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Perinatal Outcomes in Women with Pre-eclampsia Having Raised Serum Uric Acid Levels

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Author`s Contribution

[1,2]Substantial contributions to the conception or design of the work; or the acquisition, [3]Active participation in active methodology, [4]analysis, or interpretation of data for the work, [5,6]Drafting the work or revising it critically for important intellectual content

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ABSTRACT

Objective: This article intended to assess perinatal results in females having pre-eclampsia who had elevated serum uric acid levels.

Methodology: This Quasi Experimental study was conducted at the Department of Obstetrics and Gynecology, PAF Hospital Islamabad, Sarfraz Rafiqui Complex, from July 2024 to Sept 2024. Participants were serially followed with blood pressure measurements and venous blood draws to analyze serum uric acid levels. The relationship between hyperuricemia and perinatal outcomes—including Apgar scores, NICU admission, and birth weight—was assessed using data collected via a structured protocol. Statistical analysis was performed with SPSS version 23, utilizing descriptive statistics and chi-square tests to evaluate associations, with significance set at $p \leq 0.05$.

Results: Based on a study of 116 women with pre-eclampsia, 64.7% had elevated serum uric acid levels (≥6.0 mg/dL). This hyperuricemia was significantly associated with adverse perinatal outcomes. Women with raised uric acid levels delivered earlier (35.8 vs. 37.2 weeks), had higher rates of cesarean sections (68.0% vs. 41.5%), and their infants had lower birth weights (2.31 vs. 2.85 kg). These infants were also more likely to be admitted to the NICU (45.3% vs. 19.5%) and experience complications like preterm birth and fetal growth restriction.

Conclusion: Elevated serum uric acid levels in pre-eclamptic women were significantly associated with adverse perinatal outcomes, including preterm birth, low birth weight, and increased NICU admissions. These findings support the use of serum uric acid monitoring as a valuable prognostic tool for identifying high-risk pregnancies, enabling timely interventions to improve perinatal outcomes.

Keywords: Pre-eclampsia, Serum Uric Acid, Perinatal Outcomes, Pregnancy, Hypertensive Disorders of Pregnancy, Maternal Health.

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Introduction

Preeclampsia refers to high blood pressure, proteinuria, and swelling that develops in pregnant women after the 20th week of pregnancy. Worldwide about 5%–14% of all pregnancies are affected, and in regions where healthcare is hard to find, the rate rises to 18%. Across the globe, preeclampsia is responsible for over 50,000 deaths in pregnant women and more than 500,000 infancy deaths.[1] Possible poor outcomes are hypertensive crises, HELLP syndrome, premature birth, babies with low birth weight, and smaller fetuses.[2]

Serum uric acid, formed during purine metabolism, is showing promise as an indicator for predicting bad outcomes for pregnant women and their babies in preeclampsia. Elevated serum uric acid levels (>6 mg/dL) are associated with oxidative stress, endothelial dysfunction, and impaired placental blood flow, which may contribute to complications and outcomes such as NICU admissions (25.9%), poor APGAR scores (75%), Low Birth Weight (63%), and Still Birth (20.8%).[3]

Research indicates that higher uric acid levels correlate with disease severity and adverse neonatal outcomes,

with some studies reporting abnormal levels in up to 50% of preeclamptic patients.[4]

While numerous studies have explored the association between serum uric acid levels and adverse outcomes in preeclampsia, there remains inconsistency in defining clinically significant uric acid thresholds for predicting maternal and neonatal complications. Without a thorough examination of perinatal outcomes as a whole, the majority of current research concentrates on maternal or newborn outcomes separately. [5] Additionally, there are conflicting results about the prognostic significance of blood uric acid levels for illness severity and unfavourable perinatal outcomes due to differences in study designs, population demographics, and measuring techniques. [6]

Despite the high rates of maternal mortality and illness burden in the region, there remains a lack of local studies about the relationship between blood uric acid levels and perinatal outcomes in preeclampsia in Pakistan. This disparity emphasises the need for region-specific studies to develop predictive indicators and evidence-based standards for better clinical judgement and preeclampsia management. [7]

This study aims to assess the perinatal outcomes in women with Preeclampsia with raised serum uric acid levels. Doing so, will provide us with insights that can enhance and improve upon clinical practice and enhance maternal and neonatal care.

Methodology

This Quasi Experimental study was conducted in the Department of Obstetrics and Gynecology at PAF Hospital Islamabad, Sarfraz Rafiqui Complex from July 2024 to Sept 2024. following approval or until the sample size was achieved. The sample size was determined using the WHO sample size calculator, with an estimated preeclampsia prevalence of 25.9% in the local population, a 95% confidence interval, and an 8% margin of error, yielding a minimum requirement of 116 participants to assess perinatal outcomes. Participants were selected through consecutive non-random sampling, including pregnant women aged 18–35 years diagnosed with preeclampsia at or beyond 20 weeks of gestation. Exclusion criteria involved preexisting medical conditions such as chronic hypertension, diabetes mellitus, Anemia, renal or liver disease, cardiovascular disorders, thyroid dysfunction, or other endocrinologic disorders, as well as multiple pregnancies, or fetal anomalies.

Ethical approval was obtained from the hospital's Research Ethics Committee Application Number: 241118-C, and informed consent was secured from all participants before enrollment. Data collection followed a structured protocol, beginning with a comprehensive medical record review to confirm eligibility and identify confounders. Physical examinations included blood pressure measurements using a calibrated mercury sphygmomanometer after a 5-minute rest. Venous blood samples (5 mL) were collected under aseptic conditions for serum uric acid analysis, processed within 24 hours, and participants were followed up every two weeks with repeated measurements until delivery. Demographic, clinical, and neonatal outcomes were recorded using a predefined questionnaire, with all data anonymized and securely stored.

Preeclampsia was defined as hypertension (≥140/90 mmHg on two readings, 4 hours apart) with proteinuria (≥300 mg/24-hour urine or protein-to-creatinine ratio ≥0.3 mg/dL) after 20 weeks of gestation in previously normotensive women, with or without associated features such as edema, hepatic/renal dysfunction, thrombocytopenia, or neurological symptoms. Neonatal outcomes included Apgar scores (normal ≥7), NICU admission, live birth (vital signs present after 24 weeks), stillbirth (no signs of life after 24 weeks), and birth weight (low: <2.5 kg; normal: ≥2.5 kg). Hyperuricemia was defined as serum uric acid levels >6.0 mg/dL. Maternal outcome parameters included gestational age at delivery and mode of delivery. Neonatal parameters consisted of birth weight, Apgar scores, NICU admission, stillbirth, neonatal death, preterm birth, and fetal growth restriction. Statistical analysis employed descriptive measures and chi-square tests to evaluate these associations.

Data analysis was performed using SPSS version 23. Descriptive statistics (mean ± standard deviation) summarized quantitative variables such as age, BMI, gestational age, parity, and serum uric acid levels, while frequencies and percentages described categorical neonatal outcomes. Stratified analyses controlled for potential confounders including age, BMI, and gestational age, with chi-square tests used to evaluate associations. A p-value of ≤0.05 was considered statistically significant.

Results

Total of 116 pregnant women diagnosed with pre-eclampsia . The mean age of study participants was 29.4

± 4.2 years. The prevalence of raised serum uric acid levels (≥6.0 mg/dL) among the participants was found to be 64.7% (n=75).

Table 1 offers maternal and neonatal characteristics in females having pre-eclampsia. Women with raised serum uric acid levels had significantly lower mean gestational age at delivery (35.8 vs. 37.2 weeks, p=0.002), a higher rate of cesarean deliveries (68.0% vs. 41.5%, p=0.005), and lower mean birth weights (2.31 vs. 2.85 kg, p=0.001). Additionally, neonatal intensive care unit (NICU) admissions were suggestively higher in raised uric acid group (45.3% vs. 19.5%, p=0.003), while the rate of stillbirths was not statistically significant (p=0.089).

Table II highlights perinatal complications in pre-eclamptic women. The occurrence of preterm birth was suggestively higher in females having raised uric acid levels (57.3% vs. 24.4%, p=0.001). Fetal growth restriction was also significantly associated with raised uric acid levels (28.0% vs. 12.2%, p=0.034). Additionally, neonates born to mothers with elevated uric acid levels had a higher likelihood of low Apgar scores at 5 minutes (25.3% vs. 9.8%, p=0.027). Neonatal death was higher in raised uric acid group, though the change was not statistically significant (p=0.288).

Discussion

The present study evaluated the perinatal results in females having the pre-eclampsia who had elevated serum uric acid levels. The findings suggested that increased serum uric acid levels were associated with adverse maternal and neonatal results, supporting previous literature that identified hyperuricemia as a significant risk factor in pre-eclampsia.[8]

Maternal outcomes showed that women with higher levels of uric acid were more likely to have serious problems like pre-eclampsia, eclampsia, and needed to go to the intensive care unit. In this present study it was noted that Women with raised serum uric acid levels had significantly lower mean gestational age at delivery (35.8 vs. 37.2 weeks, p=0.002), a higher rate of cesarean deliveries (68.0% vs. 41.5%, p=0.005), and lower mean birth weights (2.31 vs. 2.85 kg, p=0.001). Additionally, neonatal intensive care unit (NICU) admissions were suggestively higher in raised uric acid group (45.3% vs. 19.5%, p=0.003). This was consistent with previous studies that showed that having more uric acid in the blood could make endothelial dysfunction and oxidative stress worse, both of which are important in causing pre-eclampsia. Moreover, these women were more often put on blood pressure medicine and had a higher chance of needing a C-section because their health got worse during pregnancy. The rise in cesarean sections could be due to the higher risks of complications such as placental abruption and distress in the fetus among women with high uric acid levels.[10]

The neonatal outcomes showed that babies born to mothers with high levels of uric acid usually weighed less at birth and were more likely to have a problem where they did not grow as much as normal in the womb. These findings matched up with other studies, showing that having too much uric acid in the blood can cause the placenta not to work well, which can lead to slower growth of the baby during pregnancy. Additionally, more babies in the group were born prematurely, needed more care in the hospital neonatal unit, and had a higher risk of not making it to full term. The link between high levels of uric acid in a pregnant woman's urine and poor outcomes in newborns could be due to uric acid's effect on the

Table II: Perinatal Complications in Women with Pre-eclampsia.

Complication	Normal Uric Acid (<6.0 mg/dL) (n=41)	Raised Uric Acid (≥6.0 mg/dL) (n=75)	p-value
Preterm Birth (<37 weeks)	10 (24.4%)	43 (57.3%)	0.001*
Fetal Growth Restriction	5 (12.2%)	21 (28.0%)	0.034*
Apgar Score <7 at 5 min	4 (9.8%)	19 (25.3%)	0.027*
Neonatal Mortality	2 (4.9%)	8 (10.7%)	0.288

Table I: Maternal and Neonatal Characteristics in Females having Pre-eclampsia:

Characteristic	**Normal Uric Acid (<6.0 mg/dL) (n=41)**	**Raised Uric Acid (≥6.0 mg/dL) (n=75)**	**p-value**
Mean Maternal Age (years)	28.9 ± 3.8	29.7 ± 4.5	0.361
Mean Gestational Age at Delivery (weeks)	37.2 ± 1.4	35.8 ± 2.1	0.002*
Mode of Delivery (C-section)	17 (41.5%)	51 (68.0%)	0.005*
Birth Weight (kg)	2.85 ± 0.52	2.31 ± 0.63	0.001*
NICU Admission	8 (19.5%)	34 (45.3%)	0.003*
Stillbirth	1 (2.4%)	7 (9.3%)	0.089

placenta, causing it to work less well, make it harder for the fetus to get nutrients, and leading to more damage from free radicals.[12]

Several reasons might help explain how higher uric acid levels are linked to poor health outcomes during pregnancy and birth. Uric acid can cause problems with blood vessels, which leads to high blood pressure and may also limit the oxygen supply to unborn babies.[13] Additionally, it can make the body release more inflammatory chemicals that make swelling and stress in the body worse, which play a big role in causing preeclampsia to get worse. These mechanisms probably played a role in causing more problems for mothers during childbirth, as the article explains. Furthermore, hyperuricemia has been linked to problems with how the placenta grows and forms new blood vessels, which can make it harder for the placenta to get enough blood and cause negative effects for the foetus.

Although the study gave us useful information about how higher levels of uric acid in the blood may affect women who have preeclampsia, there are still some things we can't draw conclusions from.[15] The study looked at groups of people over time, so it wasn't possible to say for sure what caused the health effects they found. Additionally, other things outside the study, like how much the mother weighs, if the mother has high blood pressure, or if these problems run in the family, might have affected what the study found.[16] Future research that includes more patients and looks at things over time might help us better understand how a higher level of uric acid in the blood during pregnancy may affect perinatal problems in women with preeclampsia.

While the study has some limitations, its results are still meaningful for medical practice. Serum uric acid can be a key indicator for identifying and keeping an eye on pre-eclampsia that might lead to problems for the mother or baby.[17] If antihypertensive treatment, fetal monitoring, and advanced delivery plans are used early, it may lessen the possible risks of hyperuricemia for pregnant women having pre-eclampsia. Alternative approaches focused on the metabolism of uric acid might also contribute to better results for both expectant mothers and their infants.[18]

According to the study, high uric acid levels in pre-eclamptic women increased the risk of major complications for mothers, more cesarean deliveries, and bad outcomes for the newborns, including IUGR, preterm birth, and admission to NICU. Consequently, managing and keeping closer eye on these women are essential to improve outcomes for their babies.[19]

Conclusion

The results indicate that pre-eclampsia mothers with high serum uric acid had adverse pregnancy outcomes compared to those with lower levels. An increase in uric acid was linked to a greater chance of preterm birth, less birth weight, growth restriction, and admissions to the neonatal intensive care unit (NICU). Also, many women in the group had problems linked to pregnancy. The study showed that uric acid measured in the blood could be a helpful marker for forecasting the severity of pre-eclampsia and its effect on the fetus. Promptly recognizing high uric acid values made it possible to manage patients more effectively and could have helped more newborns to survive. Nonetheless, more studies had to be done to create clear medical recommendations for measuring uric acid in routine prenatal care. In general, the findings confirmed the role of constant maternal and fetal monitoring for pre-eclamptic women with hyperuricemia, as it helps improve perinatal outcomes.

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