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Original Research Article

Serum uric acid as marker of severity of pre-eclampsia

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ABSTRACT

Background: In pre-eclampsia, there is increased uteroplacental resistance and reduced foetal perfusion due to inadequate invasion of spiral arterioles by trophoblast cells. This causes impaired foetal growth and foetal hypoxia. To assess the usefulness of foetal Doppler in predicting adverse perinatal outcome in preeclampsia.

Methods: All the women with preeclampsia from 30 weeks onwards were enrolled in the study. The umbilical artery (UA) Systolic-diastolic (S/D) ratio >2 standard deviation (SD) or UA - Pulsatility Index (PI) and UA - Resistive Index (RI) >2 SD were taken as abnormal. The middle cerebral artery (MCA) was visualised and cerebroumbilical PI ratio calculated. MCA-RI <2 SD was taken as abnormal.

Results: There were 107 women in the study. Major adverse outcomes 11. Umbilical artery - S/D ratio >2 SD (RR 4.46, 95% CI 1.40-14.17) and RI >2 SD (RR 3.36, 95% CI 1.03-10.61) and MCA RI <2 SD (RR 4.46, 95% CI 1.4-14.17) had a high relative risk to predict adverse major perinatal outcome. 39 babies were admitted in neonatal nursery and no parameters could predict them. Though UA - PI >2 SD predicted acute foetal distress in labour (RR 2.33, 95% CI 1.21-4.47), there was no association on multivariate regression analysis.

Conclusions: This study showed UA-S/D ratio and UA-RI >2 SD are significant predictors of perinatal deaths and immediate neonatal resuscitation in preeclampsia. Acute foetal distress in labour or neonatal nursery admission could not be predicted.

Keywords: Pre-eclampsia, Serum uric acid

INTRODUCTION

Pre-eclampsia is still one of the most important causes of maternal and foetal mortality.¹ The aetiology of pre-eclampsia still remains unexplained. Though endothelial dysfunction is considered to play a central role in pathophysiology of it.² There was no screening test reliable enough to diagnose pre-eclampsia. Uric acid is one of the most sensitive indicators of disease severity in pregnancy induced hypertensive disorders and can be of great help in monitoring the cause of disease process.³ Several studies have demonstrated a correlation between elevated maternal serum uric acid and adverse maternal and foetal outcome.⁴ Uric acid is a product of purine degradation catalysed by the enzyme xanthine oxidase. In normal pregnant women serum uric acid concentration

initially falls 25-30% due to elevation in renal clearance secondary to increased GFR or reduced proximal tubular reabsorption due to changes in its production rate. Later in pregnancy the serum uric acid levels increase due to foetal production, decreased uric acid clearance and decreased binding to albumin.⁵ Uric acid is filtered, reabsorbed and secreted by the kidney. The most commonly accepted explanation for hyperuricemia is increased reabsorption and decreased excretion of uric acid.⁶

Uric acid is a potent mediator of inflammation. Uric acid stimulates monocytes to produce pro-inflammatory cytokines IL-1 β , IL-6, TNF- α . Uric acid promotes endothelial dysfunction per se which could promote hypertension, vascular disease and renal disease.

Therefore, the present study was designed to assess the association of uric acid levels in pre-eclampsia.

METHODS

A case control study was conducted in the Obstetrics and Gynecological Department of Civil Hospital Ahmedabad. A total of 50 pregnant women in third trimester of pregnancy were taken as study subjects. 50 historical control subjects were selected. Out of 50 case subjects 22 were diagnosed as PIH, 16 were labelled as mild pre-eclampsia and 12 as severe pre-eclampsia. Pregnant women with pre-existing hypertension, diabetes mellitus and renal disease were excluded from the study by the 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 and blood samples were collected from study subjects for estimation of serum uric acid levels.

RESULTS

In Table 1, distribution and comparison of age was studied. Most of the subjects belonged to 21-30 years of age (cases 74%, controls 88%).

Table 1: Distribution and comparison of age.

Age (years)	Case (n=50)	Controls (n=50)
<20	7 (14%)	4(8%)
21-30	37 (74%)	44 (88%)
31-40	6 (12%)	2 (4%)

Other parameters in terms of gravida, gestational age and antenatal health check-ups were taken into consideration and listed in Table no 2, 3 and 4.

Table 2: Distribution and comparison of gravida in study subjects.

Study subjects	Primigravida	Multigravida
Cases (n=50)	40 (80%)	10 (20%)
Controls (n=50)	36 (72%)	14 (28%)

Table 3: Distribution and comparison of gestational age in study subjects.

Study subjects	Gestational age (Mean)
Cases (n=50)	32-34 weeks
Controls (n=50)	30-34 weeks

Table 4: Status of antenatal check-up in study subjects.

Antenatal check up	Cases (n=50)	Controls (n=50)
Regular	8 (16%)	18 (36%)
Irregular	26 (52%)	20 (40%)
None	16 (32%)	12 (24%)

Table 5 shows comparison of serum uric acid concentration between cases and controls. Mean with standard deviations of cases (Mean±SD = 7.52±1.90) were compared with that of controls (Mean±SD = 4.55±1.63). The levels were statistically significant (p value = 0.0001).

Table 5: Comparison of serum uric acid concentrations between cases and controls.

Parameter	Cases	Number	Mean
Serum uric acid (mg/dl)	PIH	22	6.89
	Mild pre-eclampsia	16	7.60
	Severe pre-eclampsia	12	8.33
	Total	50	7.52

DISCUSSION

The study was aimed at finding the association between serum uric acid and pre-eclampsia. In the present study no significant difference was observed between two groups regarding maternal age and gestational age.

The study revealed increased incidence of pre-eclampsia in primigravidas. A similar conclusion was drawn by Odegard et al where they showed nulliparity as a risk factor of pre-eclampsia.⁷

Most number of cases and controls were irregular in antenatal checkups.

Hyperuricemia is common in pregnancies complicated with pre-eclampsia. In normal pregnancy serum uric acid level slowly decreases until about 16 weeks of gestation, secondary to plasma volume expansion, increased renal clearance and uricosuric effect of estrogen.

For the most of second trimester uric acid levels remain stable, then it increases in 3rd trimester because of increased production.

In the present study, the observation showed significant difference between the two forms of pre-eclampsia i.e., mild and severe and PIH suggesting uric acid to be a good marker of severity of disease. In pre-eclampsia, uric acid levels have been known to increase and to correlate with maternal and fetal morbidity but always have been assumed to be a reflection of a disease rather than a cause. However, several other studies showed that serum uric acid is poor predictor of pre-eclampsia.⁸

CONCLUSION

Serum uric acid can be a useful indicator of maternal and foetal complication in hypertensive pregnancies.

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Conflict of interest: None declared

Ethical approval: The study was approved by the Institutional Ethics Committee

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