ORIGINAL ARTICLE

Serum Uric Acid Level as an Index of Fetal Prognosis in Pregnancies Complicated by Preeclampsia and Eclampsia

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ABSTRACT

Objective: To determine the frequency of raised serum uric acid level in hypertensive pregnant women and its fetal outcome.

Study Design: Case Series

Place and Duration: Labour room of Obs / Gynae at Kharadar General Hospital Karachi for duration of Six months from 1st October 2019 to 31st March, 2020

Subject and Methods: A total of 237 pregnant women with above 20th week of gestation were included in this study. 4cc blood sample was taken and send for serum uric acid level estimation. If uric acid level >6mg/dl, it is taken as raised. Patients was followed till delivery and their fetal outcome (i-e IUGR, LBW, preterm delivery, stillbirth and neonatal death) was noticed. Respondents were interviewed after a written informed consent and confidentiality was assured.

Results: Frequency of raised serum uric acid level (hyperuricemia) in hypertensive pregnant women was found in 36.71% (87/237) cases. Regarding fetal outcome, low birth weight babies was significantly high with hyperuricemia (p=0.034) while other fetal outcome was insignificant with and without hyperuricemia.

Conclusion: Hyperuricemia associated with PE is an important risk factor for poor fetal outcome.

Key Words: Hyperuricemia, Serum uric acid, Preeclampsia, IUCD

INTRODUCTION

Preeclampsia is a disease that develops during the 20th week of pregnancy in which a woman who was previously normotensive has hypertension and proteinuria with or without edoema(1). It is projected that 5-10 percent of pregnancies complicated by preeclampsia lead to more admissions than other conditions in the prenatal era. It is one of the most serious pregnancy complications and remains a major cause of fetomaternal morbidity and mortality, particularly in developing countries where 40-60% of maternal deaths occur. They form the fatal triad of maternal mortality along with obstetric haemorrhage and puerpeural sepsis(1). The prevalent risk factors associated with pre-eclampsia were chronic hypertension, chronic kidney disease, asthma, autoimmune disease, hypertensive disease during a prior pregnancy(2).

One of the characteristic findings of pre-eclampsia is hyperuricemia. In 1917, the link between elevated uric acid serum and preeclamptic pregnancy was first recorded. In women with preeclampsia, decreased uric acid clearance secondary to decreased glomerular filtration volume, increased reabsorption and decreased secretion may be the reasons for increased serum uric acid levels. As the underlying cause of hyperurecemia in this condition, the pathophysiological causes of preeclampsia consisting of elevated trophoblastic tissue shedding, endothelial dysfunction, and decreased blood flow in the fetomaternal unit were also hypothesized(3). Hyperurecemia was present in 16 percent of women without preoteinuria with gestational hypertension and 75 percent of women with clinical hypertension. An accumulation of adverse foetal effects are linked with pregnancy hypertension and hyperurecemia(4).

In terms of intrauterine growth restriction incidence, low birth weight, Apgar ranking, the need for resuscitation and/or admission to a neonatal intensive care unit, and stillbirths and neonatal mortality, foetal and neonatal outcomes were assessed. Intrauterine growth restriction occurrence was observed in 15.50 percent of births, poor birth weight in 56.30 percent, stillbirths in 16.90 percent, and 4.23 percent of neonates died overall[5]. In the eclampsia group, neonatal mortality occurred more, affecting 9.7 percent of births in that group. In 28.8 percent, stillbirths in 4.8 percent, and 14.8 percent general perinatal mortality, Yadav et al reported preterm deliveries(6). Another analysis also found that an improvement in SUA level (more than 5.5 mg percent) is correlated with increased perinatal morbidity and mortality. Women with SUA > 5.5 mg in the PIH party! IUGR (55 percent), low birth weight (69 percent) and still birth (13.7 percent) had higher incidences, resulting in a perinatal mortality rate of 200/1000 total births. No cases of IUGR and still birth were found in women with a percentage of SUA < 5.5 mg. This discrepancy (P<0.01) was significant(7).

The reason for my studies is to establish the extent and impact of elevated serum uric acid levels (> 6.0 mg / dl) in hypertensive pregnant patients on the foetus and to

decrease poor foetal results in hypertensive pregnant women with hyperurecemia.

METHODS AND MATERIALS

This case series study was conducted at Labour room of Obs / Gynae, at Kharadar General Hospital Karachi for duration of Six months from 1st October 2019 to 31st March, 2020. A total of 237 pregnant women with above 20th week of gestation were included in this study. The study was performed after approval by Medical ethical committee. An inclusion criterion was pregnant patient after 20th week of gestation by earlier dating scan, systolic blood pressure > 140mmHg and patient with 24hours urinary proteins> 300mg. patients detailed demographics including age, gestational age, and family history of hypertension were recorded after taking written consent. Pregnant patient who have normal systolic blood pressure (<140mmHg), pregnant patient who have raised blood pressure before 20th week of gestation and any systemic disease like Diabetes Mellitus, Gout, Renal insufficiency were excluded.

4cc blood sample was taken and send for serum uric acid level estimation. If uric acid level >6mg/dl, it is taken as raised. Patients was followed till delivery and their fetal outcome (i-e IUGR, LBW, preterm delivery, stillbirth and neonatal death) was noticed. Respondents were interviewed after a written informed consent and confidentiality was assured. Data was analyzed by SPSS 24.0. Effect modifiers like age, family H/O hypertension, obesity, preeclampsia and eclampsia was controlled through stratification. Chi-square test was applied and P - value < 0.05 will be taken as significant.

RESULTS

A total of 237 pregnant women with above 20th week of gestation were included in this study. Most of the women were between 26 to 30 years of age. The average age of the women was 28.6±4.67 years similarly average gestational age and serum uric acid level was 35.5±3.52 week and 5.96±1.55 mg/dl. Family history of hypertension was observed in 13.08% (31/237) cases. Ninety five (40.08%) women were obese. There were 30% women had preeclampsia and 53.59% had eclampsia. (Table 1)

Table No 1: Baseline characteristics of all the study patients

Variables	Frequency No.	%age
Mean Age (Yrs)	28.6±4.67	-
Gestational Age (Weeks)	35.5±3.52	-
Serum Uric Acid (mg/dl)	5.96±1.55	-
family History of Hypertension	31	13.08
Obesity	95	40.08
Pre-eclampsia	71	30
Eclampsia	127	53.59

Frequency of raised serum uric acid level (hyperuricemia) in hypertensive pregnant women was found in 36.71% (87/237) cases as shown in figure 1.

Fetal outcome of the women are presented in figure 7 to 10. IUGR was observed in 19.83% women, 56.54% had low birth weigh, 40.51% was preterm birth, 10.97% still birth and 4.64% had neonatal death. Low birth weight babies was significantly high with hyperuricemia (p=0.034) while other fetal outcome was insignificant with and without hyperuricemia as shown in table 2.

Figure No 1: Frequency of raised serum uric acid level (hyperuricemia)

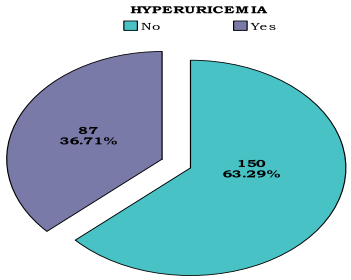

Table No 2: Fetal Outcome According to Serum Uric Acid

Fetal Outcome	RAISED Serum Uric Acid		P-Value
	Yes (n=87)	No (n=150)	
IUGR			
Yes	12(13.8%)	35(23.3%)	0.07
No	75(86.2%)	115(76.7%)	
Low Birth Weight			
Yes	57(65.5%)	77(51.3%)	0.034
No	30(34.5%)	73(48.7%)	
Preterm Birth			
Yes	49(56.3%)	92(61.3%)	0.44
No	38(43.7%)	58(38.7%)	
Alive/Dead			
Alive	69(79.3%)	131(87.3%)	
Still Birth	13(14.9%)	13(8.7%)	0.25
Neonatal Death	5(5.7%)	6(4%)	

Stratification analysis showed that hyperuricemia was significantly associated with preeclampsia while it was not observed significant with eclamptic women as shown in table 3 and 4.

Table No 3: Frequency of Raised Serum Uric Acid Level in Hypertensive Pregnant Women With Respect to Pre Eclamptic Women

Preeclampsia	Raised Serum Uric Acid		Total
	Yes (n=87)	No (n=150)	
Yes	19(26.8%)	52(73.2%)	71
NO	68(41%)	98(59%)	166

Chi-Square=4.31; p=0.038

Table No 4: Frequency Of Raised Serum Uric Acid Level In Hypertensive Pregnant Women With Respect To Eclamptic Women

Eclampsia	Raised Serum Uric Acid		Total
	Yes (n=87)	No (n=150)	
Yes	52(40.9%)	75(59.1%)	127
NO	35(31.8%)	75(68.2%)	110

Chi-Square=2.11; p=0.146

DISCUSSION

Pregnancy induces certain hormonal changes in the mother's renal function and metabolic processes. In PE and eclampsia, the alterations are frequently exaggerated. In pre-eclamptic mothers, elevated uric acid affects foetal development, which in turn gives rise to poor foetal

outcome. Traditionally, preeclampsia has been identified as a triad of hypertension, edoema and proteinuria. As a diagnostic symptom of preeclampsia, it is now known that edoema is so consistent as a part of natural pregnancy that it has little to no meaning. A late and inconstant hallmark of the condition is preeclampsia. So, the only early warning that is helpful is a change of blood pressure. Since there are several mistakes in calculating blood pressure, this early diagnostic symptom of preeclampsia alone is unsatisfactory. A rising serum uric acid is now recognised as an early preeclampsia characteristic and the precision of diagnosis is significantly improved by its measurement1[21].

The process that causes this rise in SUA concentration has not yet been explicitly identified, but as proposed by SAGEN[122] and DUMONT[123], it can result from an increase in blood lactate levels due to anaerobic uteroplacental unit metabolism. Impaired uric acid clearance caused by maternal hemoconcentration[124] can also be impaired by increased SUA concentration.

In this study, the association of elevated blood uric acid in pre-eclamptic women with low foetal outcome (LBW foetus and stillbirth) was found. In our study, Lim and Frideman measured serum uric acid concentration in serum uric acid concentration in hypertensive pregnant women in 36.71 percent (87/237) cases in a closely monitored and detailed study. In the last trimester of pregnancy, the mean serum uric acid level was estimated to be 3.5 ± 0.6 mg per cent for normal women. Hypertensive patients had a similar concentration of serum uric acid, 3.7±1.1 mg / percent, although the mean amount was 6.4±1.7 mg / percent for patients with histologically confirmed preeclampsia. Thus, there was a substantial rise in mean serum uric acid content in preeclampsia patients relative to people with hypertensive vascular disease and normal pregnant women.[125] These investigators presented good evidence to support the existence of hyperuricaemia in pregnancy toxaemia, based on careful clinical guidelines in addition to histological analysis of the kidney in preeclampsia. In addition , patients with microscopically defined glomerular alterations whose blood concentrations of urea nitrogen and non-protein nitrogen were not elevated and who displayed an increased concentration of uric acid were also identified. The utility of serum uric acid measurements was thus seen by these authors as an early and sensitive predictor of the existence of the preeclamptic state.

There were 40.51 percent pre-term, 10.97 stillbirths and 4.64 neonatal deaths in our sample out of 237 cases. Thus, in the hyperuricaemic community, all these irregular foetal findings were in line with the research performed by P. F. W. CHIEN ET AL. Relative to the low serum uric acid community, who discovered these irregular perinatal outputs are 5.3 times higher.[126]

There were 56.54 percent of low birth weight babies in this sample. In several other studies, related findings have been found. It was also found in a study by SS Hussain[127] that the foetal outcome of LBW was 72 percent in hyperuricemic subjects, whereas it was 9.38 percent in normo-uricemic subjects, which is very marginal in comparison to the hyperuricemic community. The same form of analysis has been carried out by D'Anna et al. 2000[128] and Feig et al. 2004[129]. There was an significant correlation between hyperuricemia and the LBW foetus. In PE patients with hyperuricemia, Redman et al. 1976[130] and Chesley 1985[131] both saw a similar linear pattern. This pattern of elevated uric acid with bad foetal results suggests that growth retardation is likely caused by increased uric acid, the result being expressed as LBW. In this opinion, it may be concluded that hyperuricemic status associated with PE may be the key culprit for poor foetal outcome in PE, i.e. in PE, the occurrence of poor foetal outcome increased as uric acid increased.

CONCLUSION

A significant risk factor for poor foetal outcome is hyperuricemia associated with PE. In babies born to hyperuricemic pre-eclamptic mothers, a substantial rise in the number of LBW foetuses was found. It is inferred from the study that the occurrence of bad foetal outcome rises in PE as uric acid rises. Therefore, the estimation of serum uric acid will be a successful screening tool in understanding the seriousness of the conditions and in taking previous decisions to keep the childbirth healthy and riskless for both mother and foetus. In the management of pre-eclamptic mothers, estimates of serum uric acid should also be taken into account, especially in reducing the rate of bad foetal outcomes.

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