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ORIGINAL ARTICLE

C-Reactive Protein Levels in Preeclampsia Singleton Pregnant Women and Their Outcomes

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ABSTRACT

Background: Preeclampsia is a hypertensive disorder that occurs during pregnancy, typically after 20 weeks of gestation and the relationship between C-reactive protein levels and adverse pregnancy outcomes.

Objective: To analyze the C-reactive protein levels in preeclampsia singleton pregnant women and their outcomes.

Methodology: This case control study was performed at District Health Development Centre, Sahiwal from 1st October 2022 to 31st March 2023. A total of 100 women including 50 preeclampsia and 50 controls were enrolled after the ethical clearance of the study. The inclusion criteria consisted of women having singleton pregnancy and were clinically diagnosed to be suffering from preeclampsia. Participants were assessed clinically, biochemically, and via ultrasonography to confirm a normal pregnancy or diagnose preeclampsia. The association between C-reactive protein levels and preeclampsia was then evaluated. The outcomes of pregnancy with preeclampsia and high C-reactive proteins were followed upto 3 days in women after delivery.

Results: The maternal mean age was almost similar within both groups as 24.32±4.1 years and 25.26±5.63 years respectively. There was a higher body mass index trend in preeclampsia women than controls ($p<0.05$). The mean systolic blood pressure and diastolic blood pressure was much higher than control with a mean value as 115.33±9.39 vs 72±7.74 respectively. There were 72% of the preeclampsia vs 15% controls having previous history of hypertension. While only 16% preeclampsia and 10% control was already presenting a clinical history of diabetes. The mean preeclampsia C-reactive protein levels was 6.25±2.8 mg/L ad that of controls was 3.1±1.3 mg/L with 70% cases in preeclampsia group having higher that 15.5 mg/L CRP level in comparison to only 30% controls. The 35(70%) women having high C-reactive protein level and were preeclampsia; had adverse outcomes of their pregnancy including low birth weight in 77.1 (n=27) cases while preterm birth in 62.85 (n=22) cases.

Conclusion: Higher levels of C-reactive proteins were linked with preeclampsia in singleton pregnant women leading to adverse outcomes of pregnancy including delivery complications, low birth weight and preterm births in significant number of cases.

Keywords: C-reactive protein, Preeclampsia, Pregnant women, Outcome

INTRODUCTION

Preeclampsia is a pregnancy-specific hypertensive condition marked by maternal endothelial dysfunction and an amplified inflammatory response.[1-3] It shares key pathophysiological features with cardiovascular disease, suggesting a potential link to increased long-term cardiovascular risk.[4,5] Affecting around 5% of pregnancies, preeclampsia is a major contributor to both maternal and neonatal illness and death. Although its exact mechanisms remain only partially understood, several contributing elements have been identified, including defective placental development, oxidative stress, imbalances in angiogenic factors, and inflammation.[6]

C-reactive protein (CRP), first identified in the 1930s as a marker of acute inflammation[7] has garnered renewed attention over the past decade due to its association with cardiovascular disease risk.[8] This connection has prompted investigations into CRP's potential role in preeclampsia, both as a predictive biomarker and a possible participant in its underlying pathophysiology. Elevated CRP levels have been consistently observed in patients with manifest preeclampsia.[9,10] However, findings on its effectiveness in predicting preeclampsia before clinical symptoms arise have been more variable.[11]

The present study was focused on assessing the significance of C-reactive protein levels in preeclampsia singleton pregnant women and their outcomes. The results of the preset study lead in identifying the medical importance of C-reactive protein during preeclampsia which any further assist in predicting a cut off value for negative outcome within preeclampsia singleton pregnant women, consequently, assisting in reducing the negative outcomes of pregnancy.

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MATERIALS AND METHODS

This case control study was performed at District Health Development Centre, Sahiwal from 1st October 2022 to 31st March 2023. A total of 100 women including 50 preeclampsia and 50 control were enrolled after the ethical clearance of the study. The sample size was determined using standard software for sample size calculation, with a statistical power of 80%. The inclusion criteria consisted of women having singleton pregnancy and were clinically diagnosed to be suffering from preeclampsia. Participants were assessed clinically, biochemically, and via ultrasonography to confirm a normal pregnancy or diagnose preeclampsia. Preeclampsia was identified by the onset of hypertension after 20 weeks of gestation, accompanied by proteinuria, renal impairment, reduced platelet count, or other signs of organ dysfunction. Women with chronic hypertension prior to pregnancy or a history of chronic kidney disease were excluded from the study. C-reactive protein (CRP) levels were measured using the ELISA method. For this purpose, 3 cc of venous blood was collected from each participant. Serum was separated by centrifugation at 3000 rpm and stored at –20°C until analysis. The association between CRP levels and preeclampsia was then evaluated. A well-designed questionnaire was used for documenting the demographic and clinical information of the patients including body mass index (BMI in kg/m²), family history, comorbid conditions, and relevant signs and symptoms. The outcome of pregnancy with preeclampsia and high C-reactive proteins was followed upto 3 days in women after delivery and recorded. Data were analyzed using SPSS version 25.0. The Chi-square and Odds Ratio test was employed to assess statistical associations, with a p-value of <0.001 considered statistically significant.

RESULTS

The maternal mean age was almost similar within both groups as 24.32±4.1 years and 25.26±5.63 years respectively. There was a higher body mass index trend in preeclampsia women than controls (<0.05). The mean systolic blood pressure and diastolic blood pressure was much higher than control with a mean value as 115.33±9.39 vs 72±7.74 respectively (Table 1). There was 72% of the preeclampsia vs 16% control having previous history of hypertension. While only 16% preeclampsia and 10% control was already presenting a clinical history of diabetes (Fig. 1).

Within the other clinical history variables, the urinary protein was reported highest as 3grams within 18% of the preeclampsia women than 0% of controls in same group. The kidney disease was also prevalent in 46% of the preeclampsia pregnant women compare to 6% control pregnant women (Table 2). The mean preeclampsia CRP levels was 6.25±2.8 mg/L and that of controls was 3.1±1.3 mg/L with 70% cases in preeclampsia group having higher that 15.5 mg/L CRP level in comparison to only 30% controls. Statistically the difference was significant (P<0.001) [Fig. 2].

The odds Ration comparison of preeclampsia and control pregnant women Baseline CRP levels data in mg/L interpreted around 1.0 Confidence of interval while change in CRP showed 0.997 CI (Table 3). Thirty five (70%) women having high C-reactive protein level and were preeclampsia; had adverse outcomes of their pregnancy including low birth weight (LBW) in 77.1% (n=27) cases while preterm birth in 62.85% (n=22) cases (Fig. 3).

Table 1: Comparison of the maternal, gestational age and hypertension values of enrolled patients

Variable	Preeclampsia (n=50)	Control (n=50)	P value
Maternal age (years)	24.32±4.1	25.26±5.63	0.523
Gestational age (weeks)	33.50±3.98	36.00±3.18	0.325
Body mass index (kg/m^2)	29.25±1.86	25.40±1.72	0.051
Systolic blood pressure (mmHg)	177.2±17.12	116.00±12.98	< 0.001
Diastolic blood pressure (mmHg)	115.335±0.39	72.00±7.74	< 0.001

Table 2: Comparison of clinical history of cardiac disease and urinary protein in enrolled patients

Variables	Pre-eclampsia (n = 50)	Control (n = 50)
Drug intake	4%	-
Cardiac disease	2%	1%
Urinary protein (gm)		
1	32%	4%
2	50%	2%
3	18%	-
Kidney disease	46%	6%

Table 3: Odds ratio comparison of preeclampsia and control pregnant women

Variable	Preeclampsia Median (range)	Controls Median (range)	OR (95% CI)	Adjusted OR (95% CI)
Baseline CRP (mg/L)	11.8 (0.9, 57.4)	10.00 (0.1, 49.7)	1.000 (1.000, 1.000)	1.0 (1.000, 1.000
CRP closest to delivery (mg/L)	29 (0.6, 31)	42 (0.1, 46.5)		
Change in CRP (mg/L)	−0.1 (−2.1, 3.1)	−0.3 (−4.0, 0.4)	0.997 (0.993, 1.001)	0.994 (0.981, 1.000)[#]

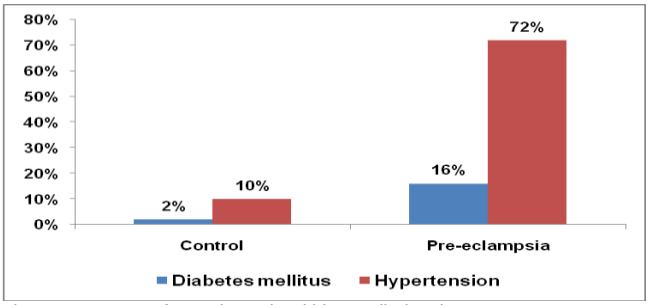

Fig. 1: Frequency of preeclampsia within enrolled patients

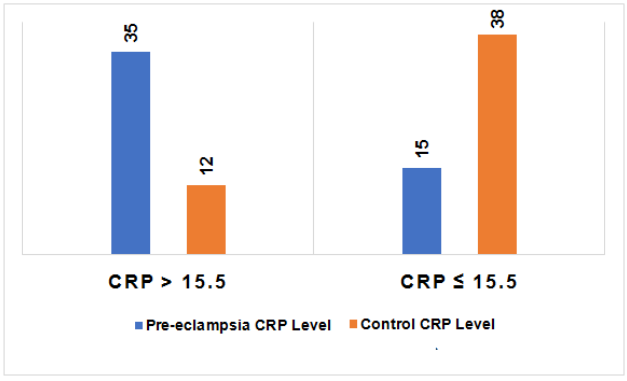

Fig. 2: Comparison of the preeclampsia and control pregnant women CRP levels

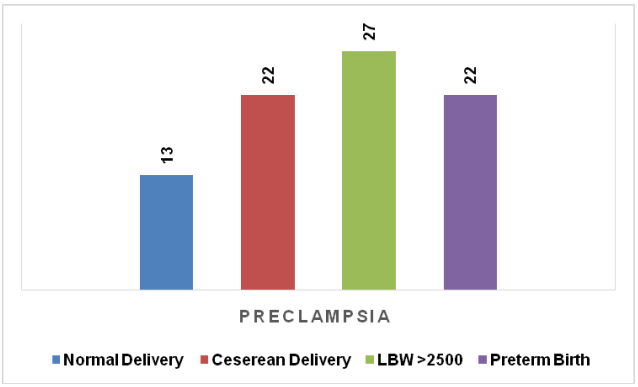

Fig. 3: The frequency of adverse outcomes in preeclampsia pregnant women with high CRP levels

DISCUSSION

The principal finding of the present study indicates that C-reactive protein (CRP) serves as a significant predictive biomarker for preeclampsia. The data clearly demonstrate markedly elevated CRP levels in pregnant women diagnosed with preeclampsia compared to those in the healthy control group. These results are consistent with prior research, which has similarly reported a positive correlation between elevated CRP concentrations and the occurrence of preeclampsia.[12-15]

Although the current investigation did not include longitudinal follow-up, comparable findings have been reported by Meena et al[16], who observed that elevated CRP levels were associated with preterm births among women with preeclampsia. Likewise,

scientist highlighted that women exhibiting elevated CRP levels were at increased risk for both preeclampsia and preterm delivery. Similar associations were also reported elsewhere ad in the current research.[17]

The presence of systemic inflammation appears to contribute to physiological alterations in pregnant women, including elevated CRP levels and increased blood pressure. Furthermore, this study underscores a greater prevalence of cardiac and metabolic syndrome/disease complications, renal impairment, and obesity in affected patients. Proteinuria was also commonly observed among preeclamptic cases, aligning with findings from earlier studies.[18,19]

CONCLUSION

Higher levels of CRP proteins were linked with preeclampsia in singleton pregnant women. The C-reactive proteins may be high due to metabolic syndromes or heart diseases. The result of this high C-reactive proteins leads to delivery complications, low birth weight and preterm births in significant number of cases.

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