

## Association of Serum Prolactin Level with Preeclampsia

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### Abstract

**Introduction:** Preeclampsia is a potentially fatal disorder of pregnant women; it remains an important cause of maternal mortality throughout the world. More than 50,000 maternal deaths occur worldwide each year. Various researchers of different countries suggested an association of increase level of serum prolactin in preeclamptic patient. Estimation of serum prolactin level in pregnancy may be helpful in diagnosis of preeclampsia.

**Objective:** The objective of the study is to observe the association of serum prolactin level with severity of preeclampsia.

**Materials and Methods:** This cross-sectional study was conducted from March 2020 to February 2021 in the Department of Laboratory Medicine, Department of Fetomaternal Medicine and Obstetrics and Gynecology, BSMMU and Dhaka Medical College Hospital, Dhaka. Fifty diagnosed patients of preeclampsia who fulfilled the inclusion and exclusion criteria were selected as study population. At the same time 50 normal pregnant women were taken in another group. In both groups gestational age was calculated from last Menstrual date and confirmed by early ultrasound which was done at <14 weeks. Then serum prolactin level was calculated.

**Results:** The mean serum prolactin level was 226.56±81.23 µg/L in mild and 394.53±78.75 µg/L in severe preeclampsia. The difference was statistically significant (p=0.001) between two groups. In ROC analysis cut off value of serum prolactin level was 118 µg/L. The area under curve (AUC) of serum prolactin was 0.923 (95% CI; 0.869-0.978). Spearman's rank correlation coefficient test showed significant positive correlation (r=0.719, p=0.001) between serum prolactin level with severity of preeclampsia. This finding of the study revealed that serum prolactin level was increased with preeclampsia and was positive correlation with severity.

**Conclusion:** Because of significant sensitivity and specificity, serum prolactin level may be used as an important tool to diagnose preeclampsia and its severity.

**Keywords:** prolactin; preeclampsia; hypertensive disorders of pregnancy; proteinuria

## Introduction

The global incidence of preeclampsia has been estimated at 5-14 % of all pregnancies (Lim, 2011). Preeclampsia is one of the hypertensive disorders of pregnancy occur in about 10% of all pregnant women around the world. Preeclampsia affects 3-5% of pregnancies and a leading cause of maternal and perinatal mortality (Kishwara et al., 2011). World Health Organization (WHO) estimates incidence of preeclampsia, seven times higher in developing countries (2.4% live birth) than in developed countries (0.4%) (WHO, 2005). In Asia, nearly one tenth of all maternal deaths are associated with hypertensive disorder of pregnancy (WHO, 2011). In India the incidence of preeclampsia is 4.0% (Bilano et al., 2014), in Nepal is 1.8% (Thapa and Jha, 2008). In developing countries, the incidence of the disease has been reported as 4-18%. 20-80% maternal death occurs in developing countries due to preeclampsia (Baruah et al., 2015). In Bangladesh, the incidence of preeclampsia is 4.3% (Ayesha et al., 2020). Serum prolactin level increases in preeclampsia. Estimation of serum prolactin may be helpful in diagnosis of preeclampsia. This parameter is less time consuming and less hazardous. So far my knowledge, no such study has been done to determine the association of serum prolactin level with preeclampsia. As such this study was designed to evaluate the association of serum prolactin level with preeclampsia. The result of the study carries valuable information about diagnosis of preeclampsia, which is beneficial for the patients and the physician.

## Methods

**Study design:** Cross sectional study (comparative design)

**Study duration:** From March 2020 to February 2021

**Place of study:** This study was conducted at the Department of Laboratory Medicine, Department of Fetomaternal Medicine and Obstetrics and Gynecology, BSMMU and Dhaka Medical College Hospital.

**Study population:** Patients with diagnosed case of preeclampsia more than 20 weeks attending outpatient and admitted inpatient Department of Fetomaternal Medicine, BSMMU and Dhaka Medical College Hospital, Dhaka was considered as case. At the same time normal pregnant women collected from outpatient and in inpatient Department of Obstetrics and Gynecology, BSMMU and Dhaka Medical College Hospital, Dhaka, more than 20 weeks was considered as control. In both groups gestational age was calculated from last menstrual date and confirmed by early ultrasound i.e., Done at <14 weeks.

## Grouping of the subjects

**Group (preeclampsia group):** Diagnosed case of preeclampsia with gestational age more than 20 weeks was considered as Group (preeclampsia group).

**Group (control group):** Normal pregnancy with duration of more than 20 weeks was considered as Group (control group).

**Sample size:** Sample size was 100 among them 50 were preeclamptic patients and 50 were normal pregnant women.

**Sample Technique:** Purposive sampling was followed.

## Laboratory procedure

**Specimen collection:** The blood sample was collected from median cubital vein after asepsis with 0.5% chlorhexidine Gluconate. Freshly drawn blood was done by standard venipuncture procedure. Total 2 ml of fasting blood was collected.

**For prolactin:** About 2.0 ml fasting venous blood was collected into plastic red screw-capped plain tube without anticoagulant. Vial was labeled with the patient's identification number.

## Storage of sample:

**For prolactin:** Store in -20-degree centigrade temperature until analysis.

## Test procedure

**Serum prolactin:** Prolactin is measured by immunochemistry auto-analyzer (Cobas e411) using the Electrochemiluminescence Immunoassay (ECLIA) with commercially available cartridge (PRL-11). Normal prolactin level is 12-17µg/L in non-pregnant women, 16µg/L in first trimester, 49µg/L in second trimester, 113µg/L in third trimester (Tritos, Kilbanski, 2019).

## Procedure of data collection

Patient was selected from outpatient and inpatient Department of Fetomaternal Medicine and Department of Obstetrics and Gynecology, BSMMU and Dhaka Medical College Hospital, Dhaka, who was fulfilling the selection criteria. A semi-structured questionnaire was developed in English and Bengali. Patients were informed about the purpose of the study and ethical issues. Before proceeding to data collection, the details of the study were explained to each patient and informed verbal and written consent from the respondents was obtained. Data collection procedure was initiated by the researcher himself through face-to-face interview. Physical examination was done properly. About 30-35 minutes was taken to collect data from each patient. From each subject, 2 ml of whole blood was drawn. The serum prolactin level was measured by immunochemistry auto-analyzer (Cobas e411) using the Electrochemiluminescence Immunoassay (ECLIA) with commercially available cartridge (PRL-11). Serum prolactin report was collected from Department of Laboratory Medicine, BSMMU, Dhaka. After getting reports, the laboratory data was recorded in the data sheet.

## Results

S. prolactin (µg/L)	Group I (n=50)	Group II (n=50)	p value
	n(%)	n(%)	
Normal	2(4.0)	7(14.0)	0.001
High	48(96.0)	43(86.0)	
Mean±SD	334.06±113.34	121.2±77.29	
Range(min-max)	(64-485)	(48-313)	

**Table 1:** Comparison of serum prolactin level between two groups of study subjects (n=100)

Table 1 shows the distribution of serum prolactin level of the study patients. It was observed that 2(4.0%) patients had normal serum prolactin in group I and 7(14.0%) in group II. The mean serum prolactin was found

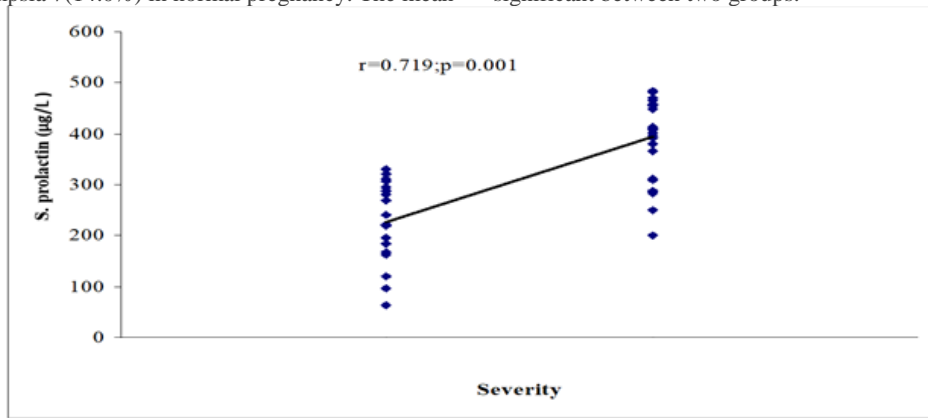
334.06±113.34 µg/L in group I and 121.2±77.29 µg/L in group II. The difference was statistically significant between two groups.

S. prolactin (µg/L)	Severity			p value
	Normal (n=50)	Mild (n=18)	Severe (n=32)	
	n(%)	n(%)	n(%)	
Normal	7(14.0)	2(11.1)	0(0.0)	0.001
High	43(86.0)	16(88.9)	32(100.0)	
Mean±SD	121.2±77.29	226.56±81.23	394.53±78.75	
Range(min-max)	(48-313)	(64-330)	(201-485)	

**Table 2:** Association between serum prolactin level with severity of preeclampsia (n= 100)

Table 2 shows the association between serum prolactin with severity of preeclampsia. It was observed that 2(11.1%) patients had normal serum prolactin in mild preeclampsia 7(14.0%) in normal pregnancy. The mean

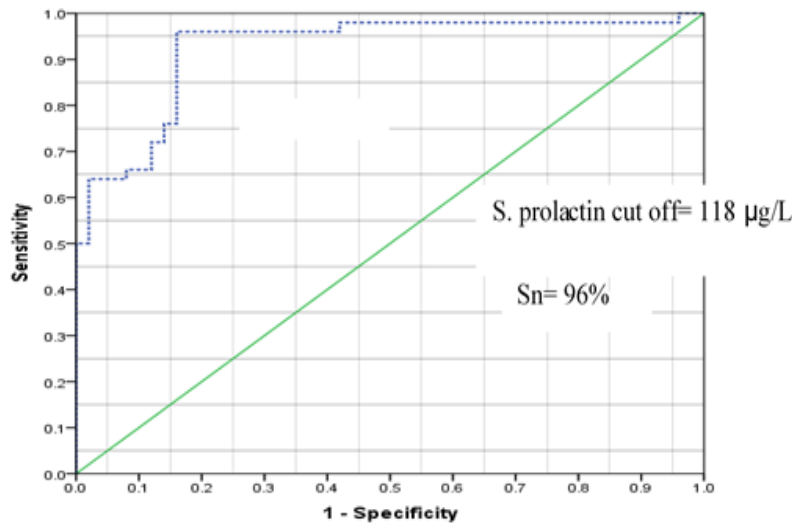
serum prolactin was 226.56±81.23 in mild, 394.53±78.75 in severe and 121.2±77.29 in normal pregnancy. The difference was statistically significant between two groups.



**Figure 1:** Scatter diagram showing correlation between the S. prolactin level and severity of preeclampsia (r=0.719; p=0.001)

Figure 1 shows that there is a positive correlation between serum prolactin level and severity of preeclampsia (r=0.719). It was observed that the

Spearman’s rank correlation coefficient statistically significant (p=0.001).



**Figure 2:** Receiver-operating characteristic (ROC) curve of serum prolactin for prediction of preeclampsia

The AUC of serum prolactin was 0.923 (95% CI; 0.869-0.978). The best cut off point of serum prolactin for predicting preeclampsia was 118 µg/L.

**Discussion**

In spite of improvement of antenatal checkup, preeclampsia is still a major obstetrics problem in developing countries like Bangladesh and also in developed countries. It is the most important cause of maternal and perinatal morbidity and mortality worldwide. This cross-sectional study was carried out with an aim to evaluate the association of serum prolactin level with preeclampsia in the Department of Laboratory Medicine,

BSMMU, Shahbag, Dhaka. Total 100 pregnant women more than 20 weeks of gestation attending outpatient and admitted in inpatient Department of Fetomaternal Medicine and Obstetrics and Gynaecology, Bangabandhu Sheikh Mujib Medical University (BSMMU) and Dhaka Medical College Hospital, Dhaka were enrolled, 50 of them were diagnosed case of preeclampsia and 50 normal pregnant women were considered as case and control respectively. In this current study, it was observed that the mean serum prolactin was found 334.06±113.34 µg/L in group I and 121.2±77.29 µg/L in group II. The difference was statistically significant between two groups. Prolactin naturally elevated

in normal pregnancy found to be raised more in preeclampsia. Malarvizhi et al. (2018) study found the mean serum prolactin level in preeclampsia was  $297.46 \pm 86.43$  and the mean serum prolactin level in normal pregnant women was  $139.60 \pm 26.12$ . The difference was statistically significant between two groups. In another study Al-Maiyah et al. (2019) demonstrated that serum prolactin level was significantly higher in patients with preeclampsia. These findings were in accordance with the findings of current study. The present study demonstrated that the mean serum prolactin level was  $226.56 \pm 81.23$  in mild,  $394.53 \pm 78.75$   $\mu\text{g/L}$  in severe preeclampsia and  $121.2 \pm 77.29$   $\mu\text{g/L}$  in normal pregnancy. The mean serum prolactin was significantly higher in severe preeclampsia than mild preeclampsia and normal pregnancy. Leanos-Miranda et al. (2013) study also found that mean serum prolactin level was  $184.6$   $\mu\text{g/L}$  to  $36.7$ – $697.1$   $\mu\text{g/L}$  in mild and  $210.8$   $\mu\text{g/L}$  to  $50.5$ – $1598.8$   $\mu\text{g/L}$  in severe preeclamptic patient. The mean serum prolactin level was significantly higher in severe preeclampsia. Similar study done by Leonos-Miranda et al (2008) observed higher serum prolactin level in mild ( $162.6$   $\mu\text{g/L}$ ) and severe in preeclamptic patients ( $190.5$   $\mu\text{g/L}$ ) Compared to normal pregnant women ( $139$   $\mu\text{g/L}$ ). The current study was supported by these previous studies. On the other hand, in this study there was a positive significant Spearman's rank correlation was found between serum prolactin levels with severity of preeclampsia. Correlation between serum prolactin levels with preeclampsia was done for the first time. The area under the receiver-operating characteristic (ROC) curves for serum prolactin level was depicted in present study. The area under curve (AUC) was  $0.923$  (95%CI;  $0.869$ – $0.978$ ). This ROC curves showed that the cut off value for serum prolactin was  $118$   $\mu\text{g/L}$  had  $96.0\%$  sensitivity and  $84.0\%$  specificity for prediction of preeclampsia. Malarvizhi et al. (2018) study found that cut off value of serum prolactin was  $196$   $\mu\text{g/L}$  had  $82.9\%$  sensitivity and  $100.0\%$  specificity. Their results were nearly consistent with our study may be due to enrolled 35 case of preeclampsia and 70 case of normal pregnant women and their average prolactin level was around  $300$   $\mu\text{g/L}$  in preeclampsia and  $150$   $\mu\text{g/L}$  in normal pregnant women. According to this study, it was demonstrated that a significant difference of serum prolactin level in preeclamptic patient compared to normal pregnant women. Serum prolactin levels increased more in severe cases. Our data indicate that serum prolactin level correlate with the severity of preeclampsia.

## Conclusion

Serum prolactin level is significantly higher in patients with preeclampsia than normal pregnant women. There was positive correlation of serum prolactin level with severity of the preeclampsia. Because of significant sensitivity and specificity, serum prolactin level may be used as an important tool to diagnose preeclampsia and its severity.



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