Comparison of Uric Acid Levels in Normotensive Pregnant Women and Women with Pregnancy Induced Hypertension

Farhana Mukhtar, Mahnoor Khan, Shazia Hameed, Faria Latif Sami

1Department of Biochemistry and Chemical Pathology, Shaikh Zayed Medical Complex, Lahore
2Allama Iqbal Medical College, Lahore

ABSTRACT

Introduction: Pregnancy induced hypertension and its complications are major causes of fetal and maternal morbidity and mortality. An association has been observed between pregnancy induced hypertension and serum uric acid levels. However assessment of 24-hour urinary uric acid excretion could glean further beneficial information. Since pregnancy induced hypertension leads to pre-eclampsia, determination of serum and urinary uric acid levels can be helpful in the management of this condition and its possible complications can be prevented. Aims & Objectives: The purpose of this study was to compare the uric acid levels in serum and 24-hour urinary samples during normal pregnancy and pregnancy induced hypertension. Place and duration of study: This study was conducted in the Department of Gynecology and Obstetrics, Shaikh Zayed hospital, Lahore in 2009. Material & Methods: This study included a total of fifty subjects, which were selected amongst the pregnant women attending the Outpatient Department of Gynecology and Obstetrics, Shaikh Zayed Hospital, Lahore. They were classified as group ‘A’ and group ‘B’ on the basis of recorded blood pressure, with each group comprising 25 pregnant women. Group A had normotensive and Group B had pregnancy induced hypertensive women. Blood and urine samples of all the 50 women were collected at 20 weeks, 24 weeks, 28 weeks, and 32 weeks of gestation and at term. Serum uric acid levels and 24-hour urinary uric acid samples were measured by clinical chemistry Autoanalyzer Dimension AR and recorded. Uric Acid Clearance was also calculated at mentioned weeks of gestation for comparison of the two groups. Results: The women in group ‘A’ had normal serum uric acid levels and normal 24-hour urinary uric acid excretion. Whereas the women in group ‘B’ had significantly raised serum uric acid values and decreased urinary uric acid excretion in a 24-hour urine sample during all gestational weeks. Conclusion: Women with pregnancy induced hypertension during all gestational weeks exhibited a positive correlation between blood pressure and serum uric acid levels, while a negative correlation was observation with 24-hour urinary uric acid excretion.

Key words: Uric acid, Pregnancy Induced Hypertension (PIH), Pre-eclampsia.

INTRODUCTION

As an established fact that, the pregnancy induced hypertension and its complications are major causes of fetal and maternal morbidity and mortality. An association has been observed between pregnancy induced hypertension and raised serum uric acid levels during gestation. Pregnancy induced hypertension may progress to pre-eclampsia, eclampsia and its complications. Pregnancy Induced Hypertension has been defined by the American College of obstetrics and Gynaecology as “Systolic blood pressure more than 140 mm of Hg and diastolic blood pressure more than 90 mm of Hg diagnosed after 20 weeks of uneventful gestation”. Based on strong evidence, pre-eclampsia and eclampsia can be included in the top prime instigators of maternal deaths all over the world. In Pakistan, the statistics of maternal mortality due to eclampsia rise to 34% for women undergoing in patient management in a tertiary care hospital.
Hyperuricemia is reported as a key biochemical feature of PIH. Rise in serum uric acid levels in PIH can be reliable indicator of pre-eclampsia and its perinatal complications. Previously, it was thought that hyperuricemia during pregnancy is caused by its decreased renal clearance, but now it has been shown that trophoblast breakdown, cytokine release and cellular ischemia also contribute the production of uric acid. Hyperuricemia can promote endothelial dysfunction, cellular damage, inflammation and oxidation which might aggravate PIH.

Serum uric acid levels are not entirely dependable to assess fetal and maternal complications and the outcome can always be influenced due to the use of different therapeutic interventions.

The present study aimed to compare the uric acid levels in serum and its 24hr urinary excretion during normal pregnancy and PIH in our local setting.

**MATERIAL AND METHODS**

This study included a total of fifty subjects which were selected amongst the pregnant women attending the outpatient Department of Gynecology and Obstetrics, Shaikh Zayed Hospital, Lahore. They were grouped as group ‘A’ and group ‘B’ containing 25 pregnant women each on the basis of their blood pressure. Normotensive Patients were assigned to group ‘A’ and those with pregnancy induced hypertension to group ‘B’. Blood and urine samples of all the 50 women were collected at 20 weeks, 24 weeks, 28 weeks, 32 weeks gestation and at term. Serum uric acid levels and 24-hour urinary uric acid samples were measured by clinical chemistry Autoanalyzer Dimension AR and recorded. Uric Acid Clearance was also calculated from 24 hrs urinary uric acid excretion at mentioned weeks of gestation for comparison of the two groups.

**Inclusion Criteria:** Twenty-five pregnant women with normal blood pressure and 25 women with pregnancy induced hypertension were included in this study.

**Exclusion Criteria:** Pregnant women with known hypertension due to cause other than pregnancy, gout, diabetes, renal, liver and cardiac diseases were excluded from this study.

**Statistical analysis:** Data was analyzed on SPSS-21. Mean and standard deviation (SD) were computed and t-test and ANOVA were employed to find out significant difference and correlations between the variables, respectively. The p-value less than 0.05 was taken significant.

**RESULTS**

The women in group ’A’ had normal values of serum uric acid and normal 24-hours urinary uric acid excretion throughout gestational weeks. The women in group ’B’ developed a gradual rise in blood pressure with increasing gestational age (Table-1), with significantly raised serum uric acid levels and decreased 24 hours urinary uric acid clearance at 20 weeks, 24 weeks, 28 weeks, 32 weeks and at term (Table-2, Fig-1,2).

| Group n=25 | BP mmHg at 20 weeks of gestation | BP mmHg at 24 weeks of gestation | BP mmHg at 28 weeks of gestation | BP mmHg at 32 weeks of gestation | BP mmHg at term |
|-----------|---------------------------------|---------------------------------|---------------------------------|---------------------------------|----------------|
| Systolic BP of Group A | 101.60±5.61 | 111.20±1.56 | 110±1.56 | 111.60±1.10 | 112.80±1.22 |
| Systolic BP of Group B | 124.80±1.02* | 132.40±1.04* | 136.80±1.38** | 140.40±0.98* | 146.00±1.04** |
| Diastolic BP of Group A | 70.40±1.12 | 67.29±1.31 | 68.13±1.37 | 70.40±0.85 | 72.00±1.59 |
| Diastolic BP of Group B | 82.0±1.00* | 84.40±0.82* | 85.80±0.69* | 90.60±0.46* | 92.20±1.12** |

*Table-1: Blood pressure (mmHg) of Normotensive and PIH patients at four weeks interval from 20 weeks to term shown as Mean±SEM. Figure in paranthesis indicate number of subject.

*p<0.02 indicating the difference is significant between Group A and Group B

**p<0.01 indicating the difference is significantly high between Group A and Group B in all weeks of gestation.
Comparison of Uric Acid Levels in Normotensive Pregnant Women and Women With PIH

| Group  | Weeks of Pregnancy | Serum Uric Acid (mg/dl) | 24 hrs Urinary Uric Acid Excretion (mg/24hrs) | Uric Acid Clearance (ml/min) |
|--------|--------------------|-------------------------|-----------------------------------------------|-----------------------------|
| Group A | 20 Weeks           | 3.04±0.10               | 640.46±22.08                                 | 14.92±0.76                  |
| Group B | 20 Weeks           | 3.64±0.17               | 540.36±23.30*                                | 10.41±0.33                  |
| Group A | 24 Weeks           | 3.12±0.10               | 659.72±16.52                                 | 15.52±0.60                  |
| Group B | 24 Weeks           | 4.8±0.14                | 548.92±19.39*                                | 9.65±0.31*                  |
| Group A | 28 Weeks           | 3.3±0.10                | 636.50±16.14                                 | 13.90±0.49                  |
| Group B | 28 Weeks           | 4.9±0.12*               | 560.48±18.94*                                | 8.96±0.31*                  |
| Group A | 32 Weeks           | 3.42±0.09               | 651.42±21.32                                 | 13.65±0.45                  |
| Group B | 32 Weeks           | 5.82±0.13*              | 554.56±17.43*                                | 8.04±0.29*                  |
| Group A | At Term            | 3.58±0.98               | 632.0±18.82                                  | 12.74±0.44                  |
| Group B | At Term            | 6.34±0.16**             | 506.44±14.24*                                | 7.34±0.17*                  |

Table-2: Serum Uric acid, Uric acid excretion as measured in 24-hours urine sample and Uric acid Clearance of Group A and Group B were recorded at four weekly intervals and the mean±SEM values. Figure in parenthesis indicate number of subjects. (*p<0.01 indicating the difference is significant between Group A and Group B.)

DISCUSSION

Pregnancy may lead to raised blood pressure levels in previously normotensive women which is known as pregnancy induced hypertension. Women with raised uric acid values in their serum had twice the risk of developing severe hypertension, eclampsia and even perinatal mortality. Serum uric acid level may be a marker of progression to pre-eclampsia among women with pregnancy induced hypertension. In a study, high sensitivity and specificity of serum uric acid levels in assessing the risk of developing PIH have been reported. Increased serum uric acid level in pregnancy induced hypertension cause aggravation of inflammation, endothelial dysfunction and oxidative stress which may explain why uric acid acts as an indicator for the progression of pre-eclampsia. In another study, it was observed that, the reduction in 24 hours urinary uric acid excretion in women with pregnancy induced hypertension is a result of decreased filtration rate through the glomerulus and increased reabsorption of uric acid in proximal tubules of the kidneys.

During a similar study significant rise in serum uric acid levels in women with pregnancy induced hypertension was reported and it was concluded that, the monitoring of serum uric acid level is an easy and economical way to assess the severity of hypertension during pregnancy. Serum uric acid can still serve as an indicator for risk assessment in women with hypertension in pregnancy. Results of our study are comparable with the other similar reported studies conducted under different circumstances in different parts of the world.
Comparison of Uric Acid Levels in Normotensive Pregnant Women and Women With PIH

CONCLUSION

In this study, women with pregnancy induced hypertension during all gestational weeks exhibited a positive correlation between their blood pressure and serum uric acid levels which was raised progressively and a negative correlation with 24hr urinary uric acid excretion. Therefore, serum and urinary uric acid can both serve to foretell the chances of developing severe complications such as pre-eclampsia and eclampsia in women with pregnancy induced hypertension and allow for timely medical interventions to prevent complications.

REFERENCES

1. American college of Obstetricians and Gynecologists. Report of the American College of Obstetricians and Gynecologists, Task Force on Hypertension in Pregnancy. Obstet Gynecol j 2013; 122: 1122 – 1131.
2. Steegers EA, von Dadelszen P, Duvekot JJ, Pignenborg R. Pre-eclampsia. Lancet. 2010; 376 (Suppl 9741): 631 – 644.
3. Shah N, Khan NH. Third delay of maternal mortality in a tertiary hospital. Rawal Med J. 2007; 32 (Suppl 2): 163 – 167.
4. Sophia M, Kali M, Theodoros T, Anargyrous K, Leomidas Z, Apostolos A. The involvement of uric acid in the pathogenesis of pre-eclampsia. Current Hypertension Reviews 2015; 2(11): 110 – 115.
5. Patel J, Patel V, vaghadiya A. A comparative study of serum uric acid level during normal pregnancy and pregnancy induced Hypertension. Int J Res Med. 2016; 5(1): 18-20.
6. Martin AC, Brown MA. Could uric acid have a pathogenic role in pre-eclampsia? Nature reviews Nephrology 2010; 6: 744 – 748.
7. Thangaratinam S, Ismail KMK, Sharp S, Coomarasamy A, Khan KS For TIPPS review group. Accuracy of serum uric acid in predicting complications of pre-eclampsia a systematic review. BJOG 2006; 113: 369-378.
8. Conde – Agndelo A, Belizh JM. Risk factors for pre-eclampsia in a large cohort of Latin American and Caribbean women. BJO 2000; 107(1): 75-83.
9. World Health organization; Maternal mortality. Available at http://www.who.int/mediacentre/factsheets/fs348/en/. Accessed on 11 July 2016.
10. Wu Y, Xiaoing X, Froser WD, Luo ZC. Association of uric acid with progression to pre-eclampsia and development of adverse conditions in gestational Hypertensive pregnancies. American Journal of Hypertension. 2012; 2516):711-717.
11. Bellomo G, Venazi S, Saronio P, Verdura C, Narducci PL. Prognostic significance of serum uric acid in women with gestational hypertension. Hypertension 2011; 58: 704 - 708.
12. Bainbridge SA, Robersts JM. Uric acid as a pathogenic factor in pre-eclampsia. Placenta 2008; 29 (suppl A): S67 – S72.
13. Jeyabaln A, Courad KP. Renal function during normal pregnancy and pre-eclampsia. Front Biosci 2007; 12: 2425 – 2437.
14. Apeksha Niraula - B.P. Koirala Institute of Health Sciences – Significance of serum Uric acid in pregnancy induced hypertension. J. National Med Assoc 2017 Autumn; 109(3):198-202.

The Authors:
Dr. Farhana Mukhtar,
Assistant professor,
Dept. of Biochemistry and Chemical Pathology, Shaikh Zayed Medical Complex, Lahore.

Dr. Mahnoor khan,
Assistant Professor,
Dept. of Biochemistry and Chemical Pathology, Shaikh Zayed Medical Complex, Lahore.

Dr. Shazia Hameed,
Assistant Professor,
Dept. of Biochemistry and Chemical Pathology, Shaikh Zayed Medical Complex, Lahore.

Faria latif Sami,
Final year MBBS student,
Allama Iqbal Medical College, Lahore.

Corresponding Author:
Dr. Farhana Mukhtar,
Assistant professor,
Dept. of Biochemistry and Chemical Pathology, Shaikh Zayed Medical Complex, Lahore.
drfarhana90@gmail.com