

## Serum uric acid level between normotensive and pre-eclamptic patients in third trimester of pregnancy and perinatal outcome

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### Abstract

**Background :** Preeclampsia is associated with maternal and neonatal complications. It has been indicated that increased uric acid might have a predictive role on preeclampsia. Several studies have demonstrated a relation between elevated maternal serum uric acid levels and adverse maternal and fetal outcome. The aim of this study was to find out the association of serum uric acid level between normotensive and pre-eclamptic (PE) patients in third trimester of pregnancy and perinatal outcome.

**Methodology :** A case control study was conducted in the department of the Obstetrics and Gynaecology in Dhaka Medical College Hospital from July 2017 to June 2018. A total number of 100 pregnant women in third trimester of pregnancy attending in Obstetrics and Gynaecology department of Dhaka Medical College Hospital were selected purposively as study subjects. Among them 50 diagnosed cases of preeclampsia were selected as cases with age range of 18-35 years and 50 normal healthy age matched pregnant women as controls. Pregnant women with pre-existing hypertension, diabetes mellitus and renal disease were excluded from the study by history, clinical examination and relevant laboratory investigations.

**Results :** The mean serum uric acid level was found  $4.49 \pm 1.72$  mg/dl in normotensive group and  $7.03 \pm 1.89$  mg/dl in preeclampsia group. Serum uric acid was significantly higher ( $p < 0.05$ ) in pre-eclampsia group than normotensive group. Regarding outcome take home as alive neonate was found 48(96.0%) in normotensive group and 41(82.0%) in pre-eclampsia group. Early neonatal death was 1(2.0%) in normotensive and 4(8.0%) in pre-eclampsia group. Still birth was 1(2.0%) and 5(10.0%) in normotensive and pre-eclampsia group respectively.

**Conclusion :** Hyperuricemia is most basic and reliable observations in pre-eclamptic pregnancies. While elevated concentrations of circulating uric acid are not uniformly increased in every woman with PE. But hyperuricemia is found in a subset of pre-eclamptic women who had higher risk for maternal and fetal complications. Therefore, measurement of serum uric acid concentration seems to be a useful test to predict maternal and fetal complications in a women with preeclampsia.

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### Introduction

Preeclampsia (PE) especially severe or early PE, is a leading cause of morbidity and mortality among the mothers and infants. Preeclampsia is associated with maternal and neonatal complications.<sup>1</sup>

Uric acid is formed by the breakdown of purines and by direct synthesis from 5-phosphoribosyl phosphate (5-PRPP) and glutamine. The normal blood uric acid in humans is approximately 4mg/dl. In the kidney, uric acid is filtered,

reabsorbed and secreted. Normally, 98% of the filtered uric acid is reabsorbed and the remaining 2% makes up approximately 20% of the amount excreted. Remaining 80% comes from the tubular secretion.<sup>11,1</sup> Among several pathophysiologic factors the most commonly accepted explanation for hyperuricemia in PE is increased reabsorption and decreased excretion of uric acid. Some investigators use serum uric acid as a predictor for preeclampsia.<sup>3,2</sup>

Many researches have been tried to identify a unique screening test that would predict the risk

of developing PE before the classic symptoms appear.

It seems that measuring the blood level of uric acid is one of the available and cheap screening tests that have already been taken into an account. Several studies have demonstrated a relation between elevated maternal serum uric acid levels and adverse maternal and fetal outcome.<sup>4</sup> Therefore, in this study we try to find out the association of serum uric acid level between normotensive and pre-eclamptic (PE) patients in third trimester of pregnancy and perinatal outcome.

**Methodology**

A case control study was conducted in the department of the Obstetrics and Gynaecology in Dhaka Medical College Hospital from July 2017 to June 2018.

A total number of 100 pregnant women in third trimester of pregnancy attending in Obstetrics and Gynaecology department of Dhaka Medical College Hospital were selected purposively as study subjects. Among them 50 diagnosed cases of preeclampsia were selected as cases with age range of 18-35 years and 50 normal healthy age matched pregnant women as controls.

Pregnant women with pre-existing hypertension, diabetes mellitus and renal disease were excluded from the study by history, clinical examination and relevant laboratory investigations.

After obtaining informed written consent from all the study subjects relevant data were documented in a predefined data sheet. Then with all aseptic precaution blood samples were collected from all the study subjects for estimation of serum uric acid concentration. Serum uric acid level was estimated by colorimetric assay.

Statistical analysis was performed by using computer based software, Statistical Package for Social Science (SPSS) for windows version 23. Mean values of different parameters were compared to see the differences between two groups by using Student’s unpaired ‘t’ test. Chi-square test was performed to find the statistical difference regarding gravida distribution between groups. For all statistical analysis, ‘p’ value <0.05 was considered as significant.

**Result**

In this study majority patients belonged to age 21-30 years in both groups. The mean age 26.12±4.51 years in normotensive group and 25.56±4.33 years in pre-eclampsia group. The difference was not statistically significant (p>0.05) between the two groups (Table I).

In our study we found mean gestational age was 34.62±2.90 weeks in normotensive group and 35.35±2.47 weeks in pre-eclampsia group. The difference was not statistically significant

(p>0.05) between two groups (Table-II).

In this study primigravida was 31(62.0%) in normotensive group and 36(72.0%) in pre-eclampsia group. Multigravida was 19(38.0%) and 14(28.0%) in normotensive and pre-eclampsia group. The difference was not statistically significant (p>0.05) between two groups (Table III).

Regular antenatal checkup (ANC) was found 17(34.0%) in normotensive group and 3(6.0%) in preeclampsia group. Irregular ANC was 21(42.0%) and 27(54.0%) in normotensive and preeclampsia group respectively. None ANC was 13(26.0%) in normotensive group and 20(40.00%) in preeclampsia group. The difference was statistically significant (p<0.05) between two groups (Table IV).

In our study mean serum uric acid level was found 4.49±1.72 mg/dl in normotensive group and 7.03±1.89 mg/dl in preeclampsia group. Serum uric acid was significantly higher (p<0.05) in pre-eclampsia group than normotensive group (Table V). We found very low birth and low birth weight babies were higher in preeclampsia group (12.0% and 48.0%). However in normotensive group majority babies were normal birth weight 44(88.0%). The difference was statistically significant (p<0.05) between two groups (Table VI). In this study at 1 minute APGAR score ≥7 was found 41(82.0%) in normotensive group and 15(30.0%) in pre-eclampsia group. At 5 minute APGAR score ≥7 was 45(90.0%) and 21(42.0%) in pre-eclampsia group. The difference was statistically significant (p<0.05) between two groups (Table VII). IUGR was found 8(16.0%) in pre-eclampsia group, prematurity was 3(6.0%) in normotensive and 13(26.0%) in pre-eclampsia group, birth asphyxia was 6(12.0%) and 15(30.0%) in normotensive and pre-eclampsia group respectively. No complication was 41(82.0%) in normotensive group and 14(28.0%) in pre-eclampsia group. The difference was statistically significant (p<0.05) between two groups (Table VIII).

Finally, we found that take home alive neonate was 48(96.0%) in normotensive group and 41(82.0%) in pre-eclampsia group. Early neonatal death was 1(2.0%) in normotensive and 4(8.0%) in pre-eclampsia group. Still birth was 1(2.0%) and 5(10.0%) in normotensive and pre-eclampsia group respectively (Table VIII).

**Table I : Distribution of the study patients by age (n=100)**

Age (years)	Normotensive (n=50)		Pre-eclampsia (n=50)		p value
	n	%	n	%	
≤20	4	8.0	5	10.0	
21-30	43	86.0	37	74.0	
>30	3	6.0	8	16.0	
Mean ±SD	26.12±4.51		25.56±4.33		0.528 <sup>ns</sup>

ns=not significant

p value reached from unpaired t-test

**Table II : Distribution of the study patients by gestational age (n=100)**

	Normotensive (n=50)		Preeclampsia (n=50)		p value
	mean ±SD		mean ±SD		
	n	%	n	%	
Gestational age (weeks)	34.62±2.90		35.55±2.47		0.087 <sup>ns</sup>

ns=not significant

p value reached from unpaired t-test

**Table III : Distribution of the study patients by gravida (n=100)**

Gravida	Normotensive (n=50)		Pre-eclampsia (n=50)		p value
	n	%	n	%	
	Primi	31	62.0	36	
Multi	19	38.0	14	28.0	

ns=not significant

p value reached from Chi square test

**Table IV : Distribution of the study patients by antenatal check up (n=100)**

Antenatal check up	Normotensive (n=50)		Preeclampsia (n=50)		p value
	n	%	n	%	
	Regular	17	34.0	3	
Irregular	21	42.0	27	54.0	
None	13	26.0	20	40.0	

ns=not significant

p value reached from Chi square test

**Table V : Distribution of the study patients by serum uric acid level (n=100)**

	Normotensive (n=50)		Pre-eclampsia (n=50)		p value
	mean ±SD		mean ±SD		
	n	%	n	%	
Serum uric acid level (mg/dl)			4.49±1.72		7.03±1.89 0.001 <sup>s</sup>

s= significant

p value reached from unpaired t-test

**Table VI: Distribution of the study patients by fetal weight (n=100)**

Fetal weight	Normotensive (n=50)		Pre-eclampsia (n=50)		p value
	n	%	n	%	
	Very low birth weight (<1.5 kg)	1	2.0	6	
Low birth weight (<2.5 kg)	5	10.0	24	48.0	
Normal weight (≥2.5 kg)	44	88.0	20	40.0	

s= significant

p value reached from Chi square test

**Table VII: Distribution of the study patients by APGAR score (n=100)**

APGAR score	Normotensive (n=50)		Pre-eclampsia (n=50)		p value
	n	%	n	%	
	At 1 minute				
<7	9	18.0	35	70.0	
≥7	41	82.0	15	30.0	
At 5 minute					0.001 <sup>s</sup>
<7	5	10.0	29	58.0	
≥7	45	90.0	21	42.0	

s= significant

p value reached from Chi square test

**Table VIII : Distribution of the study patients by fetal complication (n=100)**

Fetal complication	Normotensive (n=50)		Preeclampsia (n=50)		p value
	n	%	n	%	
	IUGR	0	0.0	8	
Prematurity	3	6.0	13	26.0	
Birth asphyxia	6	12.0	15	30.0	
No complication	41	82.0	14	28.0	

s= significant p value reached from Chi square test

**Table IX : Distribution of the study patients by perinatal outcome (n=100)**

Perinatal outcome	Normotensive (n=50)		Preeclampsia (n=50)		p value
	n	%	n	%	
	Take home alive	48	96.0	41	
Early neonatal death	1	2.0	4	8.0	
Still birth	1	2.0	5	10.00	

s= significant p value reached from Chi square test

## Discussion

This study was aimed to find out the association between serum uric acid and preeclampsia. In this study the majority patients belonged to age 21-30 years in both the groups. The mean age 26.12±4.51 years in normotensive group and 25.56±4.33 years in pre-eclampsia group. The difference was not statistically significant ( $p>0.05$ ) between two groups. Sultana A et al. found that majority (40.0%) of the cases were in age group 20-29 years and 50.0% in control group. Maternal age >34 years was found 15 (30%) in case group, and 4 (8%) in control group. The mean age was found 25.8±5.26 years with range from 17 to 38 years and 24.15±3.69 years with range from 18 to 35 years in case and control group respectively. The mean age difference was not statistically significant ( $p>0.05$ ) between two groups<sup>1</sup>, which was similar to our study. Sultana R et al. and Pramanik et al. also found similar results.<sup>4,5</sup>

In this study, mean gestational age was 34.62±2.90 weeks in normotensive group and 35.35±2.47 weeks in pre-eclampsia group. The difference was not statistically significant ( $p>0.05$ ) between two groups. Asgharnia et al. found mean gestational age was 34.74±2.64 weeks in pre-eclamptic patients in their study.<sup>2</sup>

This study showed primigravida was 31(62.0%) in normotensive group and 36(72.0%) in pre-eclampsia group. Multigravida was 19(38.0%) and 14(28.0%) in normotensive and pre-eclampsia group. The difference was not statistically significant ( $p>0.05$ ) between two groups. Sultana R et al. reported similar finding in their study.<sup>4</sup>

In our study regular antenatal check up was found 17(34.0%) in normotensive group and 3(6.0%) in preeclampsia group. Irregular ANC was 21(42.0%) and 27(54.0%) in normotensive and preeclampsia group respectively. No ANC was 13(26.0%) in normotensive group and 20(40.00%) in preeclampsia group. The difference was statistically significant ( $p<0.05$ ) between two groups. Similar observation was found Sultana R et al.<sup>4</sup>

In this study the mean serum uric acid level was found 4.49±1.72 mg/dl in normotensive group and 7.03±1.89 mg/dl in preeclampsia group. Serum uric acid was significantly higher ( $p<0.05$ ) in pre-eclampsia group than normotensive group. Sultana et al.<sup>4</sup> observed similar results. A good number of studies done previously had revealed similar findings.<sup>5,6</sup> However, several other studies showed that serum uric acid is a poor predictor of PE.<sup>7-10</sup>

In this study we found very low birth and low birth weight babies were higher in preeclampsia group (12.0% and 48.0%). However, in normotensive group majority babies were with normal birth weight 44(88.0%). The difference was statistically significant ( $p<0.05$ ) between two groups. In the study of Sultana R et al. study in case group 5(12.5%) babies had very low birth weight (<1.5 kg) but none in control group. Twenty one (52.5%) babies had low birth weight (<2.5 kg) in case group and 8.0% of babies had low birth weight in control group. These difference was significantly ( $p<0.05$ ) higher in case group. Fourteen (35.0%) babies were found normal weight ( $\geq 2.5$  kg) in case group and 46(92.0%) in control group.<sup>4</sup>

In this study 1 minute APGAR score  $\geq 7$  was found 41(82.0%) in normotensive group and 15(30.0%) in pre-eclampsia group. At 5 minute APGAR score  $\geq 7$  was 45(90.0%) and 21(42.0%) in pre-eclampsia group. The difference was statistically significant ( $p<0.05$ ) between two groups. In Sultana R et al.<sup>4</sup> study the APGAR score at 1 min and 5 min of the delivered babies of the study patients showed similar result.

In this study IUGR was found 8(16.0%) in pre-eclampsia group, prematurity was 3(6.0%) in normotensive and 13(26.0%) in pre-eclampsia group. Birth asphyxia was 6(12.0%) and 15(30.0%) in normotensive and pre-eclampsia group

respectively. No complication was 41(82.0%) in normotensive group and 14(28.0%) in pre-eclampsia group. The difference was statistically significant ( $p<0.05$ ) between two groups. Sultana R et al. reported similar result.<sup>4</sup>

Regarding perinatal outcome in the current study observed that take home alive neonate was found 48(96.0%) in normotensive group and 41(82.0%) in pre-eclampsia group. Early neonatal death was 1(2.0%) in normotensive and 4(8.0%) in pre-eclampsia group. Still birth was 1(2.0%) and 5(10.0%) in normotensive and pre-eclampsia group respectively. Similar observation was found in the study of Sultana R et al.<sup>4</sup>

## Conclusion

Hyperuricemia is most basic and reliable observations in preeclamptic pregnancies. While elevated concentrations of circulating uric acid are not uniformly seen in every woman with PE, they do appear to identify a subset of pre-eclamptic women who are at higher risk for maternal and neonatal complications. Therefore, measurement of serum uric acid concentration seems to be a useful test to predict maternal complications in case of preeclampsia.

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