

Comparison the Presence of Serum Level of Albumin, Uric Acid and Creatinine in Pregnant Women Developed Symptoms of Preeclampsia and Who are Free from Symptoms of Preeclampsia: A Prospective Study

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Abstract

Background: Preeclampsia, a hypertension condition that develops during pregnancy, is one of the most common causes of premature labour and delivery, perinatal death, and maternal mortality. Preeclampsia and other hypertensive diseases of pregnancy complicate a significant percentage of all pregnancies, necessitating early detection and warning. **Objective:** The aim of this study is to compare the presence of serum level of albumin, uric acid and creatinine in pregnant women who developed symptoms of preeclampsia and who are free from symptoms of preeclampsia. **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:** Among 119 women, PE developed in 10 patients and 109 patients remain normotensive. Among the study group incidence of PE was 8.4%. The mean age was 25.48 ± 5.26 vs 25.60 ± 3.89 in control vs PE subjects respectively. At booking the mean SBP was 104.40 ± 10.67 vs 121.50 ± 6.26 , mean DBP was 65.73 ± 6.41 vs 68.00 ± 5.87 , mean MAP was 77.66 ± 5.28 vs 78.62 ± 6.39 respectively in control and PE subjects. The mean serum albumin (gm/dl) of the study groups were as follows: control 2.97 ± 0.55 vs PE 3.73 ± 0.52 . Serum creatinine of the study group (0.78 ± 8.5 and 0.79 ± 6.11 in control vs PE) and serum uric acid (2.24 ± 0.71 and 2.65 ± 0.56 in control vs PE) shows no significant difference at booking visit. The sensitivity of S. albumin, uric acid and creatinine area is 50%, 10%, 0%. Specificity of serum albumin is 5.25%, uric acid is 9.09%. But specificity of creatinine is high (97%) positive predictive value of all parameters are low. PPV of serum albumin is 4.76%, serum creatinine is 6.6%. Negative predictive value of creatinine is high (72%). Negative predictive value of serum albumin and serum uric acid are 6.42% and 9.12% respectively. **Conclusion:** In developing nations, pre-eclampsia is a common cause of maternal and neonatal illness. In maternal serum, many biochemical markers of pre-eclampsia have been identified. Uric acid, creatinine, and albumin are only a few of them. Uncorrelated serum uric acid, serum creatinine, or serum urea readings are insufficient to be considered as reliable predictors of preeclampsia.

Keywords: Serum level, Uric acid, Preeclampsia, Pregnant women.

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INTRODUCTION

Preeclampsia is a multisystem illness that only occurs in human pregnancies and has an unknown origin. It complicates 10 million pregnancies yearly, causing 76,000 maternal and 500,000 fetal or newborn deaths globally due to its highly varied clinical presentation [1]. This condition has effects that go beyond pregnancy. They raise the chance of developing

cardiovascular problems in both the mother and the child and can result in long-term vascular and metabolic damage [1]. Despite the fact that this condition is incurable, early discovery and referral to a high-complexity center are essential to reducing pregnancy problems and their long-term effects. Preeclampsia is currently recognized in women only after the development of clinical symptoms, which makes patient care very difficult. Predicting whether women are at

risk of getting preeclampsia is still difficult due to the serious side effects of this illness. A number of interesting biomarkers that might be used to provide an early diagnosis have so far been found.

A biomarker's suitability as a screening tool should be considered in addition to its biological properties and role in the pathophysiology of the disease when selecting one. A marker that necessitates sophisticated technology and does not demonstrate a favorable cost-benefit ratio need to be disregarded. This may even be more important in low-income nations where there are more deaths from hypertensive pregnancies than in developed nations [2]. Urinary incontinence is a sign of renal failure, tissue damage, and oxidative stress [3]. Compared to a pregnancy without pre-eclampsia, the maternal serum uric acid content is considerably higher from the beginning of pregnancy. Therefore, rather than indicating severity, a rise in serum uric acid may be involved in the development of preeclampsia [3]. Due to the pregnancy-induced expansion of the blood volume, the rise in renal blood flow, the glomerular filtration rate, and the uricosuric action of estrogen, serum uric acid concentrations in uncomplicated pregnancies fall by 25–35 percent [4]. As the pregnancy progresses, the levels of serum uric acid grow until delivery due to an increase in fetal production, a decrease in albumin binding, and a decrease in renal clearance [5]. Several researchers have noted the decrease in serum albumin that occurs during a typical pregnancy. Preeclampsia may be detected by measuring the serum albumin levels [4]. Due to increased glomerular filtration load and the dilutional effect of extracellular fluid expansion, serum creatinine is lowered during a normal pregnancy below non-pregnant norms. 0.6 to 0.8 mg/dl of serum creatinine is regarded as normal. However, a blood creatinine level of more than 0.8 mg/dl in pregnant women with proteinuria should alert a doctor to the possibility of impaired renal function [5]. A profile scoring system for the early detection of preeclampsia can be applied using serum albumin, serum uric acid, and serum creatinine [6]. Early detection of the disease's biochemical indicators would not only allow for selective recruitment of those at higher risk for preeclampsia, but would also make it easier to identify which patients would most likely benefit from interventional therapies [7]. Being a poor nation, Bangladesh has a high preeclampsia rate. In order to assess and compare the serum levels of albumin, uric acid, and creatinine in preeclamptic and normotensive groups, this study was conducted in Bangladesh.

OBJECTIVE

This study aims to compare the presence of serum level of albumin, uric acid and creatinine in pregnant women who developed symptoms of preeclampsia and who are free from symptoms of preeclampsia.

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 technique applied for this study.

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±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 3rd

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 rd trimester	78.62 \pm 6.39	115.00 \pm 8.64	0.001

Serum albumin, serum uric acid and serum creatinine levels at booking are given in Table 3. The serum albumin (gm/dl) mean \pm SD of the study groups were as follows: control 2.97 \pm 0.55 vs PE 3.73 \pm 0.52. There was significant difference in serum albumin levels, between two groups. Serum creatinine (mg/dl)

mean \pm SD of the study group (0.78 \pm 8.5 and 0.79 \pm 6.11 control vs PE) and serum uric acid (mg/dl) mean \pm SD (2.24 \pm 0.71 and 2.65 \pm 0.56) in control vs PE shows no significant difference in control and PE cases at booking visit. See the Table 3 below-

Table 3: Mean serum values for S. albumin, S. creatinine and S. uric acid at booking

Variables	Control (n=109) (mean \pm SD)	PE (n=10) (mean \pm SD)	P-value
Serum albumin (gm/dl)	2.97 \pm 0.55	3.73 \pm 0.52	0.01
Serum creatinine (mg/dl)	0.78 \pm 8.51	0.79 \pm 6.11	0.693
Serum uric acid (mg/dl)	2.24 \pm 0.71	2.65 \pm 0.56	0.085

Predictive values of serum albumin, creatinine and uric acid are shown in Figure 1. And Table 4 shows the sensitivity of S. albumin, uric acid and creatinine area is 50%, 10%, 0% respectively, specificity is also low. Serum albumin is 5.25%, uric acid is 9.09%. But specificity of creatinine is high (97%) positive

predictive value of all parameters are low. PPV of serum albumin is 4.76%, serum creatinine is 6.6%. Negative predictive value of creatinine is high (72%). Negative predictive value of serum albumin and serum uric acid are 6.42% and 9.12% respectively.

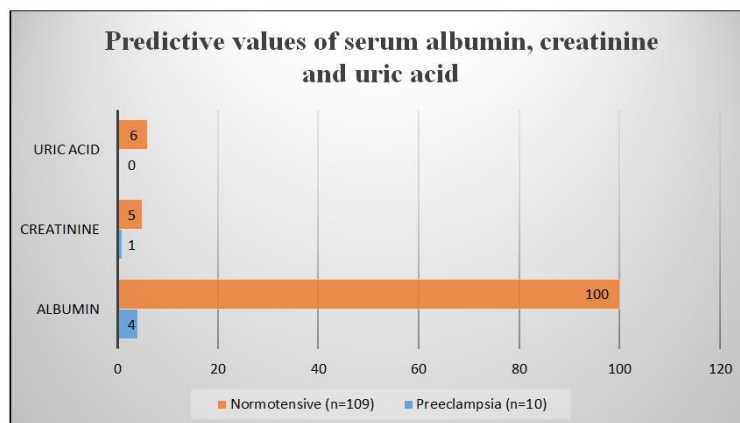


Figure 1: Predictive values of serum albumin, creatinine and uric acid

Table 4: Predictive values of serum albumin, creatinine and uric acid

	Albumin	Creatinine	Uric acid
Preeclampsia (n=10)	4	1	0
Normotensive (n=109)	100	5	6
Sensitivity (%)	50%	10%	0
Specificity (%)	5.25%	95%	9.9%
Positive predictive value (%)	4.76%	6.6%	0
Negative predictive value (%)	6.42%	72%	9.12%

DISCUSSION

Pre-eclamptics mean weight changes and significant increases in systolic and/or diastolic blood pressure, when compared to normotensives, are consistent with the findings of a number of preceding investigations [8,9]. In our study, the SBP (mean SD mmHg) at booking was 104.40/10.67 vs 121.50/6.26, the DBP (mean SD mmHg) was 65.73/6.41 vs 68.00/5.87, the MAP (mean SD mmHg) was 77.66/5.28 vs 78.62/6.39, and the MAP (mean SD There was no discernible difference between the research groups' mean arterial blood pressure, systolic blood pressure, or diastolic blood pressure upon booking. The severity of the high values of the blood uric acid levels in pre-eclamptic women appears to be in disagreement and confusion. While the majority of research that are now accessible have typically found a significant increase in serum uric acid levels in the first group, several studies have also found no such obvious significance in the corresponding results. Similar results have been seen when considering the amount of elevated creatinine levels in preeclampsia. It was discovered in multiple investigations that the degree of uric acid level rise in pre-eclamptics was a predictor of the severity of this illness [10-12]. Additionally, it has been suggested that increased uric acid levels have a significant role in the development and expression of pre-eclamptic disease [9]. The study groups' mean serum albumin concentrations (gm/dl) and standard deviations (SD) were as follows: control 2.97 ± 0.55 versus PE 3.73 ± 0.52 . Serum albumin levels between the two groups differed significantly. There is no discernible difference between the control and PE cases at the booking visit based on the serum creatinine (mg/dl) mean SD of the study group (0.788.5 and 0.796.11 control vs PE) or the serum uric acid (mg/dl) mean SD (2.240.71 and 2.650.56). This is consistent with a previous study's conclusion that the degree of proteinuria rather than the degree of hypertension can more strongly influence changes in the plasma concentrations of serum uric acid [11]. Uric acid, along with creatinine and to a lesser extent urea, has antioxidant properties that are water soluble or hydrophilic and may delay or limit cellular damage primarily through its capacity to scavenge free radicals [13]. In the human serum, uric acid is responsible for around 60% of the free radical scavenging action [14]. Increased serum uric acid levels indicate the onset of hypertension [15]. In uncomplicated pregnancies, blood uric acid concentrations initially drop by around 25% to

35%, but then rise steadily throughout the pregnancy, eventually approaching non-pregnant levels toward the end [16]. Reduced renal urate clearance as a result of renal failure is a secondary cause of increased serum uric acid in pregnancy [17].

Pre-eclamptic patients and normotensives had different mean serum uric acid or creatinine concentrations, but these changes were not statistically significant, indicating that these markers have little predictive value for preeclampsia [16].

Early research indicated elevated creatinine levels but claimed that preeclampsia was not predicted by the latter [11]. Our current research supports two earlier studies' findings that minor variations in uric acid levels, in both pre-eclamptics and normotensives, are not clinically significant [8, 18].

CONCLUSION

Early in pregnancy, a single calculation of serum uric acid and creatinine levels is of limited use in predicting pre-eclampsia. Serum albumin concentrations in the first trimester of pregnancy can be used to predict pre-eclampsia. There is an urgent need for quality antenatal care, strict monitoring of patients with eclampsia, and prompt hospitalization to improve maternal and fetal outcomes. To change these statistics on maternal, fetal, and neonatal health, governments in low-resource nations must concentrate on empowering women and providing them with the financial means to access healthcare. By doing this, avoidable issues and fatalities would be reduced. Large scale prospective and longitudinal studies should be under taken across early pregnancy in the prediction of pre-eclampsia.

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