ISSN- O: 2458 - 868X, ISSN–P: 2458 – 8687
National Library of Medicine - ID: 101731606

International Journal of Medical Science and Innovative Research (IJMSIR)
IJMSIR : A Medical Publication Hub
Available Online at: www.ijmsir.com
Volume – 10, Issue – 4, August – 2025, Page No. : 32 – 38

A Comparative Study to Assess Maternal Serum Prolactin Levels in Women with Pre-eclampsia and Normal Pregnancy

[1]Dr Bhavika Soni, Resident, Department of Obstetrics and Gynecology, S.M.S. Medical College and Attached Hospitals, Jaipur

[2]Dr Himanshi Soni, DM Resident, Department of Endocrinology, S.M.S. Medical College and Attached Hospitals, Jaipur

[3]Dr Rishika Jain, Resident, Department of Obstetrics and Gynecology, S.M.S. Medical College and Attached Hospitals, Jaipur

[4]Dr Premlata Mital, Professor & Head, Department of Obstetrics and Gynecology, S.M.S. Medical College and Attached Hospitals, Jaipur

[5]Dr Kiran Meghwanshi, Resident, Department of Obstetrics and Gynecology, S.M.S. Medical College and Attached Hospitals, Jaipur

[6]Dr Riya Mittal, Resident, Department of Obstetrics and Gynecology, S.M.S. Medical College and Attached Hospitals, Jaipur

Corresponding Author: Dr Premlata Mital, Professor & Head, Department of Obstetrics and Gynecology, S.M.S. Medical College and Attached Hospitals, Jaipur.

Citation this Article: Dr Bhavika Soni, Dr Himanshi Soni, Dr Rishika Jain, Dr Premlata Mital, Dr Kiran Meghwanshi, Dr Riya Mittal, "A Comparative Study to Assess Maternal Serum Prolactin Levels in Women with Pre-eclampsia and Normal Pregnancy", IJMSIR - August – 2025, Vol – 10, Issue - 4, P. No. 32 – 38.

Type of Publication: Original Research Article

Conflicts of Interest: Nil

Abstract

Introduction: Pre-eclampsia is a hypertensive disorder of pregnancy that contributes significantly to maternal and perinatal morbidity and mortality. Its exact etiology remains unclear; though hormonal changes are thought to play a role. This study aimed to compare maternal serum prolactin levels in women with pre-eclampsia and normotensive pregnancies and evaluate the association between prolactin levels and severity of pre-eclampsia.

Methods: This prospective cross-sectional study was conducted at the Department of Obstetrics and Gynaecology, Sawai Man Singh Medical College, Jaipur. A total of 100 pregnant women beyond 20 weeks of gestation were included: 50 with pre-eclampsia and 50 normotensive controls, all with singleton pregnancies. Serum prolactin levels were measured using chemiluminescence immunoassay. Data were analyzed using SPSS software. A p-value < 0.05 was considered statistically significant.

Results: The mean serum prolactin level in the pre-eclamptic group was significantly higher (465.1 ± 103.44 µIU/ml) compared to the normotensive group (185.36 ± 80.34 µIU/ml, $p < 0.0001$). Within the pre-eclamptic group, women with severe pre-eclampsia had higher prolactin levels (476.13 ± 102.98 µIU/ml) than those with mild pre-eclampsia (433.69 ± 102.13 µIU/ml), though the

difference was not statistically significant (p = 0.3). Prolactin levels were strongly positively correlated with systolic (r = 0.779) and diastolic (r = 0.698) blood pressure (p < 0.001 for both).

Conclusion: The findings suggest that elevated maternal serum prolactin is significantly associated with pre-eclampsia and correlates with blood pressure levels. Although levels were higher in severe cases, the difference was not significant. Prolactin may have potential as a biomarker for pre-eclampsia diagnosis and severity assessment.

Keywords: Pre-eclampsia, Serum prolactin, Normotensive pregnancy, Hypertension, Biomarker, Maternal outcome, Foetal outcome

Introduction

Pre-eclampsia, characterized by new-onset hypertension (systolic blood pressure ≥140 mm Hg and/or diastolic blood pressure ≥90 mm Hg) and proteinuria or end-organ dysfunction after 20 weeks of gestation, affects 5-8% of pregnancies globally and is a leading cause of maternal and perinatal morbidity and mortality[1]. In India, its incidence ranges from 8-10%[2]. The pathophysiology of pre-eclampsia involves defective trophoblastic invasion of maternal spiral arteries, leading to increased vascular resistance and reduced placental perfusion, which may trigger the release of anti-angiogenic factors such as soluble fms-like tyrosine kinase-1 (sFlt-1) and soluble endoglin (sEng), contributing to endothelial dysfunction[2-4].

Prolactin, a hormone secreted by the anterior pituitary and extra-pituitary sources like the decidua, plays a significant role in pregnancy through its effects on metabolism, immune function, and angiogenesis[5]. During normal pregnancy, prolactin levels rise 10-20 fold due to increased estrogen and progesterone. However, the 16-kDa prolactin fragment, derived from enzymatic cleavage, exhibits anti-angiogenic and vasoconstrictive properties, potentially contributing to pre-eclampsia's pathogenesis by inhibiting nitric oxide synthase and promoting endothelial dysfunction[6,7]. Previous studies have reported higher prolactin levels in pre-eclamptic women compared to normotensive controls, with some indicating a correlation with disease severity[8,9]. This study aims to compare maternal serum prolactin levels in pre-eclamptic and normotensive pregnant women and to assess its association with severity of pre-eclampsia.

Materials and Methods

This prospective cross-sectional study was conducted at the Department of Obstetrics and Gynaecology, Sawai Man Singh Medical College, Jaipur, from October 2023 to January 2025, after obtaining institutional ethics committee approval. The study population included 100 pregnant women with singleton pregnancies >20 weeks gestation, divided into two groups: 50 women with pre-eclampsia (study group) and 50 normotensive pregnant women (control group).

Inclusion Criteria

- Normotensive or pre-eclamptic women with live singleton pregnancy >20 weeks gestation.
- Women providing informed written consent.
- Women not participating in other studies.

Exclusion Criteria

- Women in active labor or with ruptured membranes.
- Women with signs of infection.
- Women with pre-existing hypertension, cardiovascular or renal disease, diabetes mellitus, or psychiatric disorders.
- Women on medications affecting prolactin levels (e.g., bromocriptine, neuroleptics).
- Women with foetal congenital malformations.

Sample Size: The sample size was calculated as 30 per group based on a previous study reporting a minimal detectable difference of 105.3 and standard deviation of 81.23 for 0.5 alpha error and 80% power. The sample size was increased to 50 per group to enhance statistical power.

Methodology

Participants were recruited after applying inclusion and exclusion criteria. A detailed history and physical examination, including blood pressure (BP) measurement, were performed. BP was measured using an appropriate cuff size after a 10-minute rest, with diastolic BP recorded at phase V Korotkoff sound. Pre-eclampsia was diagnosed as systolic BP ≥140 mm Hg and/or diastolic BP ≥90 mm Hg with proteinuria ≥1+ on dipstick. Pre-eclampsia was classified as mild (systolic BP 140–160 mm Hg, diastolic BP 90–110 mm Hg, proteinuria 1+ to 2+) or severe (systolic BP ≥160 mm Hg, diastolic BP ≥110 mm Hg, proteinuria ≥3+, or associated symptoms like cerebral disturbances, pulmonary edema, or thrombocytopenia).

Serum prolactin levels were measured by collecting 5 ml of venous blood from the antecubital vein under aseptic conditions. Samples were processed using a sandwich chemiluminescence immunoassay (MAGLUMI analyzer), with results expressed in μIU/ml (conversion factor: 1 ng/ml = 21.2 μIU/ml). Routine investigations included hemoglobin, urine analysis, liver function tests, renal function tests, and viral markers.

Statistical Analysis

Data were entered into a Microsoft Excel sheet. Continuous variables were presented as mean ± standard deviation, and categorical variables as percentages. The Chi-square test was used for categorical data, and the Pearson correlation coefficient assessed the association between prolactin levels and pre-eclampsia severity. A p-value <0.05 was considered statistically significant.

Results

Demographic characteristics of the participants are shown in Table 1. Mean age of the women in pre-eclampsia group (27.98 ± 5.10 years) was significantly more than mean age of the women in normotensive group (26.06 ± 3.20 years) [p – 0.03]. 56% women in pre-eclampsia group and 48% women in normotensive group were primigravida. There was no statistically significant difference in mean gestational age (p – 0.46) and mean BMI (p – 0.09) in two groups.

Table 2 shows clinical parameters of the participants. Mean systolic BP in pre-eclampsia group (165.80 ± 12.12 mm of Hg) was significantly more than mean systolic BP in normotensive group (116.48 ± 8.80 mm of Hg) [p - <0.0001]. Mean diastolic BP in pre-eclampsia group (105.88 ± 9.77 mm of Hg) was significantly more than mean diastolic BP in normotensive group (79.76 ± 6.83 mm of Hg) [p - <0.0001]. Proteinuria was significantly present in pre-eclampsia group compared to normotensive group (p - <0.0001).

Table 3 shows serum prolactin levels in pre-eclampsia and normotensive women. Mean serum prolactin levels in pre-eclampsia group (465.1±103.44) was significantly higher than mean prolactin levels in normotensive group (185.36±80.34) (p – <0.0001).

Table 4 shows mean serum prolactin levels with severity of preeclampsia. There was significant difference in mean S Prolactin levels between normotensive and mild preeclampsia (p – 0.0000) as well as between normotensive and severe preeclampsia (p – 0.0000). There was no significant difference in mean S Prolactin levels between mild preeclampsia and severe preeclampsia (p – 0.3).

Pearson correlation between serum prolactin level and systolic and diastolic blood pressure is shown in Table 5. Correlation coefficient between SBP and s. prolactin is 0.779 which shows that Serum Prolactin has a very strong positive correlation with systolic blood pressure. With increase in systolic blood pressure there is increase in serum Prolactin levels and vice versa. The relation between systolic BP and S. Prolactin is statistically significant (p - 0). (Graph 1) Correlation coefficient between DBP and s. prolactin is 0.698 which shows that Serum Prolactin has a very strong positive correlation with diastolic blood pressure. With increase in diastolic blood pressure there is increase in serum Prolactin levels and vice versa. The relation between diastolic BP and S. Prolactin is statistically significant (p - <0.001). (Graph 2)

Discussion

This study evaluated maternal serum prolactin levels in women with pre-eclampsia compared to normotensive pregnant women and examined their relationship with disease severity. The findings demonstrated significantly higher prolactin levels in pre-eclamptic women, a strong positive correlation between prolactin and blood pressure, and poorer neonatal outcomes in the pre-eclampsia group. These results contribute to a growing body of evidence implicating prolactin in the pathophysiology of pre-eclampsia and suggest its potential utility as a biomarker of disease presence and severity.

In our study, women with pre-eclampsia were slightly older (mean age 27.98 years) than normotensive controls (mean age 26.06 years), with a statistically significant difference ($p = 0.03$). Although modest, this age difference reflects the established association between maternal age and pre-eclampsia risk. Prior studies report increased risk at both younger (<25 years) and advanced maternal ages (>35 years), forming a U-shaped risk curve. Dhar (2021) observed higher pre-eclampsia incidence in women aged <26 and >35 years compared to 26–30 years[10]. Similarly, Naeem et al. (2024) reported a prevalence of 27.5% in women >35 years and 21% in women <20 years, with the lowest rates among women aged 26–30 years[11]. In our study, no significant differences were observed for gestational age, BMI, or primigravida status, indicating comparability between groups.

Pre-eclamptic women exhibited markedly elevated systolic and diastolic blood pressures compared to normotensive women (165.80 mmHg vs. 116.48 mmHg and 105.88 mmHg vs. 79.76 mmHg, respectively; both $p < 0.0001$), and proteinuria was exclusively present in the pre-eclampsia group. This clinical profile aligns with diagnostic criteria and reflects the central role of hypertension and endothelial dysfunction in pre-eclampsia. Zhu et al. (2021) reported that advanced maternal age was associated with impaired cardiac diastolic function and hypertension, suggesting a link between maternal age, cardiovascular maladaptation, and pre-eclampsia risk[12]. Sun et al. (2023) emphasized the combined effect of maternal age and pre-pregnancy BMI on hypertension risk in pregnancy[13].

Serum prolactin levels were significantly elevated in the pre-eclampsia group (465.10 ± 103.44 µIU/ml) compared to normotensive controls (185.36 ± 80.34 µIU/ml) ($p < 0.0001$), supporting the hypothesis that prolactin may contribute to pre-eclampsia pathophysiology, potentially via its anti-angiogenic and vasoconstrictive properties. Horrobin (1975) first proposed a role for prolactin in elevating arterial pressure[14].Nahar et al. (2021) found prolactin levels were significantly higher in pre-eclampsia, with good diagnostic accuracy[8]. Our study shows a trend toward higher prolactin levels in severe

pre-eclampsia (476.13 ± 102.98 μIU/ml) versus mild cases (433.69 ± 102.13 μIU/ml), though this difference was not statistically significant. This pattern is consistent with previous reports suggesting a positive association between prolactin and disease severity[15,16]. Thabat J. Al-Maiahy et al in their study observed that severity of PE was linked with PRL serum levels since 20 patients with PE showed mild PE that illustrated relatively lower PRL serum levels compared with 11 patients with severe PE ($P<0.001$)[17]. A strong positive correlation was observed between serum prolactin and both systolic ($r = 0.779$) and diastolic ($r = 0.698$) blood pressure, suggesting prolactin may reflect disease severity. Prior studies support this relationship, including experimental evidence of prolactin-induced hypertension[18], and clinical findings of correlations with mean arterial pressure in pre-eclamptic women[19].

Conclusion

In conclusion, this study confirms significantly elevated prolactin levels in pre-eclamptic women. A strong positive correlation with blood pressure, and a trend toward higher levels with disease severity, supporting prolactin's potential role as a biomarker for pre-eclampsia. Strengths include the prospective design and well-matched groups; limitations include a modest sample size, single-center setting, and cross-sectional design. Future large, multicenter, longitudinal studies are needed to confirm prolactin's predictive value and clinical utility in managing pre-eclampsia.

References

1. Cunningham FG, Leveno KJ, Bloom SL, Dashe JS, Hoffman BL, Casey BM, et al. Hypertensive disorders. In: Williams obstetrics. 25th ed. New York, NY: McGraw-Hill Education; 2018.
2. Roberts JM, Cooper DW. Pathogenesis and genetics of pre-eclampsia. Lancet. 2001;357(9249):53-6. doi:10.1016/S0140-6736(00)03577-7
3. Punthumapol C, Kittichotpanich B. Serum calcium, magnesium and uric acid in preeclampsia and normal pregnancy. J Med Assoc Thai. 2008;91(7):968-73.
4. Levine RJ, Maynard SE, Qian C, Lim KH, England LJ, Yu KF, et al. Circulating angiogenic factors and the risk of preeclampsia. N Engl J Med. 2004;350(7):672-83. doi:10.1056/NEJMoa031975
5. Al-Kuraishy HM, Al-Gareeb AI, Awad MS, Alrifai SB. Assessment of serum prolactin levels in acute myocardial infarction: the role of pharmacotherapy. Indian J Endocrinol Metab. 2016;20(1):72-9. doi:10.4103/2230-8210.172243
6. Bernard V, Young J, Chanson P, Binart N. New insights in prolactin: pathological implications. Nat Rev Endocrinol. 2015;11(5):265-75. doi:10. 1038/ nrendo.2015.36
7. Clapp C, González C, Macotela Y, Aranda J, Rivera JC, García C, et al. Vasoinhibins: a family of N-terminal prolactin fragments that inhibit angiogenesis and vascular function. Front Horm Res. 2006;35:64-73. doi:10.1159/000094309
8. Nahar S, Ferdousi S, Bhuiyan MMA, Pramanik AK, Ahmed MU, Udita SZ, et al. Association of serum prolactin level with preeclampsia. J Clin Lab Res. 2021;3(5):1-5. doi:10.31579/2768-0487/051
9. Al-Maiahy TJ, Al-Gareeb AI, Al-Kuraishy HM. Prolactin and risk of preeclampsia: a single institution, cross-sectional study. Asian Pac J Reprod. 2019;8(3):112-7. doi:10.4103/2305-0500. 259171
10. Dhar R. A study of incidence of pre-eclampsia in relation to maternal age. Int J Physiol. 2021;9(2):23-6. doi:10.37506/ijop.v9i2.3240

11. Naeem Z, Gul S, Masud A, Abrar F, Dureshahwar, Tahir Z. Association of pre-eclampsia in women with advanced maternal age. J Saidu Med Coll Swat. 2024;14(1):14-8. doi:10.52206/jsmc.2024.14.1.14-18
12. Zhu D, Chen W, Pan Y, Li T, Cui M, Chen B. The correlation between maternal age, parity, cardiac diastolic function and occurrence rate of pre-eclampsia. Sci Rep. 2021;11(1):8842. doi:10.1038/ s41598-021-88326-6
13. Sun M, Luo M, Wang T, Wei J, Zhang S, Shu J, et al. Effect of the interaction between advanced maternal age and pre-pregnancy BMI on pre-eclampsia and GDM in Central China. BMJ Open Diabetes Res Care. 2023;11(2):e003324. doi:10.1136/bmjdrc-2023-003324
14. Horrobin D. The possible role of prolactin in pre-eclampsia. Zentralbl Gynakol. 1975;97(9):526-36.
15. International Journal of Clinical Obstetrics and Gynaecology [Internet]. [cited 2025 Jul 10]. Available from: https://www.gynaecologyjournal.com/
16. Leaños-Miranda A, Campos-Galicia I, Ramírez-Valenzuela KL, Chinolla-Arellano ZL, Isordia-Salas I. Circulating angiogenic factors and urinary prolactin as predictors of adverse outcomes in women with preeclampsia. Hypertension. 2013;61 (5):1118-25. doi:10.1161/ HYPERTENSIONAHA. 111.00754
17. Al-Maiahy TJ, Al-Gareeb AI, Al-Kuraishy HM. Role of dyslipidemia in the development of early-onset preeclampsia. J Adv Pharm Technol Res. 2021; 12(1):73-8. doi:10.4103/japtr.JAPTR_266_20
18. Chang MT, Cheng YS, Huang MC. Association of prolactin haplotypes with reproductive traits in Tsaiya ducks. Anim Reprod Sci. 2012;135(1-4):91-6. doi:10.1016/j.anireprosci.2012.09.003
19. Baghel S, Sharma S, Gupta S. A prospective study for the prediction of preeclampsia with serum prolactin level. Indian J Appl Res. 2023;13(6):14-6. doi:10.36106/ijar/9603160

Legend Tables and Graphs

Table 1: Demographic Characteristics of the Participants

Parameter	Pre-eclampsia Group (n = 50)	Normotensive Group (n = 50)	p-value
Age (years)	27.98 ± 5.10	26.06 ± 3.20	0.03
Gestational Age (weeks)	34.22 ± 3.12	34.68 ± 2.87	0.46
Body Mass Index (kg/m²)	26.45 ± 3.88	25.12 ± 3.45	0.09
Primigravida (%)	56	48	0.43

Table 2: Clinical Characteristics of the Participants

Parameter	Pre-eclampsia Group (n = 50)	Normotensive Group (n = 50)	p-value
Systolic BP (mm Hg)	165.80 ± 12.12	116.48 ± 8.80	<0.0001
Diastolic BP (mm Hg)	105.88 ± 9.77	79.76 ± 6.83	<0.0001
Proteinuria 1+ to 2+ (%)	60	0	<0.0001

Proteinuria ≥3+ (%)	40	0	<0.0001

Table 3: Serum Prolactin Levels in Pre-eclampsia and Normotensive Women

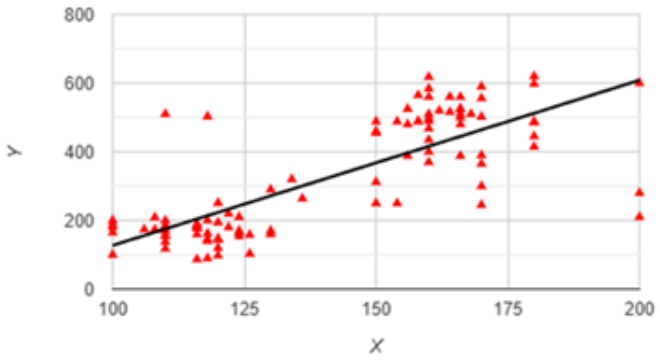
Parameter	Pre-eclampsia Group(n = 50)	Normotensive Group (n = 50)	p-value
Serum Prolactin (µIU/ml)	465.10 ± 103.44	185.36 ± 80.34	<0.0001

Table 4: Serum Prolactin Levels by Severity of Pre-eclampsia

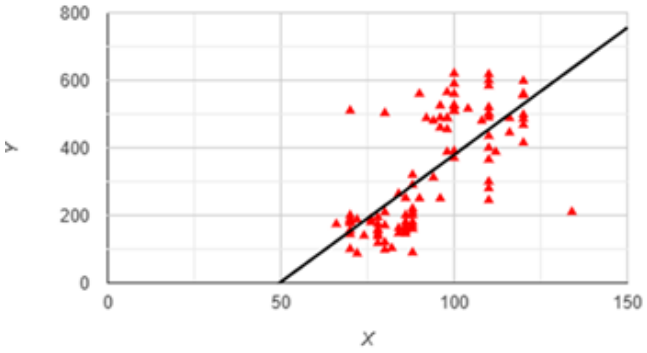
Pre-eclampsia Severity	Serum Prolactin (µIU/ml)	p-value
Normotensive pregnant women (n=50)	185.36 ± 80.34	
Mild (n=30)	433.69 ± 102.13	0.0000
Severe (n=20)	476.13 ± 102.98	0.0000

Table 5: Correlation of Serum Prolactin with Blood Pressure in Pre-eclampsia

N = 100	Mean± SD	R	R square	P value
Systolic BP	141.14±26.93	0.7709	0.5944	0
S. Prolactin	325.23±168.08			
Diastolic BP	92.82±15.58	0.6978	0.4869	<0.001
S. Prolactin	325.23±168.08			



Graph 1: Correlation of Serum Prolactin with systolic BP



Graph 2: Correlation of Serum Prolactin with diastolic BP