

EVALUATION OF URIC ACID LEVELS IN PREGNANCY INDUCED HYPERTENSION (PIH) IN RELATION TO MATERNAL AND PERINATAL OUTCOMES: A TEACHING HOSPITAL BASED STUDY

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Abstract

Background: Preeclampsia is one of the frequent disorders, with an unclear origin, that raise the risk of maternal and neonatal morbidity and mortality. Some studies claim that blood uric acid lacks the sensitivity and specificity needed to be an effective diagnostic tool, while other studies claim that uricemia can be used to predict Preeclampsia in pregnant women. **Materials and Methods:** Out of the 659 pregnant women hospitalized during a 12-month period, 86 women with an average systolic blood pressure more than 140 mm Hg and/or diastolic blood pressure more than 90 mm Hg were enrolled for this study. 56 normotensive pregnant women were also included as controls. Maternal serum uric acid levels were assessed to find out the relation to the incidence of Preeclampsia and its complications. **Result:** 86 of the 659 pregnant women have been identified as having pregnancy-related hypertension (PIH) with an incidence of 13.05%. Out of the 86 cases, there were 53 (61.63%) cases of moderate Preeclampsia, 21 (24.42%) cases of severe Preeclampsia, and 12 (13.95%) cases of Eclampsia. Maternal death was a complication in 4 (4.65%) cases with PIH. **Conclusion:** Elevated Serum uric acid levels might be used as a biochemical indicator of maternal and neonatal morbidity and mortality in Preeclampsia and Eclampsia.

INTRODUCTION

Worldwide, about 2-10% of all pregnancies are complicated by Hypertensive disorder of pregnancy (HDP), which is a significant source of maternal and perinatal morbidity and mortality.^[1,2] They are the second most common causes of pregnancy difficulties in underdeveloped nations, right behind anaemia, accounting for 7–10% of all pregnancies and causing both maternal and foetal issues.^[3,4] According to hospital statistics, the incidence of preeclampsia in India ranges greatly from 5 to 15%.^[5] The cause of Pre-eclampsia and Eclampsia is still unknown, and they are still referred to as "a sickness of theories." The pathogenesis of Pre-eclampsia appears to be primarily characterized by endothelial cell dysfunction.^[6] Uricemia is related to preeclampsia.^[7] However, some investigations found no discernible difference between preeclamptic and normal women's serum uric acid

levels.^[8] Moreover, one investigation found that serum uric acid lacked diagnostic sensitivity and specificity,^[9] while a majority of researchers claimed that uricemia could predict preeclampsia.^[10] This study was done to demonstrate whether the severity of Preeclampsia/Eclampsia can be determined by the maternal serum uric acid level during pregnancy. We therefore sought to reconsider uric acid as a helpful biomarker because it is very affordable and widely available, and because research using new biomarkers have produced inconsistent and variable results.^[11]

MATERIALS AND METHODS

The current study was carried out in the Obstetrics and Gynaecology Department at Nimra Institute of Medical sciences, Nimra Nagar, Jupudi, Ibrahimpatnam, Vijayawada, Andhra Pradesh, India in collaboration with the Department of General

Medicine during a 12-month period from May, 2021 to April, 2022.

Exclusion Criteria

Individuals having a history of hyperuricemia, symptomatic infectious illnesses, preexisting diabetes, hypertension, renal disease, or cardiovascular disease were excluded.

Sample size and Sampling

We assessed every expectant patient admitted during the research period. The right brachial artery was the site of the mercury sphygmomanometer blood pressure reading. Three readings were taken ten minutes apart. Out of the total 659 women hospitalized during the 12-month study period, 86 pregnant women had average systolic blood pressure more than 140 mm Hg and/or diastolic blood pressure more than 90 mm Hg. 56 normotensive pregnant women were also enrolled for this study as controls. In terms of age, parity, and gestational time, they were all singleton pregnancies and equivalent to the research group.

Definitions^[12]

After 20 weeks of gestation, Pre-eclampsia manifests as hypertension and severe proteinuria. Pre-eclampsia with significant hypertension, symptoms, and/or biochemical and/or haematological impairment is referred to as severe Pre-eclampsia. Pre-eclampsia accompanied by convulsive syndrome is known as Eclampsia.

Data Collection

Participants were divided into three groups after enrollment: Eclampsia, severe Preeclampsia, and moderate Preeclampsia. Informed consent was obtained from all the study participants. A thorough past medical history was recorded from all the study

participants. Sample blood was drawn from the right or left cubital vein, collected in plain tubes, and the serum level of uric acid was determined using a semi-autoanalyzer and a modified Trinder's test.^[13] Throughout the pregnancy, participants were monitored for maternal and perinatal outcomes.

Statistical Analysis

With the use of uncomplicated statistical tools, the data were verified and analyzed. To compare the mean uric acid level with the maternal and perinatal outcomes, we utilized an unpaired t-test. Statistical significance was defined as a P-value < 0.05.

RESULTS

86 women out of the 659 pregnant women admitted for deliveries during the study period had been identified as having pregnancy-related hypertension (PIH) with an incidence of 13.05%. Out of the 86 cases of PIH, 57 women (66.28%) belonged to low socioeconomic (LSE) status and 78 (90.7%) women were from rural areas. Maximum cases, 61 (70.93%), were un-booked, while 60 (69.77%) cases had not received any antenatal care. 46 (53.49%) women were in the age group of 20-26 years and 45 (52.33%) of the 86 women with PIH were primigravida. The mean Uric acid levels in the 56 normal pregnant women (controls) are 3.36 ± 1.45 mg/dl, and in women with varying severity of PIH (cases) are as follows: moderate preeclampsia - 6.21 ± 2.72 mg/dl, severe preeclampsia - 7.89 ± 3.64 mg/dl, and eclampsia - 8.26 ± 3.85 mg/dl. All the cases had significantly higher serum uric acid levels (P0.02) [Table 1].

Table 1: Comparison of Uric acid levels between normotensive pregnant women and women with PIH

Variables	No. of participants (%)	Uric acid level (mg/dl)(Mean± SD)
Control group	56 (38.6%)	3.36±1.45
* Moderate Preeclampsia	53 (61.63%)	6.21 ±2.72
* Severe Preeclampsia	21 (24.42%)	7.89 ±3.64
* Eclampsia	12 (13.95%)	8.26 ±3.85

*P-value <0.05 Statistically significant

Out of the 86 cases, 53 (61.63%) women presented with moderate Preeclampsia, 21 (24.42%) had severe Preeclampsia, and 12 (13.95%) had Eclampsia.

Table 2: Uric acid levels in varying severity of PIH

PIH	No. of participants(n=86)	Uric acid level > 5.5 mg/dl	Uric acid level< 5.5mg/dl
Moderate Preeclampsia	53	24 (45.29%)	29 (54.71%)
Severe Preeclampsia	21	17 (80.95%)	04 (19.05%)
Eclampsia	12	10 (83.3%)	02 (16.7%)

Maternal complications were seen in 29 (33.72%) cases. Eclampsia was the most common complication seen in 12 cases (13.95%), followed by abruptio placenta, postpartum haemorrhage, HELLP, and severe renal failure (ARF). [Table 3] Maternal death was a complication in 4 (4.65%) of the cases with PIH.

Table 3: Comparison between serum uric acid levels and maternal outcome

Complications	No. of participants	Uric acid level> 5.5 mg/dl	Uric acid level< 5.5mg/dl
Eclampsia	12	10 (83.33%)	02 (16.67%)
Abruptio placenta	06	04 (66.67%)	02 (33.3%)
Post-partum hemorrhage (PPH)	05	04 (80%)	01 (20%)
HELLP	04	03 (75%)	01 (25%)

ARF	02	01 (50%)	01 (50%)
Maternal mortality	04	03 (75%)	01 (25%)

The incidence of preterm births was 40.7% (35). Perinatal deaths were seen in 21 (24.42%) cases of PIH, out of which, 15 (71.43%) were stillbirths and the remaining 6 (28.57%) being neonatal deaths.

Table 4: Comparison between perinatal outcome and serum uric acid levels

Complications	No. of participants	Uric acid level> 5.5 mg/dl	Uric acid level< 5.5mg/dl
Preterm delivery	35	28 (80%)	07 (20%)
Birth weight			
< 2.5kg	62	48 (77.42%)	14 (22.58%)
> 2.5 kg	24	08 (33.33%)	16 (66.67%)
Perinatal mortality	21	15 (71.43%)	06 (28.57%)

DISCUSSION

Uric acid is a by product of the breakdown of nucleotides. High protein and fructose diets, alcohol use, accelerated cell turnover, enzymatic flaws in purine metabolism, and altered renal function are all factors that can affect uric acid levels.^[14] Due to the effects of oestrogen, increased blood volume, and higher glomerular filtration rate, uric acid concentrations initially decrease by 25–35% during pregnancy.^[15] However, at term gestation, values steadily increase to levels as seen in non-pregnant women (4-6 mg/dl).^[16] Regardless of the cause of uricemia in preeclampsia, it is most likely the outcome of lowered glomerular filtration, increased tubular reabsorption, and decreased secretion, which leads to lessened uric acid clearance.^[17] The rise in uric acid levels was formerly assumed to be simply the result of decreased renal clearance, but it is now also thought to be the result of increased uric acid generated and triggered by trophoblast breakdown, cytokine release, and ischemia.^[18] Preeclampsia is characterized in part by decreased uric acid elimination. As preeclampsia worsens, the level of uric acid in the blood rises; a level of > 5.5 mg/dL is a strong predictor of the condition, and a level of > 7.8 mg/dL is linked to considerable maternal morbidity.^[19]

In our investigation, these observations were more or less consistent. Uric acid levels greater than 5.5 mg/dl were found in 10 (83.33%) out of the 12 cases of pregnant women with Eclampsia, 17 (80.95%) out of the 21 cases of severe preeclampsia, and 24 (45.29%) out of the 53 cases of moderate preeclampsia [Table 2]. In patients with maternal complications, Serum uric acid levels greater than 5.5mg/dl were seen in 4 (66.7%) out of the 6 patients with Abruptio Placenta, 04 (80%) out of the 5 cases of PPH, 03 (75%) out of the 04 cases of HELLP, and 01 (50%) out of the 2 cases of ARF. Four cases of maternal death were noted, and three of these cases (75%) had uric acid levels greater than 5.5 mg/dl [Table 3].

Increased uric acid levels in the blood is a useful measure since it helps distinguish PIH from all other causes of pregnancy-related hypertension where there is no decrease in uric acid clearance. Consequently, a higher level of uric acid represents

the severity of the condition in PIH and the outcome of the foetus.^[20] 15 (71.43%) out of the 21 perinatal deaths were still births and all the 15 women had serum uric acid levels more than 5.5mg/dl. Uric acid levels more than 5.5 mg/dl were present in 48 (77.42%) out of the 62 mothers who gave birth to infants weighing less than 2.5 kg and 28 (80%) out of the 35 mothers who gave birth to preterm infants [Table 4]. Serum uric acid has been described as a sensitive indicator of the severity of preeclampsia by some authors,^[21] while others have even claimed that its elevation will simply confirm the diagnosis.^[19] In cases of confirmed preeclampsia, the diagnosis is typically clinically obvious; hence, its assessment is more important when the diagnosis is uncertain.^[22] A healthy prognosis for the foetus is indicated by low uric acid levels. At this time, increasing or high levels signify high-risk situations that are better controlled and treated in a hospital. According to studies, allopurinol increased endothelium dependent vasodilation in diabetic and congestive heart failure patients by lowering uric acid levels. Hence, lowering uric acid may also be a possible therapeutic strategy for preeclamptic women.

CONCLUSION

The findings in the current study showed a substantial correlation between Preeclampsia/Eclampsia and elevated serum uric acid levels, which might be used as a biochemical indicator of complications for both the mother and the foetus.

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