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*Original Article***Role of Serum Uric Acid and Creatinine as a Prognostic Indicator of the Severity of Maternal and Fetal Complications in Preeclampsia**Siddiqua S^{1*}, Alamgir MH², Parvin A³, Afrin F⁴

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Corresponding Author*Abstract**

Background: Background: Preeclampsia is a multi system disorder that can affect 5-8% of all pregnancies and is a major contributor for maternal and perinatal morbidity and mortality. There is no single test to fulfill all the criteria for a good predictor of preeclampsia.

Objective: To determine the outcome of pregnancy in preeclampsia with impaired renal functions.

Materials and Methods: This Analytic observational study was carried out in the Department of Obstetrics and Gynaecology in Rangpur Medical College Hospital, Rangpur, from January 2025 to December 2025. 20 preeclamptic patients with impaired renal function were considered as group A and 80 preeclamptic patients with normal renal function were considered as group B.

Results: Out of these 100 study subjects serum Creatinine and Uric acid level were deranged (group A) compared to group B. Maternal and perinatal complications were higher among group A than group B.

Conclusion: Impaired Creatinine and uric acid level in preeclampsia adversely affect pregnancy outcome. Therefore prior information in such patients may help to reduce perinatal and maternal morbidity and mortality.

Key words: Preeclampsia, Renal functions.

Introduction

Preeclampsia is the most challenging clinical entity affecting both mother and fetus. It is a predisposing factor for maternal as well as perinatal morbidity and mortality. Incidence of preeclampsia in developing nation has been reported to be around 4-18%.¹ Preeclampsia is defined as pregnancy specific syndrome observed usually after 20 weeks of gestation with systolic blood pressure ≥ 140 mmHg and diastolic blood pressure ≥ 90 mmHg accompanied by significant proteinuria with or without edema. Severe preeclampsia is associated with elevated blood pressure $\geq 160/110$ mmHg, on two occasions at least 6 hrs apart, on bed rest; with proteinuria ≥ 5 gm in 24 hrs urine sample; along with other symptoms such as headache, visual disturbances, hyper reflexia, epigastric or right upper quadrant pain, vomiting, oliguria, impaired liver function and thrombocytopenia (HELLP Syndrome).² In most of the cases, about 75% preeclampsia appear to be mild and 25% are severe.³ Serum uric acid and creatinine levels are a part of work

up for the pregnant women with hypertension. The elevated levels of these parameters were due to decreased urinary clearance secondary to reduced GFR and increased reabsorption.⁴ Serum uric acid is not only a marker of severity of disease but also contributes to the pathology of disorder.⁵ Serum uric acid is a marker of oxidative stress, tissue injury and renal dysfunction. It is the product of purine metabolism and is synthesised by the enzyme xanthine oxidase. Hypoxia and ischemia of the placenta and cytokines such as interferon induce the expression of xanthine oxidase and therefore increase production of uric acid and reactive oxygen species. In uncomplicated pregnancies, serum uric acid concentration fall in first and 2nd trimester 25-35 % due to an elevation in renal clearance secondary to increased GFR or reduced proximal tubular re-absorption and due to changes in its production rate continue to remain low during second trimester and slowly and slowly increase during third trimester, possibly due to raised fetal production,

decreased binding to albumin and a decline in uric acid clearance until towards the end of pregnancy.⁶

Several studies have reported a positive correlation between elevated maternal serum uric acid and creatinine adversely affect maternal and foetal outcome.⁷ Up to now, there is no reliable, valid, and cost-effective screening test for the early detection of preeclampsia. It seems that measuring the blood level of uric acid and creatinine is one of the available and cheap screening tests that may help to early detection of the disease.⁸

Referral to higher center in appropriate time and giving appropriate treatment at that center may reduce the maternal and perinatal morbidity and mortality.

Materials and Methods

This study was conducted on dept of Obst and

Gynaecology in Rangpur Medical College Hospital, Rangpur, from January 2022 to December 2022. Study population was all the admitted patients after 28 weeks of gestation diagnosed as a preeclampsia by history, thorough clinical examination and relevant investigations. Investigations was carried out in this study include CBC, proteinurea, serum creatinine, serum uricacid. Then the study population was divided into two groups. Group A comprises 20 patients of severe preeclampsia and Group B comprises 80 patients of non- severe preeclampsia .Feto - maternal complications were compared between these two groups. All the information was collected in a predesigned interview schedule. Data was analyzed using SPSS software version 23. Chi square test was done to see significance of difference and p value $p < 0.05$ was taken as significant.

Results

Table I: Socio - Demographic profile of study subject (n=100)

Parameter	Preeclamptic mother		X ² Value	P Value
	Group A	Group B		
	Severe Preeclampsia	Non severe Preeclampsia		
Age group (years)				
<20 years	02 (10%)	07 (8.75%)	2.108	0.349 (NS)
20-30 years	15 (75%)	48 (68%)		
>30 years	03 (15%)	25 (31.25%)		
Mean ± SD	25.65±4.757	25.65±4.757		
Socioeconomicstatus				
Low	18 (90%)	66 (82.5%)	1.030	0.597 (NS)
Middle	02 (10%)	11 (13.75%)		
Upper	00 (00%)	03 (3.75%)		
Gestational age				
<34 weeks	07 (35%)	17 (21.25%)	1.658	0.198 (NS)
>34 weeks	13 (65%)	63 (78.75%)		
Mean±SD	31.44±2.439	35.00±2.645		
Gravida				
Primi	15 (75%)	59 (73.75%)	0.909	0.013 (NS)
Multi	05 (25%)	21 (26.25%)		
ANC				
Yes	03 (15%)	29(36.25%)	3.320	0.068 (NS)
No	17 (75%)	51 (63.75%)		
Level of education				
Illiterate	08 (40%)	06 (7.5%)	14.196	0.003 (S)
Primary	09 (45%)	51 (63.75%)		
SSC	02 (10%)	14 (17.5%)		
HSC	01 (5%)	09 (11.25%)		

X²: Chi-square test was done, P: Probability, n: Number of patients, NS: Non-significant, S: Significant ($p < 0.05$)

Table I shows most of the study subject (75% in group A & 68% in group B) were 20-30 years age group. 90% of group A & 82.5% of group B were from low socioeconomic status. 45% of group A and 63.75% of group B were primarily educated. Majority of the patient of both group were house wife and majority of the rural population in both group. Most of the patient in both groups were matched in age, socioeconomic status, occupation and residence was not statistically

significant ($p>0.05$). 75% of group A and 73.75% of group B were primi gravid. 75% of group A & 63.75% of group B were not taking ANC. 65% of group A and 78.75% of group B were >34 weeks pregnancy. Gravida, ANC & Gestational age are not statistically significant ($p>0.05$).

Table II: Routine Investigations (Biochemical) profile of study subject (n=100)

Parameter	Preeclamptic mothers		X ² value	P value
	Group-A	Group-B		
	Severe PE (n=20)	Non severel PE (n=80)		
Routine investigations (%)				
Hb%(gm%)				
>10gm%	00 (00)	07 (8.75%)	1.882	0.170 (NS)
<10gm%	20 (100%)	73 (91.25%)		
Platelet count				
1.5-4.0 lack/μL	04 (25%)	80 (100%)	76.190	p<0.001 (S)
<1.5 lack/μL	16 (75%)	00 (00)		
Proteinurea				
Trace	00 (00)	25 (31.25%)	8.913	0.012 (NS)
+	00 (00)	00 (00)		
++	02 (10%)	09 (11.25%)		
+++	18 (90%)	46 (57.5%)		

X²: Chi-square, P: Probability, n: Number of patients, S: Significant, NS: Non-significant. in Chi-square test of significance of difference.

Table II shows in group A 100% of Hb% & 75% of platelet count was decrease which was statistically significant ($p<0.005$). 90% of group A patient having +++ proteinuria.

Table III: Special Investigations (Renal functions) profile of study subject (n=100)

Renal Functions	Preeclamptic mothers		X ² value	P value
	Group-A	Group-B		
	Severe PE (n=20)	Non severe PE (n=80)		
Serum creatinine Normal (0.6 – 1.2 mg/dl)	02(10%)	80(100%)	87.805	$P<0.001$ (s)
Raised (>1.2mg/dl)	18(90%)	00(00%)		
Serum uric acid Normal (2.4 – 5.7 mg/dl)	07(35%)	80(100%)	59.770	$P<0.001$ (s)
Raised(>5.7mg/dl)	13(65%)	00(00%)		

X²: Chi-square, P: Probability, n: Number of patients, S: Significant, NS: Non-significant. in Chi-square test of significance of difference.

Table III shows Serum uric acid and creatinine was raised in 65% and 90% of population respectively. Which was also statistically significant (P<0.001).

Table IV: Distribution of maternal outcome of the study subject (n=100)

Parameter	Pre eclamptic mothers		x ² value	P value
	Group-A	Group-B		
	Severe PE(n=20)	Non severe PE (n=80)		
Mode of delivery				
VD	09 (45%)	55 (68.75%)	3.917	0.048 (S)
LSCS	11 (55%)	25 (31.25%)		
Maternal morbidity	20 (100%)	12 (15%)	53.125	p<0.001 (S)
PPH	04 (20%)	04 (5%)	4.891	0.027 (S)
Abruppio placentae	00 (00)	02 (2.5%)	.510	0.475 (NS)
Hepatic dysfunction	02 (10%)	00 (00)	8.163	0.004 (S)
Pulmonary oedema	07 (35%)	06 (7.5%)	10.698	0.001 (S)
HELLP syndrome	05 (25%)	00 (00)	21.053	p<0.001 (S)
DIC	04 (20%)	00 (00)	16.667	p<0.001 (S)
Maternal mortality	07 (35%)	03 (3.75%)	25.781	p<0.001 (S)

X²: Chi-square, P: Probability, n: Number of patients, S: Significant, NS: Non-significant. in Chi-square test of significance of difference

Table IV shows LSCS was more in group A than group B which was statistically significant (p<0.005). Maternal complication were significantly higher in women of group A compared to group B among them pulmonary edema is highest. Maternal mortality was 45% in group A and 3.75% in group which was statistically significant (p<0.001).

Table V: Distribution of feta and perinatal outcome of the study subject (n=100)

Neonatal Issues	Pre eclamptic mothers		X ² value	P value
	Group-A	Group-B		
	Severe PE (n=20)	Non severe PE (n=80)		
Live birth	15 (75%)	75 (82.5%)	.199	0.656 (NS)
APGAR score (1 minute)	5.06±3.104	7.76±1.216	3.475	0.062 (NS)
	08 (45%)	54 (68%)		
APGAR score (5 minutes)	5.82±3.555	8.73±1.387	4.720	0.030 (S)
	12 (60%)	66 (83%)		
Low birth weight <2.5Kg	08 (40%)	25 (31.25%)	0.554	0.457 (NS)
Asphyxia	06 (30)	08 (10%)	5.316	0.021 (S)
NICU Admission	10 (50%)	28(35%)	1.528	0.216 (NS)
IUGR	08 (40%)	09 (11.25%)	9.373	0.002 (S)
IUD	05 (25%)	05 (6.25%)	12.524	<0.001 (S)
Death within 7 days	05 (25%)	04(5.0%)	2.512	0.113 (NS)

χ^2 : Chi-square, P: Probability, n: Number of patients, S: Significant, NS: Non-significant. in Chi-square test of significance of difference.

Table V shows no significant difference in birth weight of babies between group A and group B. 1 minute and 5 minute both Apgar score was better in group B. Neonatal complications are more in group A compared to group B and it was statistically significant. Perinatal death is high in group A (25%) than in group B (11.25%) which was statistically not significant ($p > 0.005$).

Discussion

This study was conducted in Obstetrics and Gynecology dept in Rangpur Medical College and Hospital, Rangpur, is an important referral hospital of North Zone in Bangladesh. In the present study, study population were 100 having preeclampsia, had been divided into two group. Severe Preeclampsia 20 were in group A and Non severe PE 80 were in group B.

Younger age (Table- I) group is an important risk factor for preeclampsia. Though it is a disease of adolescent group but in the present study, mean age was 25.65 ± 4.757 years in both groups are matched. Majority of the population were 20-30 years. These ages are more vulnerable due to early marriage and pregnancy in our country as compared to western countries. This age difference was not statistically significant ($p > 0.34$). It is consistent with the study of Amit G *et al* where mean age was 25.12 ± 3.65 years. Maximum 82.82% of patient were between 20-29 years of age.⁹ Also consistent with S Kishwara *et al* in Bangladesh Medical Journal (2011).¹⁰

In the present study majority came from low socioeconomic status (Table-I) which was statistically not significant ($p < 0.597$). It correlates with the study of Savita Rani *et al* where 84% belongs to low socioeconomic status.¹¹

Regarding educational background (Table-I) majority of the patient were primarily educated and very few are illiterate in both groups which was statistically significant ($p < 0.05$). It is due to primary education is free in our country so, majority of the people were primarily educated. This study was matched with the

study of Cicih O, Lelly A. They showed that lowered educated women had highest risk of preeclampsia compared to high education.¹² It was also consistent with Koido Pet *et al*.¹³

In this study most of the population were came from rural area (Table-I). rural people are more vulnerable to developed preeclampsia, because in rural area there is lack of ANC facilities, women are less empowered due to lack of education and also the study was conducted in Rangpur Medical College Hospital which is a public hospital where maximum case were came from low affluent society and referred from different rural zone. It correlates with the study of Savita Rani Singhal *et al* where 84% had rural background.¹¹

The incidence of preeclampsia is more in primigravid. This is comparable to Mac Gillivray which shows that primigravida has 15 times greater risk compared to multigravida.¹⁴ It also correlate with Savita Rani Singhal *et al* where primigravida were 70%.¹¹

In present study 75% of group A and 63.75% of group B took irregular and no antenatal care at all (Table-I). Group B comparatively took more ANC but it was not significant ($p > 0.068$). According to Majhi *et al*, shows 82.3% of patient did not have a regular antenatal check-up.¹⁵ Which indicates that low socioeconomic status, lack of education poverty and inadequate antenatal check-up has a close relationship with preeclampsia and poor foeto – maternal outcome.

Present study show mean gestational age of the mother was 31.44 ± 4.39 and 35.00 ± 2.645 weeks in group A and B respectively (Table- I), which statistically insignificant ($p > 0.0198$). Amit G *et al* also observed similar finding with that of present study, their study was also statistically not significant.⁹ Barua found mean gestational age was 37.55 weeks.¹⁶ This study indicates more the gestational age less the maternal and perinatal complications.

Regarding Renal function (Table-III) Serum creatinine and uric acid level are raised 90% and 65% of group A patient respectively. Was statistically significant ($p < 0.001$) which was consistent with Maryam Asgharnia *et al* where Mean level of uric

acid in women with severe pre-eclampsia (5.66 ± 1.46) was significantly higher than non-severe preeclampsia (5.12 ± 1.29) ($p=0.031$).¹⁷

Regarding maternal outcome (Table-IV) out of 20 patient in group A, 25% developed HELLP, 20% PPH, 10% renal dysfunction, 35% pulmonary edema, 20% DIC and maternal mortality was 45% all are statistically significant ($p<0.001$). Abruptio placenta were 2.5% in group B population which was statistically not significant ($p>0.0475$). As per Loi K *et al*¹⁸ HELLP 6%, pulmonary edema 5%, ARF 14%, Abruptio 2% were noted in preeclamptic patient with deranged liver function. As per PunnetMet *et al*¹⁹ support these result which was statistically significant ($p<0.001$).

In the present study 75% of group A and 82.5% of group B were live birth which was statistically not significant. In these study fetal complication is more in group A population compared to group B. Out of 20 patient in group A 30% developed fetal asphyxia, 40% IUGR, 25% IUD and 25% perinatal death occur within 7days which was statistically significant. 40% are LBW and 50% of them need NICU admission which was not statistically significant. Apgar score in both one minute and five minute were deranged in group B neonate but Apgar score in one minute is nonsignificant ($p>0.062$ and Apgar score in five minute is statistically significant ($p<0.05$). This study was consistent with Savita Rani Singha *et al*.¹¹

So, from this study we found that nulliparous, primarily educated women with low socioeconomic status and lower gestational age group those who are not in antenatal care are more prone to develop impaired liver function. People with impaired liver functions showed adverse pregnancy outcome.

Conclusion

Serum uric acid and creatinine are elevated in severe PE whereas no significant difference was observed between severe and non severe PE. Serum uric acid level showed better specificity and sensitivity for severe PE and also correlated negatively with fetal outcome. Serum uric acid and creatinine levels vary with gestational age hence studies should focus on

estimating these markers in 2nd and 3rd trimesters. To diagnose or to predict a possible PE at an early stage and avert maternal and fetal outcome estimation of these two marker to be recommended at an earlier sages of pregnancy.

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