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A STUDY TO EVALUATE THE RENAL FUNCTION PARAMETERS IN PRECLAMPSIA

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ABSTRACT: Preeclampsia usually develops systemic hypertension, proteinuria, coagulation abnormalities and eclampsia develops when convulsions superimpose on the syndrome of preeclampsia. Disturbed renal functions with elevated blood urea and serum creatinine levels were reported in various studies but, elevations of serum uric acid levels are controversial. The aim of the current study is to determine the renal function Parameters such as blood urea, serum creatinine and serum uric acid levels in preeclampsia patients and to compare it with the normal pregnant women. 100 subjects were selected with 50 controls and 50 preeclampsia cases. Renal function parameters are estimated in preeclampsia cases and controls (normal pregnant women). Statistical analysis was done. The study may be concluded that the uric acid levels are elevated along with urea and creatinine in preeclampsia compared to normal pregnancy women.


INTRODUCTION: Pre-eclampsia is a multisystem disorder of unknown etiology, unique to pregnancy. Women with pre-eclampsia usually develop raised blood pressure and proteinuria, but the condition is also associated with abnormalities of the coagulation system, disturbed liver function, renal failure and cerebral ischemia¹. Preeclampsia may be placental in origin and may also be influenced by maternal factors such as obesity, diabetes, and preexisting hypertension². The details of pre-eclampsia are usually mentioned in the medical birth registry. The notification form may also hold information on specific symptoms of pre-eclampsia, such as hypertension induced by pregnancy, proteinuria and edema³.

Eclampsia, the occurrence of one or more convulsions superimposed on the syndrome of preeclampsia, occurs less frequently, complicating between 1 in 100–1700 pregnancies in the developing world and about 1 in 2000 pregnancies in Europe and other developed countries⁴.

Over the years, a lot of interest has been directed at studies on the role of serum uric acid, blood urea and serum creatinine in the pathogenesis of pregnant induced hypertension, such as preeclampsia.

Such Contradictory reports have encouraged us to undertake a detailed study on these aspects, with a desire to understand the underlying intricacies. The aim of the study was to measure and evaluate the serum uric acid, blood urea and serum creatinine levels in preeclampsia patients and normal pregnant women.

MATERIALS AND METHODS: 100 subjects selected in which 50 were preeclampsia cases and

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50 normal pregnancy controls. 3ml of venous blood sample was collected in a plain tube. After centrifugation at 3000 rpm for 10 minutes, the serum samples were analyzed for renal parameters using standard kits. Serum uric acid levels were measured by colorimetric assay⁵. Serum creatinine and urea levels were measured using standard procedures.^{6,7}

Statistical Analysis: The data were statistically analyzed by a Graph Pad Software using unpaired students t - test. The results were expressed in terms of Mean, Standard Deviation, and Confidence interval. The two – tailed P values are provided in the table showing the results; P value of < 0.05 was considered statistically significant.

RESULTS: Mean ± standard deviation for the controls and cases of each parameter were calculated, which is shown in **Table 1**. Statistical analysis was done (using 2-tailed) which is shown in **Table 2**. Serum uric acid, blood urea and serum creatinine levels of both cases and controls are clearly shown in the bar graph (**Fig.1**). As per **Table 1**, there is statistically significant elevation of serum urea, creatinine, and uric acid levels as compared to the control ones. The serum uric acid levels were higher in preeclampsia cases compared to the normal pregnant women. Mean ± standard deviation for the controls and cases of each parameter was found, which is shown in **Table 1**.

TABLE 1: MEAN AND SD OF RENAL PARAMETERS

Parameters	Group	N	Mean	Std. Deviation	Std. Error Mean
Uric Acid	Controls	50	4.3920	.67849	.09595
	Patients	50	7.0920	.46416	.06564
Creatinine	Controls	50	.8900	.24599	.03479
	Patients	50	2.0960	.26647	.03768
Urea	Controls	50	28.5000	5.68295	.80369
	Patients	50	67.0800	15.19243	2.14853

TABLE 2: STATISTICAL SIGNIFICANCE

		T	DF	Sig. (2-Tailed)	Mean Difference	95% Confidence Interval of The Difference	
						Lower	Upper
Controls	Equal Variances Assumed	- 23.224	98	.000	- 2.70000	- 2.93071	- 2.46929
Patients							
Uric Acid	Equal Variances Assumed	- 23.515	98	.000	- 1.20600	- 1.30778	- 1.10422
Controls							
Patients							
Creatinine	Equal Variances Assumed	- 16.818	98	.000	- 38.58000	- 43.13223	- 34.02777
Controls							
Patients							
Urea	Equal Variances Assumed						

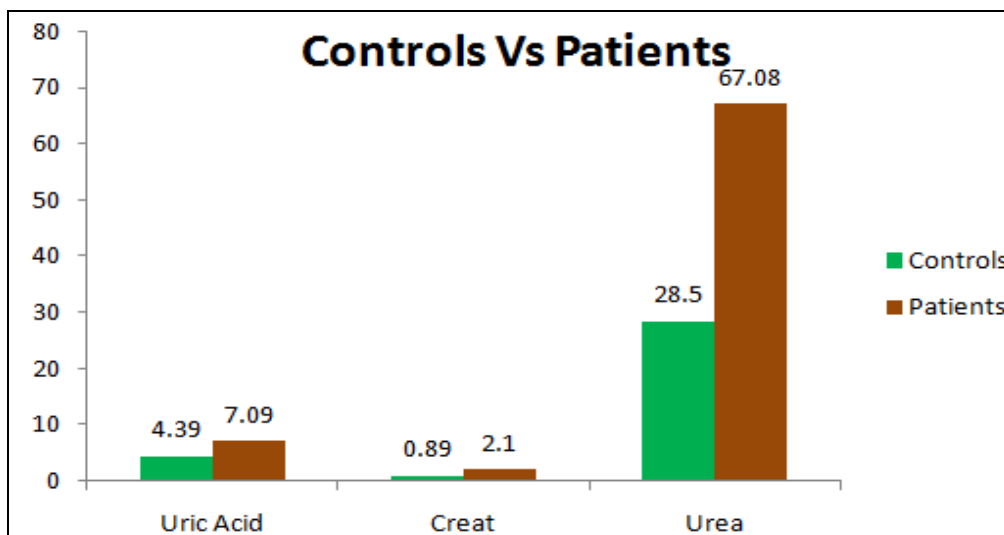


FIG.1: COMPARISON OF RENAL PARAMETERS OF CONTROLS AND PATIENTS

DISCUSSION: The controversial reports are available regarding the extent of the elevated values of the serum uric acid levels in pre-eclampsia women. While a majority of available studies generally observe significant elevation in serum uric acid levels in the former group, several studies also find no such clear cut significance in the respective results.

Similarly, with reference to the extent of blood urea or serum creatinine levels in preeclampsia, often differing results have been observed.

Furthermore, whether or not the elevated levels of serum uric acid (as those of the blood urea or serum Creatinine) can be taken as a predictive indicator for the pre-eclampsia disorder remains to be elucidated. For example, in several studies it was found that the extent of the elevation in serum uric acid level in pre-eclamptics was an indicator for the degree of severity of this disorder.^{8-13, 15-17}

Elevated serum uric acid levels have also been interpreted to act as an important cofactor involved in the pathogenesis and manifestation of pre-eclamptic disorder.¹⁴ Proteinuria rather than hypertension was observed.⁸

One of the most commonly accepted explanations for elevated serum uric acid has been said to be increased reabsorption and decreased excretion of uric acid in proximal tubules, similar to the physiologic response to hypovolemia.¹⁸

On the basis of observed TOS (Total Oxidant Status) and TAS (Total Antioxidant Status) levels, it has been inferred that increased oxidative stress and antioxidative defence mechanisms may contribute to the disease process in preeclampsia.¹⁹ Recently, increased oxidative stress and formation of reactive oxygen species (ROS) have been proposed as another contributing source of hyperuricemia noted in preeclampsia apart from renal dysfunction.²⁰

Uric acid (as also Creatinine and to some extent urea), possessing water soluble or hydrophilic antioxidant characteristics, may delay or inhibit cellular damage mainly through the free radical scavenging property; it also presents strong antioxidant activity towards ROS in aqueous phase.²¹

Uric Acid contributes to about 60% of free radical scavenging activity in human serum.²² The observed uric acid elevation may be a protective response, capable of opposing harmful effects of free radical activity and oxidative stress.

Elevated serum uric acid concentrations predict the development of hypertension.¹⁷

In addition, an elevated serum uric acid concentration may reflect impaired endothelial integrity, in which endothelial dependent vascular relaxation produced by nitric oxide (NO) is reduced.²³

Uric acid thus may function as a marker of oxidative stress tissue injury dysfunction. During uncomplicated pregnancies serum uric acid concentrations decrease by about 25 % to 35 % in early pregnancy, but then increase throughout the pregnancy until towards the end of it when they approach non-pregnant levels.²⁴

It has been proposed that these pregnancy mediated changes in serum uric acid are often the result of altered renal handling. Increased serum uric acid in preeclampsia is secondary to reduced renal urate clearance because of renal dysfunction.²⁵ and also due to increased Xanthine Oxidase activity.²⁰

It is also possible that increased serum uric acid values may indicate the presence of undiagnosed sub-clinical renal disease in some subjects and this may increase the risk for preeclampsia.

However, in several studies it was concluded that the measured elevated serum uric acid level can be taken as an unreliable indicator for development of hypertension.^{14, 15}

Another review inferred that uric acid is not a consistent predictive factor for the development of preeclampsia, but its level generally increases once the disease manifests and plasma levels of uric acid may often correlate with disease severity.¹⁷

The differences in each of the mean serum uric acid or serum creatinine concentrations between the preeclampsia and the normotensives respectively were not statistically significant and that these parameters are of little value in the prediction of preeclampsia.¹⁶

Few studies^{8, 16} observe insignificant change in serum creatinine level in the two cited groups. On the other hand, an early study showed increased serum creatinine level but said the latter to be of no predictive value in preeclampsia.¹⁸

Our present study is also in line with two earlier studies^{16, 18} wherein small change in blood urea levels both in pre-eclampsics and normotensives are insignificant.

In the present study, though the serum uric acid level was higher in pre-eclampsics when compared to the normotensives, the elevated levels of uric acid did not correlate with the raised systolic blood pressure or the raised diastolic blood pressure.

This is in line with an earlier study predicting that the changes in the plasma concentrations of serum uric acid can more prominently be correlated with the degree of this study examined both work and leisure-time activity levels, providing an opportunity to assess their independent and combined effects on the risk of preeclampsia.

CONCLUSION: The study is concluded that the elevated uric acid levels alone does not predict and correlate with the severity of the preeclampsia but in combination with blood urea, serum creatinine levels may predict it. The serum uric levels may provide additional information which is helpful to predict the preeclampsia.

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