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A prospective study on serum uric acid levels in severe pre-eclampsia and the obstetric outcome in a high-risk pregnancy tertiary referral government hospital

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Abstract
Introduction: Despite considerable research, the pathophysiology of preeclampsia remains unclear. However, oxidative stress has been attributed to be the causative factor of preeclampsia. Uric acid is a marker of oxidative stress, tissue injury and renal dysfunction.
Aims and objectives: To study the association of raise in serum uric acid level in severe preeclampsia and to evaluate perinatal outcome in severe preeclampsia with raised serum uric acid.
Methodology: This is a prospective clinical observational study undertaken to study the significance of estimating serum uric acid in severe preeclampsia and perinatal outcome in severe preeclampsia and compare it with normotensive pregnant women. This study was conducted for a period of one year from October 2018 to September 2019 in the department of obstetrics and gynaecology, Vanivilas hospital, Bangalore.
Results: Mean serum uric acid in study group is 7.16mg/dl & in control is 3.52mg/dl. The difference in mean serum uric acid concentration between study and control group was found to be statistically significant (p<0.05).
The highest mean serum uric acid concentration is in preterm study group (8.23mg/dl) followed by term study group (7.52mg/dl). The difference between them is statistically significant (p<0.05)
In the study group the MSUA concentration is found higher in LBW & VLBW babies compared to normal birth weight babies & the difference in MSUA concentration was statistically significant in study group (p<0.05).

Keywords: severe preeclampsia, serum uric acid, perinatal mortality, renal

Introduction

Background:

The association of hyperuricemia with preeclampsia has been known since 1917 [1]. Uric acid is a component of non-protein nitrogenous substances A small fraction of urates is loosely bound to plasma proteins. It is important to identify women who are high risk of developing the disease early in pregnancy [2]. Recently, because of uric acid's role in vascular damage and in oxidative stress, hyperuricemia has been evoked as a contributor to the pathogenesis of Xanthine oxidase [4]. During uncomplicated pregnancies, serum uric acid concentration decreases by 25–35% in early pregnancies, but then increases throughout the pregnancy, primarily as the result of altered renal handling [5].

Reasons of Increased Uric Acid in Preeclampsia

1. Elevated uric acid level in preeclampsia is the result of a decrease in uric acid clearance that is secondary to disproportionate fall in glomerular filtration rate due to vasoconstrictors such as angiotensin II, nor epinephrine and endothelia [6].
2. Preeclampsia is associated with increased free radical formation and elevated oxidative stress. Uric acid production is coupled with formation of reactive oxygen species when the Xanthine oxidase/dehydrogenase enzyme is in the oxidase form [7].
3. Elevated blood lactic acid levels interfere with uric acid excretion. Hyperlactacidemia is reported in PE, produced by hypoxic placenta [8].

Material and Method

This is a prospective clinical observational study undertaken to study the significance of

estimating serum uric acid in severe preeclampsia and perinatal outcome in severe preeclampsia and compare it with normotensive pregnant women.

Source of data

This study was conducted for a period of one year from October 2018 to September 2019 in the department of obstetrics and gynaecology, Vanivilas hospital, Bangalore. Data was collected from 150 patient, it included 75 pregnant women with severe preeclampsia as study group and 75 normotensive pregnant women as controls.

Inclusion criteria

- Singleton pregnancy, with gestational age of 28-40weeks, With no other medical or surgical cause of hypertension,
- Severe preeclampsia criteria: Systolic blood pressure more than 160 or Diastolic blood pressure more than 110mmHg

Exclusion criteria

Multiple pregnancies, Chronic HTN, DM, Liver disorder, antepartum haemorrhage, h/o taking diuretics.

The following methods of statistical analysis have been used in this study.

SPSS version 16 were used for data entry and analysis.

1. Student's t test.
2. Proportions were compared using Chi-square test of significance.

In all the above tests, the ''p'' value of less than 0.05 was accepted as indicating statistical significance

Results

Table 1: Table showing age distribution of study and control group

Age in years	Case n=75	Control n=75
<20yrs	28 (37.33%)	18 (24%)
21-25yrs	34 (45.34%)	37 (49.33%)
26-30yrs	10 (13.33%)	15 (20%)
31-35yrs	1 (1.33%)	5 (6.67%)
36-40yrs	2 (2.67%)	0
Total	75 (100%)	75 (100%)

According to table 1, majority of the patient were in 21-25yr age group in both study (45.34%) and control (49.33%) group. Followed by 37.33% in study group and 24% in control group in <20years age group. In 26-30 years age group, 13.33% were in study and 20% were in control group.

Table 2: Table showing parity distribution among study and control group

Parity	Case	Control
Primigravida	59 (78.67%)	40 (53.33%)
Multi gravida	16 (21.33%)	35 (46.67%)
Total	75 (100%)	75 (100%)

According to table 2, 78.67% of the patient were primigravida in study group whereas only 53.33% patients were primigravida in control group. 21.33% of the patient were multigravida in study group and 46.67% of the patients were multigravidas in control group. The difference in parity between study and control group was statistically significant (p<.05).

Table 3: Table showing mean comparison of serum uric acid in case & control group.

	N	Mean uric acid	Std deviation
Case	75	7.16	1.43
Control	75	3.52	0.36

According to table 3, Mean serum uric acid in study group is 7.16mg/dl & in control group is 3.52mg/dl. The difference in mean serum uric acid concentration between study and control group was found to be statistically significant (p<0.05).

Table 4: Table showing comparison of perinatal mortality according to gestational age.

Gestational age	Group	Perinatal mortality		Total
		Live	Dead	
Pre Term	Case	37 (66.07%)	19 (33.93%)	56 (100%)
	Control	5 (100%)	0	5
	Total	42 (68.85%)	19 (31.15%)	61 (100%)
Term	Case	17 (89.47%)	2 (10.53%)	19
	Control	70 (100%)	0	70
	Total	85 (95.51%)	4 (4.49%)	89 (100%)

According table 4, In the study group 56 (74.67%) were preterm out of which 19 (33.93%) died and 37 (66.07%) were alive and 19 (25.33%) term babies were born in study group, of which 2 (10.53%) babies died & 17 (89.47%) babies were alive. In the control group, 5 (6.67%) were preterm but there was no mortality, also of the 70 (93.33%) term babies born there was no mortality. Highest mortality 33.93% was observed in the study preterm group, which indicates preterm with pre-eclampsia is the high risk for perinatal mortality.

Table 5: Table showing mean comparison of serum uric acid according to gestational age in study and control group.

Group	Gestational age	N	Mean serum uric acid	Std deviation	'p' value
Case	Preterm	56	8.23	1.23	<0.05
	Term	19	7.52	0.89	
Control	Preterm	5	3.52	0.88	>0.05
	Term	70	3.67	0.42	

According to table 5, the highest mean serum uric acid concentration is in preterm study group (8.23mg/dl) followed by term study group (7.52mg/dl). The difference between them is statistically significant (p<0.05)

The mean serum uric acid concentration between term and preterm deliveries in control group is not found statistically significant. (p>0.05).

Table 6: Table showing mean comparison of serum uric acid according to birth weight in study & control group.

Group	Birth weight	N	Mean serum uric acid	Std deviation	'p' value
Case	Very low	21	9.25	1.32	<0.05
	Low	42	8.02	1.01	
	Normal	12	7.12	0.81	
Control	Low	6	3.89	0.06	>0.05
	Normal	69	3.75	0.52	

According to table 6, in the study group the MSUA concentration is found higher in LBW & VLBW babies compared to normal birth weight babies & the difference in MSUA concentration was statistically significant in study group ($p<0.05$).

In control group the difference in MSUA concentration between LBW & normal weight babies was not statistically significant. ($p>0.05$)

Discussion

In current study, mean serum uric acid level in study group is 7.16 mg/dl & in control is 3.52mg/dl and is comparable with the study by Sapna Vyakaranam *et al.*, [9] the mean serum uric acid levels were significantly elevated in PE (6.26 ± 1.19 mg/dL) when compared with normotensive pregnancy (4.25 ± 0.8 mg/d). In a study by Krishna TS *et al.* [10] also the mean values of serum uric acid were significantly elevated in preeclamptic compared to that of normotensive pregnant women. In the current study, in the study group the MSUA concentration is found higher in LBW & VLBW babies compared to normal birth weight babies & the difference in MSUA concentration was statistically significant in study group ($p<0.05$) and was comparable with study by Aparna Nair. M.S, [11] where in the study group, the MSUA concentration is found higher in LBW and VLBW babies compared to normal birth weight babies.

In current study, the highest mean serum uric acid concentration is in preterm study group (8.23mg/dl) followed by term study group (7.52mg/dl). The difference between them is statistically significant ($p<0.05$). In current study, highest mortality 33.93% was observed in the study preterm group, which indicates preterm with pre-eclampsia is the high risk for perinatal mortality.

Conclusion

The detection of raised MSUA concentration in initial stages of pregnancy should be an indicator for close follow up of these patients for early detection of preeclampsia associated complication. Raised MSUA should prompt closer foetal monitoring to detect early foetal comprise.

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