ( $174.3 \pm 42.8$  vs.  $136.9 \pm 41.3$  mg/dL), and VLDL-C ( $41.1 \pm 8.4$  vs.  $32.7 \pm 9.4$  mg/dL) (all  $p < 0.001$ ). HDL-C levels were lower in cases but not statistically significant ( $34.5 \pm 8.7$  vs.  $37.3 \pm 11.6$  mg/dL;  $p = 0.143$ ). Serum uric acid levels were significantly higher in the preeclampsia group ( $5.60 \pm 1.11$  vs.  $5.12 \pm 1.11$  mg/dL;  $p = 0.020$ ). Serum calcium levels were also significantly elevated in cases ( $7.90 \pm 0.71$  vs.  $7.48 \pm 0.94$  mg/dL;  $p = 0.006$ ).

**Table 1: Hemodynamic Parameters, Anthropometric Parameters of Normotensive and Preeclampsia Group:**

| Parameter               | Normotensive (n = 60) | Preeclampsia (n = 60) | p-value  |
|-------------------------|-----------------------|-----------------------|----------|
| SBP (mmHg)              | $115.0 \pm 8.4$       | $167.3 \pm 12.5$      | $<0.001$ |
| DBP (mmHg)              | $75.7 \pm 6.6$        | $108.5 \pm 9.1$       | $<0.001$ |
| Symphysis Fundal length | $31.6 \pm 3.6$        | $33.4 \pm 4.0$        | 2.60     |
| Abdominal Girth         | $89.8 \pm 6.2$        | $94.7 \pm 6.5$        | 4.23     |

**Table 2: Biochemical Parameters of Normotensive and Preeclampsia Group:**

| Parameter                 | Normotensive (n = 60) | Preeclampsia (n = 60) | p-value  |
|---------------------------|-----------------------|-----------------------|----------|
| Total Cholesterol (mg/dL) | $211.2 \pm 37.7$      | $255.8 \pm 37.8$      | $<0.001$ |
| Triglycerides (mg/dL)     | $160.8 \pm 47.1$      | $206.7 \pm 34.4$      | $<0.001$ |
| LDL-C (mg/dL)             | $136.9 \pm 41.3$      | $174.3 \pm 42.8$      | $<0.001$ |
| HDL-C (mg/dL)             | $37.3 \pm 11.6$       | $34.5 \pm 8.7$        | 0.143    |
| VLDL-C (mg/dL)            | $32.7 \pm 9.4$        | $41.1 \pm 8.3$        | $<0.001$ |
| Uric Acid (mg/dL)         | $5.12 \pm 1.11$       | $5.60 \pm 1.11$       | 0.020    |
| Calcium (mg/dL)           | $7.48 \pm 0.94$       | $7.90 \pm 0.71$       | 0.006    |

## DISCUSSION

The present study demonstrated significant alterations in hemodynamic and biochemical parameters in women with Preeclampsia, supporting its multisystem involvement and complex pathophysiology. The marked elevation in blood pressure observed in preeclamptic women reflects the fundamental pathophysiological process of systemic endothelial dysfunction. A significant atherogenic lipid profile observed in the present study, characterized by elevated total cholesterol, triglycerides, LDL-C, and VLDL-C levels, suggests enhanced metabolic dysregulation in preeclampsia. Increased circulating lipids contribute to endothelial dysfunction through oxidative modification of LDL particles, promoting vascular inflammation and atherosclerosis-like changes in placental vessels [11,12]. The significantly elevated serum uric acid levels observed in this study further support its role as a marker of disease severity. Hyperuricemia in preeclampsia is primarily due to reduced renal clearance resulting from decreased glomerular filtration rate, along with increased production secondary to oxidative stress and xanthine oxidase activation. Uric acid not only reflects renal involvement but also contributes to endothelial dysfunction by reducing nitric oxide bioavailability, thereby worsening hypertension [13,14]. These findings are consistent with earlier reports linking elevated uric acid with adverse maternal and fetal outcomes [15].

Interestingly, serum calcium levels were found to be significantly higher in preeclamptic women in the present study. This observation contrasts with several studies reporting hypocalcaemia or inverse associations with preeclampsia risk. The discrepancy may be explained by variations in dietary calcium intake, population differences, or altered protein-bound calcium fractions during pregnancy. It is also possible that transient changes in calcium homeostasis occur secondary to endothelial dysfunction and altered renal handling in preeclampsia. Despite conflicting evidence, calcium metabolism disturbances are increasingly recognized as contributing to vascular smooth muscle excitability and increased peripheral resistance [16,17]. Further large-scale studies are needed to clarify this association. Overall, the findings of this study support the concept that

preeclampsia is a multisystem disorder originating from placental dysfunction and progressing through endothelial injury, metabolic imbalance, and oxidative stress. The observed alterations in lipid profile, uric acid, and calcium suggest that these biochemical parameters may serve as useful adjuncts in early prediction and assessment of disease severity.

## CONCLUSION

The findings of the present study indicate that elevated total cholesterol, TG and LDL decreased, along with elevated serum uric acid and decreased calcium levels, reflects underlying endothelial dysfunction, oxidative stress, and useful biochemical markers for the early identification and assessment of preeclampsia severity. These biochemical parameters also helpful for better clinical management and prevention of pregnant women at risk for developing preeclampsia.

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