Relationship of Serum Uric Acid Level to Maternal and Perinatal Outcome in Patients with Hypertensive Disorders of Pregnancy

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ABSTRACT:
Aim and objective: To Study Serum Uric Acid level elevation in Hypertensive Disorders of Pregnancy and its role on maternal and perinatal outcome.

Material and Methods: The Study was performed on two groups of women with hypertensive disorders of pregnancy; the first group (n=50) with a serum uric acid level of ≥6mg/dl was compared to the second group (n=50) with a serum uric acid level of <6mg/dl. Maternal and perinatal complications like eclampsia, HELLP (Hemolysis, Elevated Liver Enzymes, Low Platelets) syndrome, ARF (Acute Renal Failure), IUFD (Intra-Uterine Fetal Death), low apgar score, IUGR (Intra-Uterine Growth Retardation) were studied.

Results: A comparison between the two groups revealed that hyperuricemia in patients with hypertensive disorders of pregnancy is a strong risk factor for several maternal and perinatal complications with an increased risk of an apgar score <7 by 6.0 fold, IUFD by 20 fold, IUGR by 4.0 fold, eclampsia by 4.2 fold and cesarean section by 3.4 fold in patients with a uric acid level ≥6mg/dl as compared to those with a level of <6mg/dl.

Conclusion: Hyperuricemia in patients with hypertensive disorders of pregnancy is a strong risk factor for several maternal and perinatal complications.

INTRODUCTION
Hypertensive disorders are among the commonest medical disorders during pregnancy and continue to be a major cause of maternal and perinatal morbidity and mortality worldwide. In developing countries they rank second only to anaemia, with approximately 7-10% of all pregnancies being complicated by some form of hypertensive disease.1

Pregnancy may induce hypertension in women who are normotensive before pregnancy and may aggravate hypertension in those that are hypertensive before pregnancy.2,3 Early screening for preeclampsia may allow vigilant antenatal surveillance and appropriate timing of fetal delivery in order to avoid serious sequelae.

In the non-pregnant population hyperuricemia is an independent predictor of cardiovascular and renal disease in both the general population and in subjects with chronic hypertension.

Elevated uric acid level in maternal blood, presumably due to decreased renal urate excretion is frequently found in women with preeclampsia. Various studies have been conducted to find out the relationship between elevated uric acid level and preeclampsia.4 There are several potential origins for uric acid in preeclampsia; abnormal renal function, increased tissue breakdown, acidosis and increased activity of the enzyme xanthine oxidase/dehydrogenase.

Studies of serum uric acid level in normal and hypertensive pregnancy and its relation with the early diagnosis of preeclampsia, severity of preeclampsia and associated perinatal outcome have been done in various parts of the world by many workers5-7.

AIMS AND OBJECTIVES
To study level of serum uric acid elevation in Hypertensive Disorders of Pregnancy and its role in maternal and perinatal complications.

MATERIAL AND METHODS
The study was performed on 100 women with hypertensive disorders of pregnancy at Ob and Gy dept, B.J. Medical College and Civil Hospital, Ahmedabad from 2011 to 2012. Serum Uric acid levels were studied at the onset of parturition. The participants were categorized into two groups according to their serum uric acid level:

Group A, those with a serum uric acid level of ≥6mg/dl (n=50)

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Group B, patients with a serum acid level of <6mg/dl (n=50)

Maternal and fetal complications like Intra Uterine Fetal Death (IUFD), low apgar score, Intra Uterine Growth Retardation (IUGR), increased cesarean section rate and eclampsia were studied. Blood samples for serum uric acid were taken and determined by enzymatic colorimetric method.

Follow up levels were not measured. Only a single estimation of serum uric acid level at the onset of parturition was done.

### Table-I : Association between Uric acid level and Type of Hypertension

<table>
<thead>
<tr>
<th>Type of Hypertension</th>
<th>Uric acid ≥6 mg/dl</th>
<th>Uric acid &lt;6 mg/dl</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chronic hypertension</td>
<td>5</td>
<td>3</td>
</tr>
<tr>
<td>Preeclampsia superimposed on chronic hypertension</td>
<td>6</td>
<td>2</td>
</tr>
<tr>
<td>Mild Preeclampsia</td>
<td>10</td>
<td>35</td>
</tr>
<tr>
<td>Severe preeclampsia</td>
<td>25</td>
<td>9</td>
</tr>
<tr>
<td>Eclampsia</td>
<td>4</td>
<td>1</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>50</strong></td>
<td><strong>50</strong></td>
</tr>
</tbody>
</table>

### Table-II : Perinatal Outcome

<table>
<thead>
<tr>
<th>Complication</th>
<th>Uric acid ≥6mg/dl</th>
<th>Uric acid &lt;6mg/dl</th>
<th>Odds ratio(95%CL)</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Apgar &lt;7</td>
<td>20</td>
<td>5</td>
<td>6.0(2.03-17.72)</td>
<td>0.001</td>
</tr>
<tr>
<td>Preterm deliveries</td>
<td>10</td>
<td>2</td>
<td>6.0(1.24-28.98)</td>
<td>0.02</td>
</tr>
<tr>
<td>IUGR</td>
<td>13</td>
<td>4</td>
<td>4.04(1.21-13.43)</td>
<td>0.02</td>
</tr>
<tr>
<td>IUFD</td>
<td>8</td>
<td>0</td>
<td>20.0(1.13-360.29)</td>
<td>0.04</td>
</tr>
</tbody>
</table>

IUFR (Intra Uterine Growth Retardation)
IUFD (Intra Uterine Fetal Death)

### Table-III : Maternal Outcome

<table>
<thead>
<tr>
<th>Complication</th>
<th>Uric acid ≥6mg/dl</th>
<th>Uric acid &lt;6mg/dl</th>
<th>Odds ratio(95%CL)</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cesarean Section</td>
<td>23</td>
<td>10</td>
<td>3.4(1.40-8.28)</td>
<td>0.006</td>
</tr>
<tr>
<td>Eclampsia</td>
<td>4</td>
<td>1</td>
<td>4.26(0.45-39.54)</td>
<td>0.20</td>
</tr>
<tr>
<td>Abruptio</td>
<td>4</td>
<td>0</td>
<td>9.7(0.51-186.52)</td>
<td>0.12</td>
</tr>
<tr>
<td>HELLP</td>
<td>4</td>
<td>0</td>
<td>9.7(0.51-186.52)</td>
<td>0.12</td>
</tr>
<tr>
<td>ARF</td>
<td>1</td>
<td>0</td>
<td>3.06(0.12-76.95)</td>
<td>0.49</td>
</tr>
<tr>
<td>Maternal mortality</td>
<td>1</td>
<td>0</td>
<td>3.06(0.12-76.95)</td>
<td>0.49</td>
</tr>
</tbody>
</table>

HELP (Hemolysis, Elevated Liver Enzymes, Low Platelets)
ARF (Acute Renal Failure)

### DISCUSSION

In present study, two groups, Group A (uric acid ≥6mg/dl) and Group B (uric acid <6mg/dl), both consist of 50 patients were studied. Mean age of the patients in Group A was 29±5.1 yrs and that in Group B was 28±4.8 yrs. Mean weight of the patients in Group A and B was 55.6±6.0 kg and 52.8±4.28 kg respectively. There was no significant difference in age and weight parameters of both groups. Out of 50 patients in Group A, there were 36 primigravida and 14 multigravida while in Group B, there were 20 primigravida and 30 multigravida patients.

Preeclampsia has been defined as a triad of hypertension, edema and proteinuria. A rising serum uric acid is now recognized as an early feature of preeclampsia and its measurement greatly increases the accuracy of diagnosis and helps to differentiate this disorder from essential and other chronic forms of pre-existing hypertension complicating pregnancy.

In a carefully controlled and extensive investigation, Lim and Frideman measured serum uric acid concentration in healthy pregnant females, patients with preeclampsia and patients with hypertensive vascular disease. They determined the mean serum uric acid level in the last trimester of pregnancy for the normal women to be 3.5±0.6 mg%. Patients with hypertension had similar concentration of serum uric acid, 3.7±1.1mg%, whereas the mean level for patients with histologically proven preeclampsia was 6.4±1.7mg%. Thus a significant increase in mean serum uric acid concentration was present in patients with preeclampsia compared to those with hypertensive vascular disease and normal pregnant women.

Mustaphi and Gopalan found that an elevation of mean values for uric acid correlated with degree of severity of toxemia. Lim and Frideman in 1998 found that the concentration of serum uric acid also correlated well with...
severity of glomerul lesion. Anna and Leo concluded that the level of serum uric acid appears to be a sensitive index of severity of preeclampsia. In group A, there were 10 pre-term babies, 8 IUFD, 13 IUGR and 20 babies had low apgar (<7). In group B, 2 pre-term babies, 4 IUGR, 5 babies with low apgar (<7) and no IUFD. So these entire abnormal fetal outcomes were higher in Group A (uric acid ≥6mg/dl).

In group B, there were no complications like Abruptio placenta, HELLP syndrome, ARF and maternal mortality. Only one case of eclampsia in group B while in group A, there were 4 cases of eclampsia.

This study of 100 patients with hypertensive disorders of pregnancy shows that serum uric acid is an useful index of fetal status and this results are comparable to those of Lim and Frideman, Anna and Leokee-HakLim, Williams and Galernea.

This study indicated that in pregnant women with hypertension, measurement of serum uric acid is a better indicator of fetal consequences of preeclampsia than measurement of blood pressure itself. In an established preeclampsia case, the diagnosis is usually clinically evident and elevation of serum uric acid will simply confirm the diagnosis. But since urate retention is an early feature of the disorder, serum uric acid measurement is of the greatest value where the diagnosis is in doubt.

According to William et al., the time of onset of preeclampsia is of great importance in determining the final outcome of fetus because the only treatment for disorder is earliest delivery. Since preeclampsia is usually relentlessly progressive disorder, if it starts between 24 and 30 weeks of gestation, it may readily progress either to IUFD or to a dangerous illness demanding delivery at a time when neonatal survival is unlikely.

The time at which serum uric acid concentration begins to rise is an approximate indicator of the time of onset of the preeclampsia. The value of measuring serum uric acid in hypertensive pregnancy is greatest between 24 to 32 weeks of gestation. Low values indicate a good prognosis for the fetus. Rising or high values at this time indicate high-risk cases which are better managed and treated in hospital. Early bed rest, monitoring of fetal well being in utero and anticipation of maternal problems related to preeclampsia then ensure the best chances for bringing the pregnancy to stage where planned delivery prevents serious maternal complications and gives the best possible chance of fetal survival.

The measurement of serum uric acid is thus of great diagnostic and prognostic value for fetus. This study shows that estimation of serum uric acid level in pregnancies complicated by both pre-existing hypertension and preeclampsia help to assess the severity of illness, and to identify those fetuses that are likely to have IUGR and high perinatal mortality and morbidity. Because, laboratory investigation of serum uric acid is simple, it can be easily performed in any laboratory.

## References