


## Original Article

# Association of First Trimester Serum Albumin, Creatinine and Uric Acid Level as Early Prediction of Hypertensive Disorders: An Observational Study in a Tertiary Care Hospital in Bangladesh

DOI: dx.doi.org

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Received: 08 Aug 2022

Accepted: 13 Aug 2022

Published: 15 Aug 2022

Published by:

Sher-E-Bangla Medical College,  
Barishal

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**ABSTRACT**

**Background:** Hypertensive disorders of pregnancy are a common cause of both maternal and perinatal morbidity and mortality in both developed and developing countries. **Objective:** This study aims to identify the association of first trimester serum albumin, creatinine, and uric acid level as early prediction of hypertensive disorders in pregnant women of a tertiary care hospital in Bangladesh. **Method:** A prospective study was carried out among 119 pregnant women in the outpatient Department of obstetrics and Gynaecology, Bangabandhu Sheikh Mujib Medical University, Bangladesh, from June 2005 July 2006. Details and data obtained from medical records section were analyzed. **Results:** In our study, 119 women were included. Among them PE developed in 10 patients and 109 patients were normotensive. The mean age was  $25.48 \pm 5.26$  vs  $25.60 \pm 3.89$  in control vs PE subjects. At booking the mean SBP were  $104.40 \pm 10.67$  vs  $121.50 \pm 6.26$ , mean DBP were  $65.73 \pm 6.41$  vs  $68.00 \pm 5.87$ , mean MAP were  $77.66 \pm 5.28$  vs  $78.62 \pm 6.39$ , and mean MAP at 3<sup>rd</sup> trimester was  $78.62 \pm 6.39$  vs  $115.00 \pm 8.64$  in control and PE subjects. The mean systolic blood pressure during third trimester of the study group was  $104.40 \pm 10.67$  in control vs  $135.00 \pm 11.79$  in PE subjects. The mean diastolic blood pressure during 3<sup>rd</sup> trimester of the study group was  $65.73 \pm 6.41$  in control vs  $105.00 \pm 7.82$  in PE subjects. Mean arterial blood pressure at 3<sup>rd</sup> trimester of the study group were  $78.68 \pm 6.39$  in control vs  $115.00 \pm 8.64$  in PE. **Conclusion:** Single estimations of serum uric acid, creatinine and serum albumin concentrations associated with early pregnancy are of little value in the prediction of subsequent development of hypertensive disorders in pregnant women.

**Keywords:** First trimester, Serum albumin, Creatinine, Uric acid, Hypertensive disorder

(The Planet 2022; 6(1): 26-31)

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## INTRODUCTION

The classification and diagnostic standards for the hypertensive disorders of pregnancy have never been fully agreed upon. Due to this uncertainty, unfavorable mother and fetal outcomes for the many hypertension diseases of pregnancy, especially pre-eclampsia, are likely to vary between centers. Pre-eclampsia is a type of pregnancy hypertension disease. It typically affects between 2 and 8 percent of pregnancies.<sup>1</sup>

In both industrialized and developing nations, it is a frequent cause of maternal and neonatal illness and mortality.<sup>2</sup> Aspirin at low doses and calcium supplements have been tested as disease prevention measures, however they come with dangers.<sup>3</sup> Maternal serum has been found to contain a variety of biochemical indicators of pre-eclampsia. These include, among others, albumin, creatinine, and uric acid. According to certain research conducted on normotensive pregnant women, serum uric acid levels rise before hypertension and proteinuria do.<sup>4</sup> Pre-eclampsia has been demonstrated to have considerably higher plasma concentrations of creatinine than normotensive patients. However, during pregnancy and in pregnancies exacerbated by pre-eclampsia, plasma albumin reduces much more. Late in the second and third trimesters of pregnancy, when the disease process was typically manifest, the majority of research using estimations of serum uric, albumin, and creatinine levels as biochemical indicators for the prediction of the eventual development of pre-eclampsia were conducted.<sup>5</sup> Predictive tests for pre-eclampsia should be simple, reproducible, straightforward to administer early in pregnancy, and have a high positive predictive value. Therefore, it's critical to spot pregnant women who have a greater chance of contracting the illness. In non-pregnant women, serum uric acid is linked to insulin resistance.<sup>6</sup> Higher uric acid levels have been shown to be associated with insulin resistance in pregnant women

with hypertensive diseases.<sup>7</sup> From the eighth week of gestation to 24 weeks, the blood uric acid levels typically fall dramatically because of the increased glomerular filtration rate and reduced uric acid reabsorption from the renal tubules. It probably resembles preconception uric acid levels in the first trimester, and greater levels may indicate women who are susceptible to metabolic syndrome and have a higher chance of developing hypertensive diseases. This is due to the fact that early detection of the disease's biochemical markers would make it easier to choose individuals who were more likely to benefit from interventional therapies while also facilitating selective recruitment of those who were at elevated risk for hypertensive disorders. Therefore, single estimations of the relationship between first trimester serum albumin, creatinine, and uric acid levels as early predictors of hypertensive disorders in pregnant women of a tertiary care hospital in Bangladesh are used in this study.

## OBJECTIVE

This study aims to identify the association of first trimester serum albumin, creatinine, and uric acid level as early prediction of hypertensive disorders in pregnant women of a tertiary care hospital in Bangladesh.

## MATERIALS AND METHODS

**Type of Study** - A prospective study

**Place of Study** - Department of obstetrics and Gynaecology, Bangabandhu Sheikh Mujib Medical University, Bangladesh

**Period of study** - June 2005 July 2006

**Sample size** – 119 cases

### Sampling method

Purposive sampling.

### Inclusion criteria:

All pregnant women before 20 weeks of pregnancy.

### Exclusion criteria:

- Diabetic pregnant women.
- Pregnancy with chronic renal disease

- Patient with hypertension
- Multiple pregnancy
- Patient with any acute chronic illness
- Patient with history of collagen vascular disease.

**Data collection:** Relevant clinical data were recorded in a predesigned data collection sheet.

**Ethical consideration:**

The thesis protocol was submitted to the chairperson and head of the department, Department of Obstetrics and Gynaecology and Department of Biochemistry and duly approved. All the women enrolled in the study were explained about the nature and purpose of the study and informed written consent was taken.

**Data analysis:** Statistical analysis was performed using a statistical package

(SPSS for windows) data are expressed as mean $\pm$ SD. The statistical significance of differences between mean values was assessed by one way ANOVA test. The difference between groups were evaluated with the P-value <0.05.

**RESULTS**

In the present study, 119 women were included. All were before 20th weeks of pregnancy without any complication or any risk factors for developing pre-eclampsia. Among them PE developed in 10 patients. The rest 109 patients remain normotensive. Among the study group incidence of PE was 8.4%. The age (mean  $\pm$ SD, years) were 25.48 $\pm$ 5.26 vs 25.60 $\pm$ 3.89 in control vs PE subjects respectively. The age and BMI showed no significant difference among the two groups. See the table 1 below-

**Table 1: Anthropometric characteristics of the study subjects**

Group	Control (n=109) (mean $\pm$ SD)	PE (n=10) (mean $\pm$ SD)	P value
Age years	25.48 $\pm$ 5.26	25.60 $\pm$ 3.89	0.943
BMI	21.42 $\pm$ 1.22	21.00 $\pm$ 1.29	0.258
Mean gestational age	13.73 $\pm$ 3.32	13.90 $\pm$ 3.18	0.880

Maternal clinical characteristic of study groups at booking are given in table 2. At booking the SBP (mean  $\pm$ SD mmHg) were 104.40 $\pm$ 10.67 vs 121.50 $\pm$ 6.26, DBP (mean  $\pm$ SD mmHg) 65.73 $\pm$ 6.41 vs 68.00 $\pm$ 5.87, MAP (mean  $\pm$ SD mmHg) 77.66 $\pm$ 5.28 vs 78.62 $\pm$ 6.39, and MAP (mean  $\pm$ SD mmHg)

at 3<sup>rd</sup> trimester was 78.62 $\pm$ 6.39 vs 115.00 $\pm$ 8.64 respectively in control and PE subjects. At booking no significant difference of the systolic blood pressure (mmHg) and diastolic blood pressure and mean arterial blood pressure between study groups.

**Table 2: Maternal clinical characteristics of study groups at booking**

Variables	Control (n=109) (mean $\pm$ SD)	PE (n=10) (mean $\pm$ SD)	P-value
Mean systolic blood pressure at booking mmHg	104.40 $\pm$ 10.67	121.50 $\pm$ 6.26	0.294
Mean diastolic blood pressure at booking mmHg	65.73 $\pm$ 6.41	68.00 $\pm$ 5.87	0.284
Mean arterial blood pressure at booking mmHg	77.66 $\pm$ 5.28	78.62 $\pm$ 6.39	0.647

Mean arterial blood pressure at 3 <sup>rd</sup> trimester	78.62±6.39	115.00±8.64	0.001
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Maternal clinical characteristic at 3<sup>rd</sup> trimester are given in table 3. The systolic blood pressure (mmHg ±SD) during third trimester of the study group was as follow. Control 104.40±10.67 vs PE 135.00±11.79. There was significant difference of the systolic blood pressure (mmHg) between control and PE during 3<sup>rd</sup> trimester. The diastolic blood pressure (mmHg ±SD) during third trimester of the

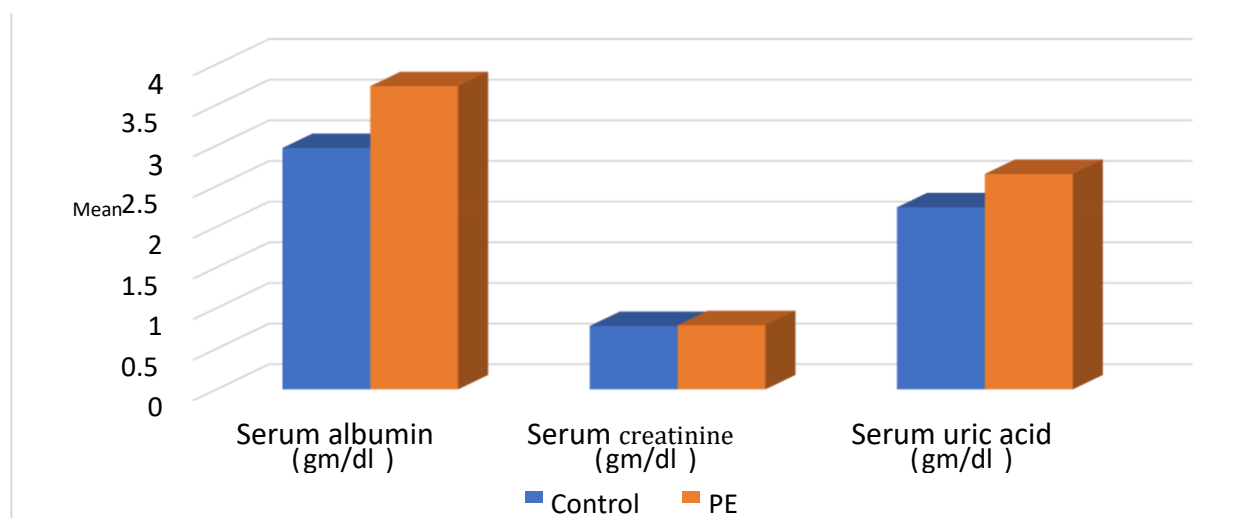
study group was as follows: control 65.73±6.41 vs PE 105.00±7.82. There was significant difference of the diastolic blood pressure (mmHg) between control and PE during third trimester. Mean arterial blood pressure at 3<sup>rd</sup> trimester of the study group were as follows: control 78.68±6.39 vs PE 115.00±8.64. There was significant difference between two groups. See table 3 below-

**Table 3: Maternal clinical characteristics of study groups at 3<sup>rd</sup> trimester**

Variables	Control (n=109) (mean±SD)	PE (n=10) (mean±SD)	P-value
Mean systolic blood pressure at 3 <sup>rd</sup> trimester	104.40±10.67	135.00±11.79	0.001
Mean diastolic blood pressure at 3 <sup>rd</sup> trimester	65.73±6.41	105.00±7.82	0.001
Mean arterial blood pressure at 3 <sup>rd</sup> trimester	78.62±6.39	115.00±8.64	0.001

Serum albumin, serum uric acid and serum creatinine levels at booking are given in figure 1. The serum albumin (gm/dl) mean ±SD of the study groups were as follows: control 2.97±0.55 vs PE 3.73±0.52. There was significant difference in serum albumin levels, between two groups.

Serum creatinine (mg/dl) mean ±SD of the study group (0.78±8.5 and 0.79±6.11 control vs PE) and serum uric acid (mg/dl) mean ±SD (2.24±0.71 and 2.65±0.56) in control vs PE shows no significant difference in control and PE cases at booking visit. See the figure 1 below-



**Figure 1: Serum albumin, serum uric acid and serum creatinine levels at booking**

## DISCUSSION

This study's goal was to prospectively evaluate the possibility of early hypertensive disorders prediction using a single computation of levels of numerous well-known biochemical components affected by the disease. Mixed parity was employed based on past studies for early pre-eclampsia prediction.<sup>8</sup> The prevalence was 8.4 percent, which is slightly lower than the average for the developing world but seems to be appropriate in a city. Ten of the 119 pregnant women who later had screening for PE had the condition. Similar to other studies, the mean maternal age and the mean gestational age at the first trimester did not show any apparent difference.<sup>9</sup> Furthermore, there is little change in BMI throughout the first trimester. This result is in line with studies by Clausen and Chavarria.<sup>10,11</sup> At the third trimester, the pre-eclampsia group showed significantly higher mean systolic, diastolic, and mean arterial pressure values. These results agree with those of other research. The booking of the study group and the first 20 weeks' blood pressure, however, showed no appreciable change.

There was no appreciable difference in mean uric acid levels between the two groups at booking, despite the fact that PE patients have higher blood uric acid levels. This result is in line with the research. The mean serum albumin concentration in the pre-eclampsia group was higher than in the normotensive group, although it was still within the normal range. The Salako research but not other studies that employed the generally established idea that pregnancies complicated by pre-eclampsia are characterized by hypoalbuminaemia, supports this conclusion.<sup>12</sup> Many more studies were undertaken on the blood albumin level in the late third trimester.

In individuals with hypertension problems or those who are more likely to develop them, early diagnosis and adequate

treatment will assist to prevent unfavorable outcomes for the mother and fetus as well as safeguard them from long-term difficulties. In their study, Al-Rowaily et al. found that multiparous women had an 8.29-fold higher risk of diabetes mellitus than nulliparous women.<sup>13</sup>

According to a study, there was no difference in the incidence of diabetes mellitus according to the parity of the population studied ( $p = 0.870$ ), and the majority of the pregnant women who participated had serum uric acid levels that were in the second and third quartiles and were non-obese (BMI 30 kg/m<sup>2</sup>) and 80% of the pregnant women studied were non-obese. Twenty percent of people were obese, with serum uric acid levels in the third and second quartiles, respectively.

Laughon KS et al. made a similar claim, stating that even though body mass index and uric acid were substantially correlated, women with elevated first-trimester uric acid had an increased risk of gestational diabetes regardless of BMI. Similarly, first trimester hyperuricemia is linked to an increased chance of developing diabetes mellitus, according to Langhon KS et al.<sup>14</sup>

## CONCLUSION

The results of this study demonstrated that single estimates of serum levels of uric acid, creatinine, and albumin linked with early pregnancy are of limited use in predicting the development of hypertensive problems in pregnant women later on, either individually or in combination. In our study, individuals who developed pre-eclampsia had considerably higher mean serum albumin levels. To accurately determine the usefulness of estimation of blood albumin levels in early pregnancy in the prediction of additional hypertension illnesses, a larger investigation is therefore advised.

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