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Original Research Article

Correlation Between Serum Creatinine Levels and Severity of Pre-eclampsia: A Cross Sectional Study

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ABSTRACT

Background: Pre-eclampsia, a pregnancy-specific hypertensive disorder, is a leading contributor to maternal and perinatal morbidity and mortality worldwide. Early identification of biomarkers that can reflect the severity of this condition is essential for guiding timely intervention and improving outcomes. Objective: To determine the relationship between serum creatinine levels and the severity of pre-eclampsia in pregnant women. Methods: This analytical case-control study was conducted at Gauhati Medical College & Hospital over one year. A total of 300 pregnant women beyond 20 weeks of gestation were enrolled—150 normotensive controls and 150 pre-eclamptic patients (75 mild, 75 severe). Serum creatinine levels were evaluated and correlated with disease severity. Results: The mean serum creatinine values among the study groups were: control group –0.56 ± 0.08 mg/dL, mild pre-eclampsia –0.61 ± 0.10 mg/dL, and severe pre-eclampsia –0.74 ± 0.29 mg/dL. A statistically significant positive correlation ($r = 0.488$, $p < 0.0001$) was observed between serum creatinine levels and disease severity. Conclusion: Elevated serum creatinine levels correspond with increasing severity of pre-eclampsia. This suggests its potential role as a reliable and accessible marker for identifying severe cases, thereby aiding clinical decision-making.

Keywords: Pre-eclampsia, Serum creatinine, Hypertensive disorders, Renal function, Biomarkers

INTRODUCTION

Pre-eclampsia is a complex hypertensive disorder unique to human pregnancy, typically emerging after 20 weeks of gestation. It is marked by new-onset hypertension accompanied by proteinuria or signs of systemic organ dysfunction. Affecting 2–8% of pregnancies globally, it significantly contributes to maternal and perinatal morbidity and mortality1. Despite intensive research, its pathogenesis remains incompletely understood, though endothelial dysfunction, placental ischemia, and systemic inflammatory responses are known contributors2.One of the defining features of severe pre-eclampsia is its impact on renal function, resulting in reduced glomerular filtration and elevated serum creatinine levels. Although proteinuria has traditionally been used to assess severity, emerging evidence supports serum creatinine as a more reliable indicator of renal involvement and overall disease progression^3. Identifying such cost-effective and accessible biomarkers becomes crucial, especially in resource-limited settings. This study was designed to assess whether serum creatinine levels are significantly associated with the severity of pre-eclampsia. A reliable correlation could facilitate early intervention, individualized monitoring, and better maternal-fetal outcomes.

Materials and Methods

This analytical cross-sectional study was conducted in the Department of Obstetrics and Gynaecology at Gauhati Medical College and Hospital from October 2023 to September 2024. Ethical approval was obtained from the institutional ethics committee.

A total of 300 pregnant women beyond 20 weeks of gestation were recruited after informed consent. The study population included 150 normotensive controls and 150 cases diagnosed with pre-eclampsia. Pre-eclamptic cases were further subdivided into mild (n=75) and severe (n=75) based on American College Of Obstetrics and Gynaecology (ACOG)guidelines[3].

Exclusion criteria included chronic hypertension, renal disease, diabetes mellitus, heart disease, multiple gestations, and smoking. Serum creatinine levels were estimated using enzymatic methods in the biochemistry department's automated analyzer. Statistical analysis was performed using SPSS version 21.0. Continuous variables were analyzed using ANOVA and correlation was evaluated using Pearson's

correlation coefficient. A p-value <0.05 was considered statistically significant. A convenience sampling technique was employed due to time and logistical constraints. Students were invited to participate voluntarily, and informed consent was obtained from all respondents.

Results

A total of 300 pregnant women were included in this case-control study, comprising 150 normotensive controls and 150 pre-eclamptic cases. Among the cases, 75 were classified as having mild pre-eclampsia and 75 as severe, according to American College Of Obstetrics and Gynaecology(ACOG)guidelines.

Demographic Characteristics.

Age:

Table 1 : Age wise distribution of controls, mild and severe preeclampsia

			Category			Total	
	age group		Control	Mild	Severe		P value
<=20		Count	29	13	7	49	0.536
		% within Category	19.30%	17.30%	9.30%	16.30%	
21-30		Count	101	51	56	208	
		% within Category	67.30%	68.00%	74.70%	69.30%	
31-40		Count	19	10	10	39	
		% within Category	12.70%	13.30%	13.30%	13.00%	
>40		Count	1	1	2	4	
		% within Category	0.70%	1.30%	2.70%	1.30%	
Total		Count	150	75	75	300	
		% within Category	100.00%	100.00%	100.00%	100.00%	

In my study, 69.30% among total patients, among control 67.30%, among mild preeclampsia 68.0%, among severe preeclampsia 74.70 % is in 21-30 years of age group. Study population was divided homogenously regarding age distribution. (p = 0.536)

Gestational Age:

incidence of severe preeclampsia among primigravida and multigravida is 49.3% and 50.7 % respectively showing no difference in regard of gravida. (p=0.145)

Blood Pressure Findings:

Table 2: Relationship between Blood Pressure with Mild and Severe Preeclampsia

Category		BP systolic	BP diastolic
Control	Mean	118.2333	75.5067
	SD	7.32232	5.22224
Mild	Mean	145.7333	91.4667
	SD	5.24361	5.37596
Severe	Mean	168.9333	110.8
	SD	9.66651	8.96841
Total	Mean	137.7833	88.32
	SD	22.53076	15.88265
	P value	0.0001	0.0001

Systolic Blood Pressure (SBP):
The mean SBP was
Control group: 118.2 ± 7.3 mmHg
Mild pre-eclampsia: 145.7± 5.2 mmHg
Severe pre-eclampsia: 168.9 ± 9.6 mmHg
Diastolic Blood Pressure (DBP):
The mean DBP was:
Control group: 75.5 ± 5.2 mmHg
Mild pre-eclampsia: 91.4 ± 5.3 mmHg
Severe pre-eclampsia: 110.8 ± 8.9 mmHg

These increases were highly statistically significant ($p < 0.0001$). A strong positive correlation was observed between both SBP and DBP with the serum creatinine levels, suggesting progressive renal impairment with increasing blood pressure.

Table 3 : Correlation between creatinine value with severity of preeclampsia

Category	Mean (mg/dl)
Control	0.56 ± 0.08
Mild	0.61± 0.10
Severe	0.74± 0.29
Total	0.62±0.18
P value	0.0001

As shown in Table 3,
Serum Creatinine Levels
Mean Creatinine Levels:
Control group: 0.56 ± 0.08 mg/dL
Mild pre-eclampsia: 0.61 ± 0.10 mg/dL
Severe pre-eclampsia: 0.74 ± 0.29 mg/dL
The differences were statistically significant ($p < 0.0001$). Serum creatinine values increased steadily with the severity of disease. Pearson's correlation coefficient between creatinine and severity was $r = 0.488$ ($p < 0.0001$), indicating a moderate to strong positive association.

Discussion

This study found that serum creatinine levels increase significantly with the severity of pre-eclampsia. The control group had a mean creatinine value of 0.56 ± 0.08 mg/dL, which rose to 0.61 ± 0.10 mg/dL in mild pre-eclampsia and 0.74 ± 0.29 mg/dL in severe cases. The correlation coefficient ($r = 0.488$, $p < 0.0001$) confirms a moderate positive relationship.

This study demonstrated a significant and progressive rise in serum creatinine levels from normotensive pregnancies to mild and severe pre-eclamptic cases. Notably, creatinine levels showed a strong positive correlation with systolic and diastolic blood pressures, highlighting the intertwined relationship between hypertension and renal dysfunction in pre-eclampsia.

As pre-eclampsia progresses, systemic endothelial damage and vasospasm reduce renal perfusion, resulting in impaired glomerular filtration. This pathophysiological cascade leads to increased serum creatinine compromise. a direct marker of renal compromise .

These findings support the hypothesis that impaired renal function is a hallmark of disease progression in pre-eclampsia. Similar observations were reported by Sibai et al., who demonstrated elevated creatinine levels in severe pre-eclampsia cases compared to controls[4]. A recent meta-analysis by Bellos et al. further affirmed the diagnostic and prognostic value of renal markers in hypertensive pregnancy disorders[5].

Compared to proteinuria, which may not reliably predict disease severity or adverse outcomes, serum creatinine offers a more stable and interpretable index of renal involvement. Moreover, creatinine estimation is simple, widely available, and cost-effective, enhancing its utility in both primary and tertiary care settings.

In agreement with our study, a Nigerian study by Osanyin et al. found a consistent elevation in serum creatinine levels among patients with severe pre-eclampsia and a statistically significant correlation with systolic blood pressure and other clinical

markers of severity[6]. Likewise, Mukherjee et al. in West Bengal highlighted the importance of serum markers including creatinine as part of a predictive model for adverse maternal outcomes[7]. However, certain limitations exist. Our study was hospital-based and limited to a single center, which may influence the generalizability of results. Also, the cross-sectional design restricts causal inference. Nonetheless, the findings emphasize the practical value of serum creatinine as a supportive marker for pre-eclampsia severity.

Conclusion

Our study demonstrates a statistically significant positive correlation between serum creatinine levels and the severity of pre-eclampsia. With rising levels observed from normotensive pregnancies to severe pre-eclamptic cases, serum creatinine proves to be a promising and accessible marker. Its clinical utility lies in its affordability, simplicity, and ability to reflect renal compromise, aiding in risk stratification and decision-making for timely intervention. Further multicentric prospective studies may help solidify its role in antenatal screening protocols.

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