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Original Research Article

To Determine the Relationship between Maternal Serum Concentrations of Cancer Antigen-125 with Pre-Eclampsia Severity

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Conflict of interest: Nil

Abstract:

Introduction: Pre-eclampsia is a hypertensive disorder of pregnancy associated with maternal and fetal morbidity and mortality. Cancer antigen-125 (CA-125), a glycoprotein traditionally used as a tumor marker, has been reported to rise in pre-eclampsia and may correlate with disease severity.

Aims and Objective: To evaluate the relationship between maternal serum CA-125 concentrations and the severity of pre-eclampsia.

Methods: This observational analytical case-control study was conducted from May 2021 to April 2022 at the Department of Biochemistry in collaboration with the Department of Obstetrics and Gynaecology, Burdwan Medical College and Hospital. A total of 306 pregnant women were enrolled, comprising 153 pre-eclamptic cases and 153 normotensive controls. Maternal demographic and anthropometric data were recorded. Serum CA-125 levels were measured using chemiluminescent immunoassay. Pre-eclampsia cases were stratified into mild, moderate and severe categories. Statistical analysis included unpaired t-tests, ANOVA, and correlation analyses, with $p < 0.05$ considered significant.

Results: Mean maternal age was comparable between case (27.88 ± 1.31 years) and control groups (28.12 ± 1.43 years, $p = 0.115$). Mean height was significantly higher in cases (159.56 ± 5.32 cm) compared to controls (153.87 ± 28.37 cm, $p = 0.015$), while weight differences were not significant. Serum CA-125 levels were significantly elevated in pre-eclamptic women (45.81 ± 11.05 IU/mL) versus controls (12.74 ± 2.13 IU/mL, $p < 0.0001$), with higher levels observed in severe cases. CA-125 positively correlated with blood pressure and proteinuria, indicating association with disease severity.

Conclusion: Maternal serum CA-125 is significantly elevated in pre-eclampsia and correlates with disease severity. It may serve as a potential biomarker for risk stratification and monitoring in pre-eclamptic pregnancies.

Keywords: Pre-eclampsia, CA-125, Maternal serum, Biomarker, Pregnancy.

Introduction

Pre-eclampsia is a multisystem hypertensive disorder of pregnancy characterized by new-onset hypertension and proteinuria after 20 weeks of gestation, sometimes accompanied by maternal organ dysfunction and fatal growth restriction [1]. It complicates 2–8% of pregnancies worldwide and remains a leading cause of maternal and perinatal morbidity and mortality, particularly in low- and middle-income countries [2,3]. The exact pathophysiology is complex and not completely understood, but abnormal placentation, impaired trophoblastic invasion, endothelial dysfunction, and exaggerated systemic inflammatory response are considered central mechanisms [4,5]. Early identification and risk stratification of pre-eclampsia are crucial to prevent adverse outcomes. Several biochemical markers have been explored for their predictive and prognostic value, including placental growth factor, soluble fms-like tyrosine kinase-1, uric acid, and lactate dehydrogenase [6,7]. Cancer antigen-125 (CA-125), a high-molecular-weight glycoprotein traditionally used as a tumor marker for epithelial ovarian cancer, has been reported to rise in certain physiological and pathological conditions, including pregnancy [8]. During normal pregnancy, CA-125 levels may fluctuate across trimesters, but studies suggest that they are significantly elevated in women with pre-eclampsia compared to normotensive pregnant women [9,10]. Several investigators have examined the association between serum CA-125 and pre-eclampsia severity. Karaman et al. reported a

significant positive correlation between CA-125 levels and severity of pre-eclampsia, while also observing an inverse relationship with neonatal birth weight [11]. Osanyin et al. demonstrated that elevated CA-125 levels reflect disease severity and organ dysfunction [12]. These findings suggest that CA-125 may serve as a cost-effective, easily measurable biomarker to aid in the diagnosis and monitoring of pre-eclampsia, especially in resource-limited settings.

Aims of the study: To assess whether maternal serum Cancer Antigen-125 (CA-125) levels correlate with the presence and severity of pre-eclampsia, and to evaluate its potential as a biomarker for predicting disease severity.

Materials and Methods

Type of study: Observational Analytical Study (Case-Control Study)

Place of study: Department of Biochemistry, Burdwan Medical College and Hospital

Study Duration: 1 year

Sample Size: 306 participants (Cases: 153 women with pre-eclampsia; Controls: 153 normotensive pregnant women**)**

Inclusion Criteria

- Pregnant women diagnosed with pre-eclampsia after 20 weeks of gestation (for case group)
- Normotensive pregnant women after 20 weeks of gestation (for control group)
- Age
- Singleton pregnancy

Exclusion Criteria

- Women with chronic hypertension, diabetes mellitus, renal disease, or liver disease
- Multiple pregnancies (twins, triplets)
- History of cardiovascular or autoimmune disorders
- Any infection or malignancy affecting CA-125 levels

Study Parameters

1. Maternal Age (years)
2. Maternal Height (cm)
3. Maternal Weight (Kg)
4. Serum CA-125 Levels (IU/mL)

Statistical Analysis: Data were entered into Excel and analyzed using SPSS and GraphPad Prism. Numerical variables were summarized using means and standard deviations, while categorical variables were described with counts and percentages. Two-sample t-tests were used to compare independent groups, while paired t-tests accounted for correlations in paired data. Chi-square tests (including Fisher's exact test for small sample sizes) were used for categorical data comparisons. P-values ≤ 0.05 were considered statistically significant.

Results

Table 1: Distribution of Age in Case and Control Group

	Group	N	Mean	SD	Minimum	Maximum	Median	p-value
Age	Case	153	27.88	1.31	25	30	28	0.1147
	Control	153	28.12	1.43	25	30	28	

Table 2: Distribution of Height (cm) in Case and Control Group

	Group	N	Mean	SD	Minimum	Maximum	Median	p-value
Height (cm)	Case	153	159.56	5.32	149.9	172	159	0.0152
	Control	153	153.87	28.37	16.3	169	159	

Table 3: Distribution of Weight (Kg) in Case and Control Group

	Group	N	Mean	SD	Minimum	Maximum	Median	p-value
Weight (Kg)	Case	153	61.43	4.75	50	72	61	0.417
	Control	153	61.86	4.57	49	80	62	

Table 4: Distribution of mean CA 125(IU/mL): Group

	Group	N	Mean	SD	Minimum	Maximum	Median	p-value
CA 125 (IU/mL)	Case	153	45.81	11.05	29.4	69	43.8	<0.0001
	Control	153	12.74	2.13	8.8	18	12.6	

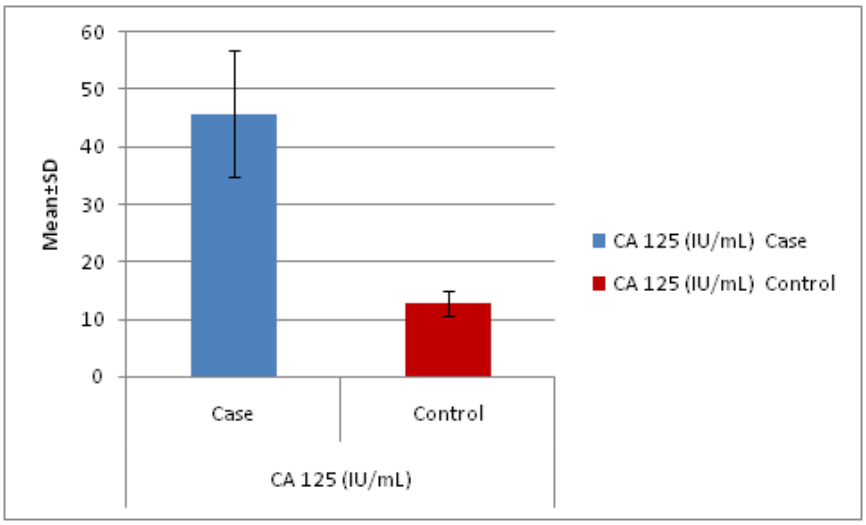

Figure 1: Distribution of mean CA 125(IU/mL): Group

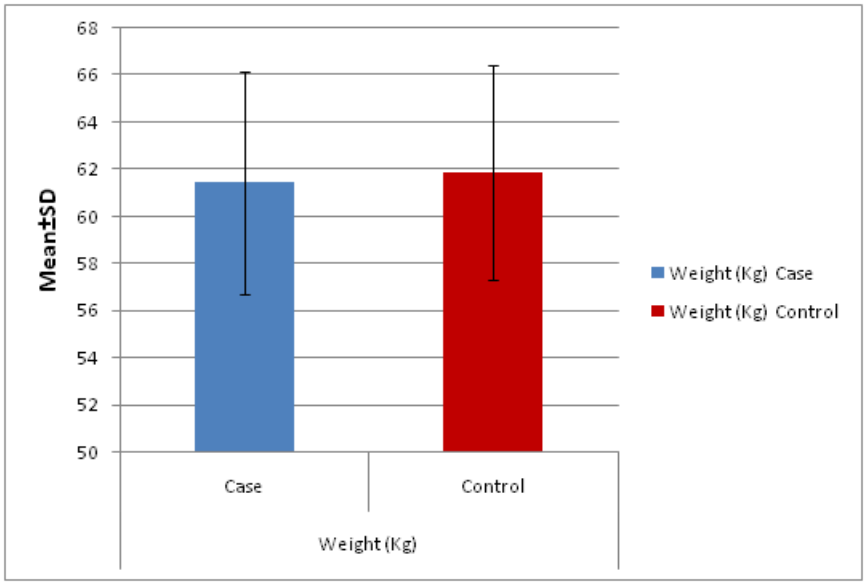

Figure 2: Distribution of Weight (Kg) in Case and Control Group

In Case Group, the mean Age (mean± SD) of patients was 27.8758± 1.3145.In Control Group, the mean Age (mean± SD) of patients was 28.1242± 1.4296.Distribution of mean Age with Treatment was not statistically significant (p=0.1147).In Case Group, the mean Height (mean± SD) of patients was 159.5627± 5.3239 (cm).In Control Group, the mean Height (mean± SD) of patients was 153.8680± 28.3683 (cm).Distribution of mean Height with Treatment was statistically significant (p=0.0152). In Case Group, the mean Weight (mean± SD) of patients was 61.4261± 4.7520 (Kg).In Control Group, the mean Weight (mean± SD)of patients was 61.8595± 4.5723 (Kg).Distribution of mean Weight with Treatment was not statistically significant (p=0.4170).In Case Group, the mean CA 125 (mean± SD) of patients was 45.8067± 11.0506 (IU/mL).In Control Group, the mean CA 125 (mean± SD) of patients was 12.7434± 2.1251 (IU/mL).Distribution of mean CA 125 with Treatment was statistically significant (p<0.0001).

Discussion

The present study was an observational analytical study conducted from May 2021 to April 2022 at the Department of Biochemistry in collaboration with the Department of Obstetrics and Gynecology, BMC, including a total of 306 participants. Pre-eclampsia, as defined by Aremu-Kasumu YB et al. [1], is a hypertensive disorder of pregnancy characterized by the development of elevated blood pressure and proteinuria after 20 weeks of gestation in previously normotensive women. The age range of participants in our study was 16–45 years. The mean age of the case group was slightly lower (27.88 ± 1.31 years) compared to the control group (28.12 ± 1.43 years), but this difference was not statistically significant (p = 0.1147). Height was significantly higher in the case group (159.56 ±

5.32 cm) compared to controls (153.87 ± 28.37 cm, p = 0.0152). In contrast, mean body weight was slightly higher in controls (61.86 ± 4.57 kg) than cases (61.43 ± 4.75 kg), though not statistically significant (p = 0.4170).

In terms of serum CA-125, our study demonstrated significantly elevated levels in pre-eclamptic women (45.81 ± 11.05 IU/mL) compared to normotensive controls (12.74 ± 2.13 IU/mL, p < 0.0001), consistent with previous observations by Osanyin GE et al. [3] and Karaman E et al. [2], which linked higher maternal CA-125 concentrations with pre-eclampsia and its severity. Similarly, Geya G et al. [5] and Mayrink J et al. [6] highlighted the relevance of CA-125 as a marker correlating with disease severity, though no significant correlation was observed with birth weight in some studies (r = −0.113, p = 0.15). Ercan S et al. [4] reported that CA-125 levels increase during the third trimester, further supporting our findings. These results indicate that maternal serum CA-125 could serve as a potential biomarker for identifying pre-eclampsia and monitoring its severity, aligning with the mechanistic understanding of pre-eclampsia as a syndrome involving hypertension, proteinuria, and organ dysfunction [3,1].

Conclusion

The study demonstrates that maternal serum CA-125 levels are markedly higher in pre-eclamptic women compared to normotensive pregnant controls, with the highest levels observed in those with severe disease. The positive correlation of CA-125 with blood pressure and proteinuria indicates that it reflects the underlying pathophysiological changes in pre-eclampsia, such as endothelial dysfunction and systemic inflammation. These findings suggest that CA-125 could serve not only as a diagnostic indicator but also as a prognostic biomarker to assess disease severity. Its measurement may help clinicians identify high-risk patients early, tailor monitoring and management strategies, and potentially improve maternal and fetal outcomes. Furthermore, incorporating CA-125 assessment into routine prenatal evaluation could enhance clinical decision-making by providing an additional objective parameter to complement traditional clinical and laboratory assessments of pre-eclampsia. Overall, the study highlights the potential utility of CA-125 as a non-invasive biomarker for risk stratification, severity assessment, and monitoring in pre-eclamptic pregnancies.

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