A Comparative Study of Serum Uric Acid & Creatinine in Preeclampsia and Normotensive Pregnant Women Attending a Tertiary Care Hospital of Tripura

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Abstract:
As Preeclampsia is a progressive, multisystemic and multifactorial pregnancy specific disorder, it is one of the major challenges for the obstetrician to combat this complication. In this hospital based observational Cross-sectional study, we have included 70 preeclamptic patients as cases and 70 normal pregnant women in the control group. Current study was aimed to estimate and compare the levels of serum uric acid and creatinine among women with preeclampsia and normotensive pregnant women attending Dept. of Obstetrics & Gynaecology at AGMC. This tests are done by XL-640 Fully Automated Autoanalyzer. Pearson's cor relation coefficient and independent sample 't' test were used for statistical analysis. Serum uric acid & creatinine are significantly higher in preeclamptic patients compared to normotensive pregnant women and it shows positive correlation with systolic blood pressure & diastolic blood pressure. This study concludes the utility of measurement of serum uric acid and creatinine may be helpful for pregnant women during screening in Antenatal check up to prevent risk of preeclampsia.

Introduction

Preeclampsia is a pregnancy specific hypertensive disorder and if left untreated exerts serious medical complications of pregnancy culminating in maternal as well as perinatal morbidity and mortality worldwide. A progressive multisystem disorder of unknown etiology characterized by the development of new onset of hypertension to the extent of 140/90 mm Hg or more with proteinuria $\geq$ 300 mg per 24 hours or urinary protein to creatinine ratio $\geq$ 0.3 or dipstick 1+ persistent after 20 weeks of gestation in a previously normotensive and nonproteinuric pregnant woman.[1]

Though the etiology of preeclampsia is still unclear, many theories suggest that abnormal placental implantation and abnormal trophoblastic invasion may be the possible causes of it. The molecular basis of this condition is also unresolved till now.

Hyperuricemia & elevated creatinine level are associated with clinical severity of preeclampsia and perinatal outcomes. The elevated levels of these parameters are due to decreased urinary clearance secondary to reduced GFR and increased reabsorption. [2,3]

Materials & Method

A hospital based observational Cross sectional study which was conducted in the Department of Biochemistry, in collaboration with the Department of Obstetrics & Gynaecology, AGMC & GBP Hospital from July 2021 to June 2023 among the pregnant women attending the Department of Obstetrics & Gynaecology after 20 weeks of gestation. Sample size was calculated by openepi software & 70 (Seventy) in the study group and 70 (Seventy) in the control group were taken as sample.

Measurement of Analytes

Estimation of serum uric acid & creatinine were done by XL-640 Fully automated Autoanalyzer.

Statistics

Data entry and analysis was performed using SPSS 27 in windows PC & student t- test for testing the significance of difference between two means.

Correlation analysis was done by Karl Pearson's correlation coefficient. p-value less than 0.05 were considered statistically significant.

Result

Table 1: Comparison of variables between both the study groups-

Variables	Preeclampsia (Mean ± SD)	Normotensive (Mean ± SD)	P-Value	Significance
Age (Years)	29.74±2.44	22.91±3.34	<0.0001	Highly Significant
POG (Weeks)	34.01±3.04	32.35±2.93	0.0013	Highly Significant
SBP (mmHg)	155.85±12.06	114.57±9.09	<0.0001	Highly Significant
DBP (mmHg)	97.88±6.86	73.54±6.22	<0.0001	Highly Significant

Table 2: Comparison of biochemical parameters between both the study groups

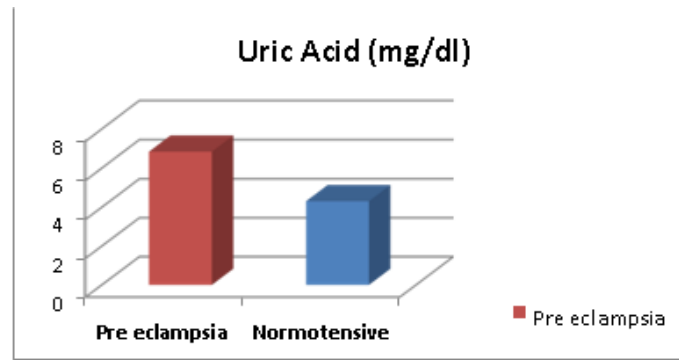| Parameter	Preeclampsia (Mean± SD)	Normotensive (Mean± SD)	p- value	Significance
Uric Acid (mg/dl)	6.84±1.46	4.31±0.91	<0.0001	Highly Significant
Creatinine (mg/dl)	0.70±0.23	0.56±0.24	0.0004	Highly Significant

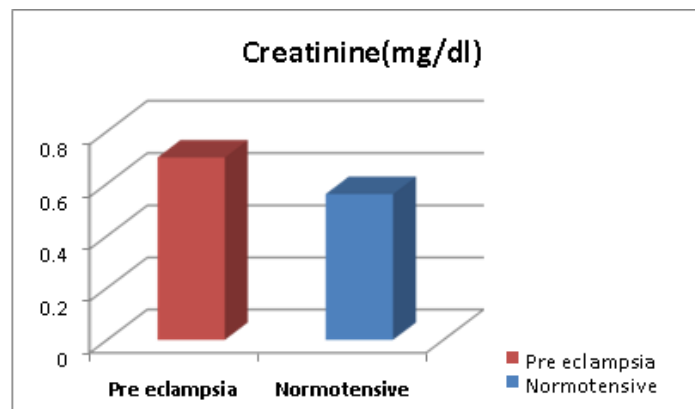**Figure 1: Comparative study of serum uric acid between cases and control group**

Figure 2: Comparative study of serum Creatinine between cases and control

Table 3: Correlation of SBP (mmHg) & DBP (mmHg) in all parameters

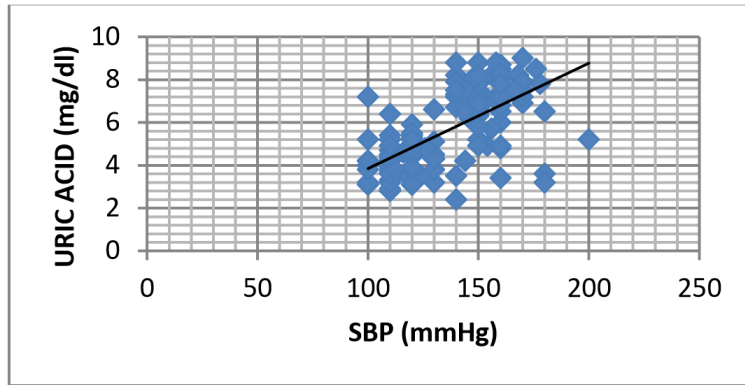| Variables	SBP (mmHg)	DBP(mmHg)	P -value
Uric Acid (mg/dl)	0.651	0.626	<0.0001
Creatinine (mg/dl)	0.235	0.237	0.005

Figure 3: Correlation between systolic blood pressure (mmHg) and Uric acid (mg/dl)
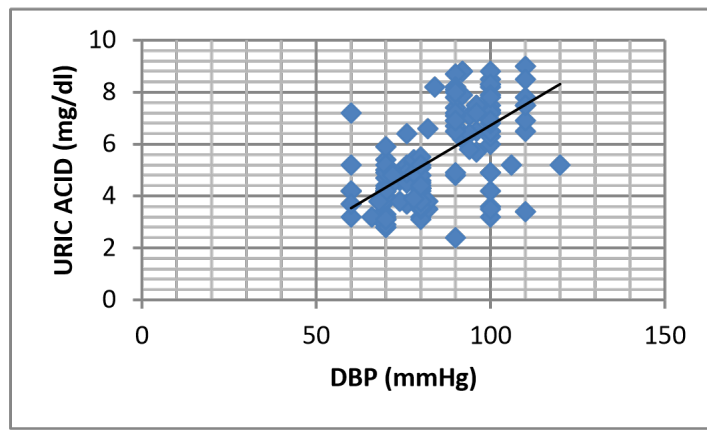

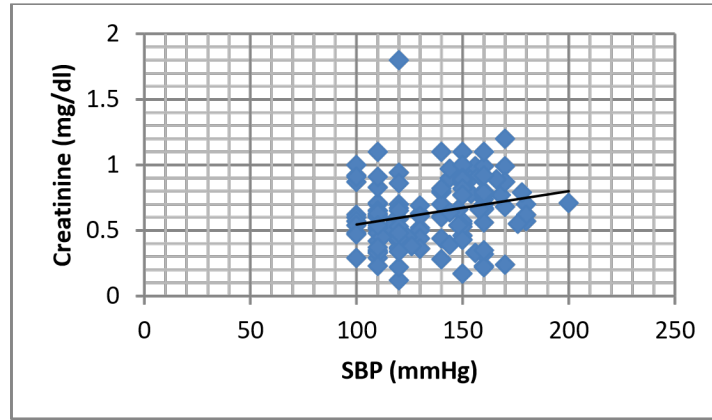**Figure 4: Correlation between diastolic blood pressure (mmHg) and Uric acid (mg/dl)**

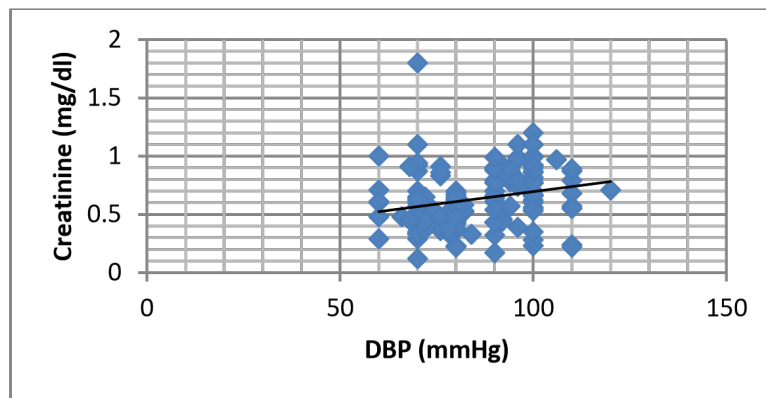**Figure 5: Correlation between systolic blood pressure (mmHg) and Creatinine (mg/dl)**

Figure 6: Correlation between diastolic blood pressure (mmHg) and Creatinine (mg/dl)

Discussion

Maternal age distribution for both the groups is shown in table 1 and it shows that mean age of preeclampsia patients is 29.74±2.44 and mean age of normotensive patients is 22.91±3.34 and the p value is <0.001 which is highly significant. Similar findings was observed by Owiredu WK et al.[4] indicating the advanced maternal age posed a substantial risk factor for the development of preeclampsia. Regarding another anthropometric indicator gestational age between cases and control groups are compared in table 1 and it shows [mean ± SD] gestational age of the cases was 34.01 ± 3.04weeks and of the controls 32.35 ± 2.93 weeks reflecting a statistical difference with a p-value of 0.0013.Our study showed that, the mean SBP (mmHg) was more [155.85±12.06] in cases compared to controls [114.57±9.09] it is statistically significant (p<0.0001) and the mean DBP (mmHg) was higher [97.88±6.86] in preeclamptic compared to normotensive pregnant women [73.54±6.22] which was statistically significant (p<0.0001) as shown in table 1.

Table 2 and graph 1 shows that serum uric acid levels are raised in preeclamptic patients compared to normotensive pregnant women. A similar study conducted by Meena R et al.[5] found that Mean serum uric acid levels in preeclampsia was higher than control group. Perinatal complications are more common in cases compared to controls. In the study group, the MSUA concentration is found higher in LBW and VLBW babies compared to normal birth weight babies. There is a positive correlation between SUA & severity of preeclampsia, and a significant adverse fetal outcome is observed with raised MSUA in preeclamptic patients.

The mean serum creatinine in our study group was (0.70 ± 0.23) while in the comparison group was (0.56 ± 0.24) with the p-value of 0.0004 as shown in table 2 and graph 2. This result is in accordance with a study conducted by Ambad RS et al.6 comparing the level of serum creatinine between preeclampsia and normal pregnant women with an increased serum creatinine level and both the parameters shows positive correlation with SBP & DBP as shown in table no 3 and graph 3,4,5 and 6.

Conclusion

The results of this study confirms that hyperuricemia is correlated with preeclampsia being an indirect risk factors. Rise in serum uric acid level in preeclampsia is secondary to placental damage leading to purine catabolism and production of uric acid. Decreased renal clearance may be the most important mechanism. Other factors not highlighted in this study may also play essential roles in the disease progression. Serum creatinine was significantly higher in preeclampsia. This may be due to an increase in the glomerular filtration resistance in preeclampsia by the mechanical effect of swelling in the cytoplasm, along with an alteration in the metabolism, leading to a reduction in renal perfusion and the glomerular filtration rate. A reduction in creatinine excretion from the kidneys can cause an increase in renal vascular resistance leading to elevated Blood Pressure in preeclampsia. Development of simple and inexpensive methods to predict and prevent preeclampsia in early stage is very important. Thus, their study concludes the utility of measurement of serum uric acid and creatinine for screening patients at risk of developing preeclampsia.

Ethical Consideration

The study was approved by the Institutional ethical committee.

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