



Original Article

Comparative Evaluation of C-Reactive Protein, Serum Uric Acid and Lactate Dehydrogenase in Pregnancy-Induced Hypertension: A Cross-Sectional Study

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 OPEN ACCESS

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Received: 21-03-2026

Accepted: 03-04-2026

Available online: 28-04-2026

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Medical and Pharmaceutical Research

ABSTRACT

Background: Pregnancy-induced hypertension (PIH) is a major contributor to maternal and perinatal morbidity. Inflammatory and biochemical markers such as C-reactive protein (CRP), serum uric acid and lactate dehydrogenase (LDH) may help in understanding disease severity and progression.

Material And Method: This cross-sectional study was conducted in the Department of Biochemistry, Government Medical College, Kota from December 2024 to November 2025. A total of 120 pregnant women were enrolled including 60 PIH cases and 60 normotensive pregnant controls. Serum CRP, uric acid and LDH levels were measured using standard biochemical methods and statistically analyzed.

Result: Mean CRP level in PIH cases was 13.74 ± 7.53 mg/L compared with 4.87 ± 1.53 mg/L in controls. Mean serum uric acid level in PIH cases was 5.27 ± 2.53 mg/dl compared with 4.07 ± 1.06 mg/dl in controls. Mean LDH level in PIH cases was 578.68 ± 191.56 U/L compared with 481 ± 113.29 U/L in controls. All differences were statistically significant ($p < 0.05$).

Conclusion: Elevated levels of CRP, serum uric acid and LDH in PIH indicate increased inflammatory activity, endothelial dysfunction and cellular damage. These markers may help in the evaluation and monitoring of pregnancy-induced hypertension.

Keywords: Pregnancy-induced hypertension; C-reactive protein; Uric acid; Lactate dehydrogenase; Preeclampsia.

INTRODUCTION

Pregnancy is one of the important stages of woman life with blessings and noble service of nature. Though pregnancy is a normal physiological process, not a disease, the mother and foetus are susceptible to certain risks. Hypertension in pregnancy is considered to be one of the commonest problems for expectant mothers along with infection and postpartum haemorrhage. Pregnancy induced hypertension (PIH) is the onset of hypertension after 20 weeks of gestation in a previously normotensive woman.

Certain factors are considered as predisposing to PIH. It frequently affects young and nulliparous women, whereas older women are at greater risk for chronic hypertension with superimposed preeclampsia. Young women with a first pregnancy, pregnant women having age less than 20 years and those having age more than 40 years, women with multiple foetuses, pregnant diabetics, pregnant women with pre-existing hypertension or history of pre-eclampsia or PIH in previous pregnancy and pregnant women with pre-existing kidney disease are more vulnerable to PIH(1).

The etiology of preeclampsia is unknown and in fact, the entity is remarkably poorly understood. The process probably begins early or in gestation. Preeclampsia has been described as a "disease of theories". Some theories include,

endothelial cell injury, immune rejection of the placenta, compromised placental perfusion, altered vascular reactivity, imbalance between prostacyclin and thromboxane, dropped glomerular filtrations rate, dropped intravascular volume, increased central nervous system irritability, DIC, uterine muscle stretch (ischemia), genetic factors, dietary factors, including vitamin deficiency, obesity, abnormal trophoblast invasion of uterine blood vessels, maladaptation to cardiovascular changes, inflammatory changes to pregnancy, immunological tolerance between fetoplacental and maternal tissues, classic lesion of glomerular endotheliosis, vascular mediated factors are all hypothecated to play an important role in the development of this disease.

Biochemical markers play a crucial role in the early detection, monitoring, and management of preeclampsia. Among these markers, C-reactive protein (CRP), serum uric acid and lactate dehydrogenase (LDH) have gained significant attention due to their potential roles in the pathophysiology of the disease.

CRP is an acute-phase reactant produced by the liver in response to inflammation. CRP is an objective and sensitive index of overall inflammatory activity in the body. It has been suggested that CRP, in accordance with its proposed function, may play a role in eliciting the inflammatory response characteristics of preeclampsia.

Uric acid levels correlate with plasma rennin activity(2). Hyperuricemia predicts the development of hypertension in the general population(3). Elevated serum uric acid levels correlate with the severity of hypertension and the risk of adverse maternal and fetal outcomes. It serves as a useful marker for monitoring disease progression and assessing the risk of complications(4).

Elevated LDH levels in preeclamptic women indicate cellular damage and hemolysis, reflecting the severity of endothelial dysfunction and organ involvement.

MATERIAL AND METHODS

This study was carried out in the Department of Biochemistry, Government Medical College, and Central Laboratory NMCH and JK LON Hospital Kota.

STUDY DESIGN

The study design is observational cross-sectional study.

MATERIAL

Questionnaire, Blood pressure measurement, C- Reactive Protein, Serum Uric Acid, Serum LDH.

STUDY GROUP

The study comprises of 60 cases and 60 healthy controls. The subjects will be selected from antenatal clinic of attached group of hospitals.

INCLUSION CRITERIA

1. Confirmed diagnosis of PIH through blood pressure measurements.
2. Gestational age 20 weeks and above.
3. Singleton pregnancy
4. Ready to give informed and written consent to be part of study.

EXCLUSION CRITERIA

1. Women with pre-existing Essential hypertension
2. Patients with history of renal diseases, cardiac diseases and tanking treatment for these diseases.
3. Acute febrile illness.

METHODOLGY

Venous blood sample were collected from all the participants under aseptic precaution from antecubital vein by venipuncture in plain vials. Serum was separated by centrifugation at 3000 rpm for 15 minutes and subjected to following assays:

- (a) Serum Uric Acid: - by uricase/pod, end point assay.
- (b) Serum LDH: - by recommendations of DGKCH (from pyruvate).
- (c) Serum CRP: - by turbidimetric immunoassay.

OBSERVATION

Table 1: - Comparison between mean value of CRP, URIC ACID and LDH level in cases and controls.

Biochemical	Subjects	N	Mean	SD	Std. error	t-test	P value
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Parameters					mean		
CRP	Cases	60	13.74	7.53	0.97	8.94	< 0.005
	Controls	60	4.87	1.53	0.19		
S. Uric acid	Cases	60	5.27	2.53	0.32	3.389	< 0.005
	Controls	60	4.07	1.06	0.13		
LDH	Cases	60	578.68	191.56	24.73	3.4	< 0.005
	Controls	60	481	113.29	14.62		

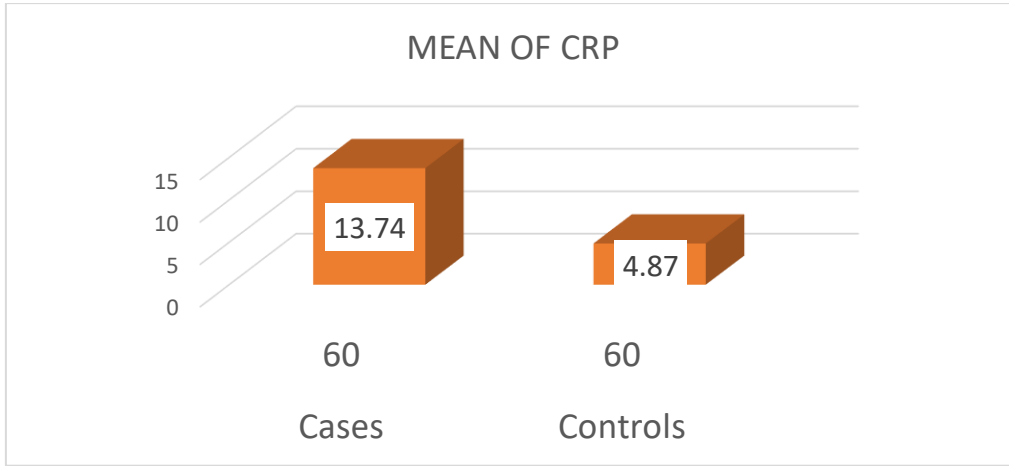


Figure 1: Mean of CRP in Cases and Controls

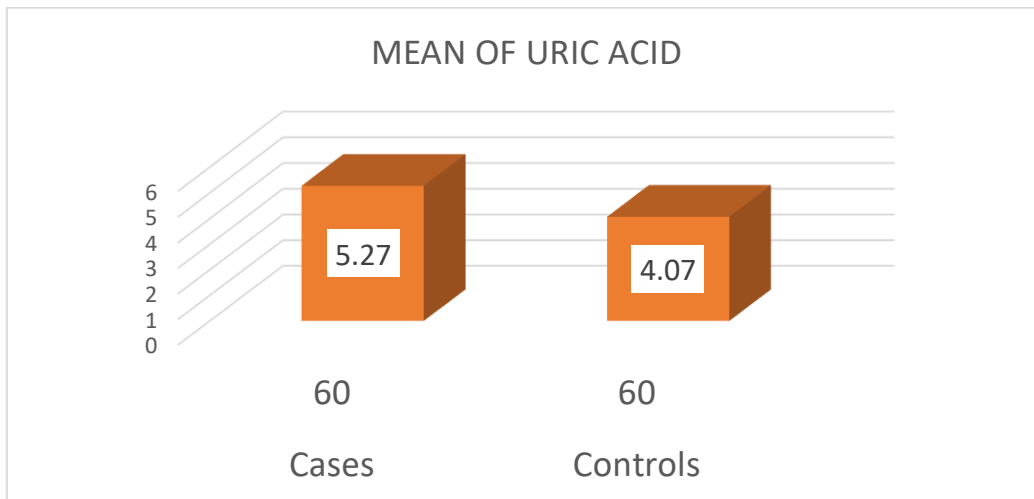


Figure 2: Mean of Uric Acid in Cases and Controls

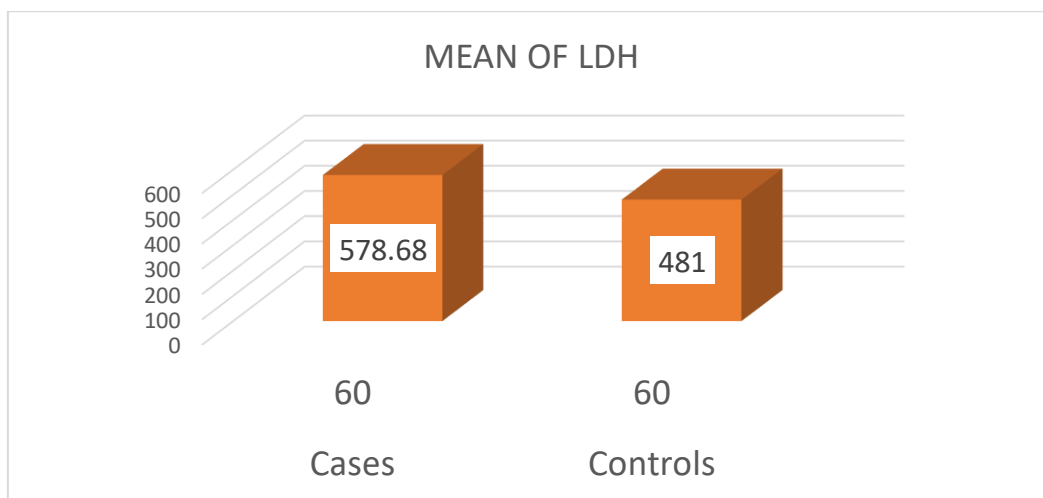


Figure 3: Mean of LDH in Cases and Controls

Table 1 and figure 1,2 and 3 shows that the mean value of CRP in the study group was 13.74 ± 7.53 mg/L which was quite higher than that of the control group i.e. 4.87 ± 1.53 mg/L and this difference was statistically significant ($p = 0.005$). The mean value of serum uric acid level in the study group was higher (5.27 ± 2.53 mg/dl) than that of the control group (4.07 ± 1.06 mg/dl) & this difference was statistically significant ($p = 0.005$). The mean value of LDH in the study group was 578.68 ± 191.56 U/L and 481 ± 113.29 U/L in the control group & this difference is statistically significant ($p = 0.005$).

Overall, the biochemical parameters CRP, uric acid, and LDH were found to be elevated in PIH cases compared to normotensive pregnant women, suggesting their potential role as markers in the evaluation of pregnancy-induced hypertension.

RESULT

It was an Observational Cross-sectional, Hospital based study of 120 participants (60 controls and 60 cases with PIH) above the 20 weeks of Gestational age.

It was found that the cases had higher levels of Serum CRP, Serum Uric Acid and Serum LDH compared to the mean levels of Serum CRP, Serum Uric Acid and Serum LDH of controls and the result was statistically significant ($p < 0.005$)

DISCUSSION

The incidence of PIH in India is about 7-10% of all antenatal admissions(5). Globally the incidence of PIH has been estimated at 10-13 % of all pregnancies(6).

The present study demonstrated significantly elevated levels of CRP, serum uric acid and LDH in pregnant women with pregnancy-induced hypertension compared with normotensive pregnant women. These findings support the hypothesis that inflammatory response, endothelial dysfunction and cellular injury play a central role in the pathogenesis of PIH.

Table-1 shows that the Mean \pm SD of CRP levels were high in cases (13.74 ± 7.53 mg/L) than controls (4.87 ± 1.53 mg/L) and difference was statistically highly significant ($P < 0.005$).

These results are in agreement with the previous report of Kumru S et al(7) who had recorded an elevation of plasma CRP among preeclamptic women when compared to their matched controls and a positive significant correlation between CRP levels and pre-eclampsia severity.

Table-1 shows that the Mean \pm SD of Uric Acid levels were more in cases (5.27 ± 2.53 mg/dl) than controls (4.07 ± 1.06 mg/dl) and difference was statistically highly significant ($P < 0.005$).

This finding is in accordance with the study done by Punthumapol C et al,(8) Josephine PL,(9) Gandhi M et al.(10) During pregnancy maternal serum uric acid levels initially fall, with a subsequent rise to prepregnancy levels near term.

Similar results were seen in a study by Gandhi M et al (11). They found a significant increase in serum LDH and serum uric acid levels in women with hypertension in comparison with normotensive women.

Table-1 shows that the Mean \pm SD of serum LDH level were more in cases (578.68 ± 191.56 IU/L) than controls (481 ± 113.29 IU/L) and difference was statistically highly significant ($P < 0.005$).

Similar results were seen in a study by Gandhi M et al (11). They found a significant increase in serum LDH and serum uric acid levels in women with hypertension in comparison with normotensive women. The finding was in accordance with a study done by Umasatyasari Y et al(12) and Bera S et al(13) Quablan H et al(14) concluded serum LDH can be used as a marker for the prediction of adverse outcomes of pregnancy in severe preeclampsia.

CONCLUSION

The pregnant women with PIH associated with elevated CRP, serum uric acid and LDH levels were at a greater risk for antepartum complications and adverse pregnancy outcomes. Hence by serial monitoring of these inexpensive biomarkers, we would be able to know the severity and progression of the disease process. Prompt termination of pregnancy in such cases would prevent maternal complications. Increased serum CRP, LDH and uric acid levels are correlated with preeclampsia being an indirect risk factor for placental vasculopathy predating clinical preeclampsia.

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