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Original Article

Clinical and Biochemical Marker as a Predictor in the Early Stages of Pregnancy for the Future Development of Preeclampsia: A Prospective Study

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ABSTRACT

Background*:** *One of the most significant pregnancy problems is preeclampsia (PE). There are 8.5 million women worldwide who are affected with PE, which affects 3 to 8% of pregnancies globally.* ***Objective*:** *This study aims to identify the clinical and biochemical marker as a predictor in the early stages of pregnancy for the future development of preeclampsia 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±5.26 vs 25.60±3.89 in control vs PE subjects. At booking the mean SBP were 104.40±10.67 vs 121.50±6.26, mean DBP were 65.73±6.41 vs 68.00±5.87, mean MAP were 77.66±5.28 vs 78.62±6.39, and mean MAP at 3rd trimester was 78.62±6.39 vs 115.00±8.64 in control and PE subjects. The mean systolic blood pressure during third trimester of the study group was 104.40±10.67 in control vs 135.00±11.79 in PE subjects. The mean diastolic blood pressure during 3rd trimester of the study group was 65.73±6.41 in control vs 105.00±7.82 in PE subjects. Mean arterial blood pressure at 3rd trimester of the study group were 78.68±6.39 in control vs 115.00±8.64 in PE.* ***Conclusion*:** *Many biochemical marker of pre-eclampsia have been recognized in maternal serum. Single estimation of serum uric acid and creatinine levels early in pregnancy are of little value in the prediction of pre-eclampsia. Early pregnancy levels of serum albumin can be used as predictors of pre-*

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eclampsia.

Keywords**:** *Biochemical marker, Pregnancy, Preeclampsia.*

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INTRODUCTION

A prevalent cause of fetal or maternal illness and mortality is preeclampsia. Delivery is still the only option for treatment once the condition has started because its etiology is unclear. The absence of a preeclampsia predictive test has made it difficult to identify a high-risk population. Numerous diagnostics, both clinical and biologic, have been described, however it is still unclear or controversial how well they predict outcomes.[1,2] When assessing a test's or a collection of tests' ability to predict preeclampsia, a number of errors must be avoided. The diagnosis is primarily clinical, and multiparous women are more likely to be incorrectly classified than other women. The likelihood of a first-time reading of raised blood pressure during labor or in the early postpartum period is not linked to the increased consequences seen in preeclampsia cases.[3] If the result becomes abnormal shortly before the presentation of the clinical signs, the timing of testing may impact the test's predictive ability and may invalidate its use as an early predictor of the disease. In order to focus research on new interventions on those who are most at risk for the condition and may therefore benefit from preventative medicine, an accurate predictive algorithm to asses the risk of severe preeclampsia could be a useful tool. The majority of researchers have only paid attention to clinical prediction criteria, and the outcomes have been dismal.[4-6] Recently, several researchers have proposed an association between precclampsia and biochemical markers present during the second trimester.[7,8] In this paper, we provide the outcomes of our prospective study's evaluation of numerous putative clinical and biochemical indicators of preeclampsia using stringent diagnostic criteria.

OBJECTIVE

This study aims to identify the clinical and biochemical marker as a predictor in the early stages of pregnancy for the future development of preeclampsia in pregnant women of a tertiary care hospital in Bangladesh.

MATERIALS & 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

Probability sampling technique applied.

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 were 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 ±SD, years) were 25.48±5.26 vs 25.60±3.89 in control vs PE subjects respectively. The age and BMI showed no significant difference among the two group. See the table 1 below-

Table 1: Anthropometric characteristics of the study subjects

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

Maternal clinical characteristic of study groups at booking are given in table 2. At booking the SBP (mean ±SD mmHg) were 104.40±10.67 vs 121.50±6.26, DBP (mean ±SD mmHg) 65.73±6.41 vs 68.00±5.87, MAP (mean ±SD mmHg) 77.66±5.28 vs 78.62±6.39, and MAP (mean ±SD mmHg) at 3rd trimester was 78.62±6.39 vs 115.00±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±SD)	PE (n=10) (mean±SD)	P-value
Mean systolic blood pressure at booking mmHg	104.40±10.67	121.50±6.26	0.294
Mean diastolic blood pressure at booking mmHg	65.73±6.41	68.00±5.87	0.284
Mean arterial blood pressure at booking mmHg	77.66±5.28	78.62±6.39	0.647
Mean arterial blood pressure at 3rd trimester	78.62±6.39	115.00±8.64	0.001

Maternal clinical characteristic at 3rd trimester are given in table 3. The systolic blood pressure (mmHg ±SD) during third trimester of the study group were 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 3rd trimester. The diastolic blood pressure (mmHg ±SD) during third trimester of the study group were 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 3rd 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-

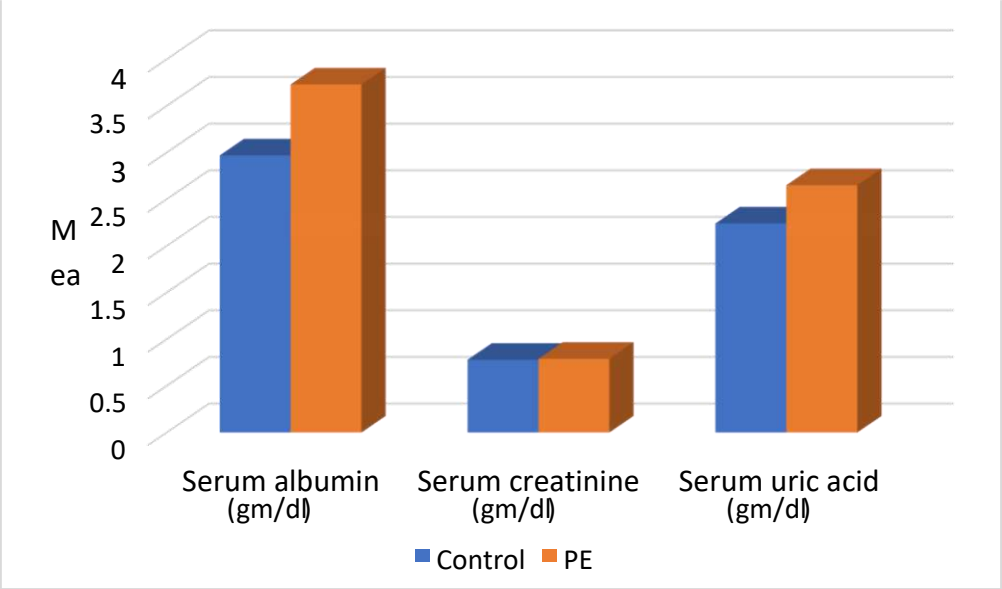
Table 3: Maternal clinical characteristics of study groups at 3rd trimester

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

Serum albumin, serum uric acid and serum creatinine levels at bookingare 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.



Predictive values of serum albumin, creatinine and uric acid are shown in table 4. It 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.

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

More than 100 clinical, biophysical, and biochemical tests have been previously published, which is evidence that preeclampsia development can be predicted.[9] However, the published results from a number of studies could not be replicated or had significant design errors. This study's goal was to prospectively assess a number of commonly accessible clinical and molecular indicators' capacity to detect pregnancy in its early stages.

A predictive test must be modified early enough in pregnancy to give the requisite time for the preventative measures to be effective if it is to be useful in identifying women for whom the risk of preeclampsia is high enough to warrant the administration of preventive measures.

According to a study, having a family history of hypertension and having a high body mass index both enhance the chance of preeclampsia.[8]

In our study, there was a substantial variation in body mass index. The receiver-operator characteristics curves prevent the study's lack of power from being used in relation to the other physiological tests. To boost sensitivity while maintaining a tolerable level of specificity, we integrated the biologic indicators using stepwise logistic regression.

Predicting which patients are most likely to develop preeclampsia would be very helpful in both preventative and interventional studies since it would be possible to identify a high-risk population that would benefit from more aggressive treatment and close monitoring. We opted to concentrate on preeclampsia early stage prediction since afflicted patients have unfavorable pregnancy outcomes more frequently. The presence of specific clinical characteristics or aberrant biochemical marker levels has been linked to an elevated risk for preeclampsia, but no method for effectively preventing preeclampsia with both clinical variables and biochemical markers has been reported. [10-13]

It's interesting to note that while our study's findings support several previously documented relationships between preedampsia and clinical risk factors, they do not support all of them. It is noteworthy that despite prior reports linking them to preeclampsia, clinical variables like extreme maternal age, race, body mass index, autism, and insulin-dependent diabetic mellitus were not linked to an elevated risk for severe preeclampsia.[14.15] According to numerous researchers, preeclampsia can be accurately predicted by clinical indicators and other risk factors with comparable effect sizes.

The purpose of this study was to prospectively assess the potential for early pre-eclampsia prediction using a single calculation of levels of various well-known biochemical compounds impacted by the condition. The different factors in this study's sensitivity, specificity, and predictive values were consistent with those in earlier investigations.[16] Low sensitivity throughout the board. High specificity is present in serum creatinine. Low positive predictive value across the board serum creatinine levels having a negative predictive value.Therefore, serum albumin can be utilized as a poor

specificity and predictive value early indicator of pre-eclampsia.

CONCLUSION

Many biochemical marker of pre-eclampsia have been recognized in maternal serum. Single estimation of serum uric acid and creatinine levels early in pregnancy are of little value in the prediction of pre-eclampsia. Early pregnancy levels of serum albumin can be used as predictors of pre-eclampsia.Using a well-defined criteria for diagnosis of the disorder the present study wasundertaken to assess the value of serum albumin, serum uric acid and serum creatinine in the prediction of pre-eclampsia and also to compare serum albumin with serum uric acid and serum creatinine in this prediction. 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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