



Original Article

Uric Acid as a biomarker for hypertensive disorder of pregnancy:

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Abstract

Maternal, fetal complications are correlated with hypertensive disorders during pregnancy. In this context, maternal blood uric acid level is reported to be one of the prognostic factors in determining the perinatal outcome. The purpose of the present study is to estimate serum uric acid levels in preeclamptic, eclamptic and normotensive groups to identify women who are at high risk of developing the disease early in pregnancy. The study may provide possible biochemical parameter in preeclampsia and eclampsia. This is because early identification of biochemical markers of the disease would not only facilitate to identify those at increased risk for pre eclampsia but also help to determine those patients likely to benefit from interventional measures. A total 50 patients were selected and categorized into three groups. 30 among 50 women, were pregnancy induced hypertension BP>140/90 mm Hg. Who were as the experimental group and remaining 20 were normotensive (BP <140/90 mm Hg) taken as control (n=20). The experimental group was further categorized into two groups having 20 women in preeclampsia (n=20), and Ten in eclampsia (n=10). The serum uric acid level studied in various study groups showed a significant increase in pre eclampsia (n=20) and the eclamptic (n=10). The serum uric acid level for women with pre eclampsia (5 mg/dl-6.3 mg/dl n=10) were significantly higher than those of controls (4-5.6 mg/dl n=20) more over, it was experimentally found that the individual values of observed serum uric acid in preeclamptics and eclamptics were relatively higher than those of the average values of normotensives. In the setting of chronic hypertension, however a serum uric acid level at or =5.5 mg/dl could identify women with increased likelihood of having superimposed pre eclampsia. A comparison between three groups related that hyperuricemia in a patient with preeclampsia, eclampsia is certainly a risk factor for several perinatal and maternal complications.

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Introduction

Preeclampsia is a multisystem disorder of pregnancy characterized by high blood pressure and large amount of protein in urine. Preeclampsia causes decreasing blood supply to organ due to vasospasm². It contributes to both maternal and

perinatal morbidity and mortality in both developed and developing countries³. It is well known that preeclampsia is one of the potential complications contributing to preterm labour, maternal mortality, Intrauterine growth retarded, intrauterine death and many such related

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complications. The clinical utility of serum uric acid as a marker of preeclampsia has been substantiated⁴. Maternal hypertensive, even in its severe form, without hyperuricemia is associated with a good prognosis for the foetus⁵. Perinatal mortality, however, is markedly increased when maternal plasma urate is raised. According to study carried out in Argentina, determination of serum uric acid as a screening tool for pregnancy complication is an easy expensive method without for prognostications of perinatal out come associated with severe preeclampsia⁶. Over the years, a lot of interest has been directed at the studies on the role of serum uric acid and in the pathogenesis of pregnancy induced hypertension, preeclampsia. A number of important studies are available which confusingly and often complicating describe the dependence of this parameter level in preeclampsia and normotensive groups. The serum uric acid levels were found to be significantly elevated in the preeclampsia with references to the normotensive in a number of studies⁷. The results of some studies in normotensive pregnant women suggest that serum uric acid levels begin to rise before the appearance of hypertension and proteinuria⁸. It is important therefore, to identify woman who at high risk of developing the disease in early pregnancy. This study therefore involves estimation of serum uric acid level in preeclampsia, Eclampsia and normotensive groups. The objective of this study was to determine serum uric acid can be used as a

prognostic factor for determining the outcome of preeclampsia and eclampsia.

Material and Methods

This study was conducted in the department of obstetrics and gynaecological department, Rajshahi Medical College. The cases for the present study were selected from the antenatal out patient department according to specific criteria like women with age group between 18-30 years, primi gravidae with known last menstrual period and gestational age between 20-40 weeks. If menstrual history and examination findings were not correlating, early ultrasonography report was seen to find out exact period of gestation. Exclusion criteria were known hypertension, diabetes mellitus, multiple pregnancy, hyperuricemia, or renal dysfunction and liver dysfunction. A total of 50 subjects were selected in this study. All the 50 patients included in the present study were subjected to a detailed history taken, systemic examination and routine antenatal investigations. 30 among 50 women were pregnancy induced hypertension (BP> 140/90 mm Hg and proteinuria > 0.3 gm l/day and remaining 20 were normotension BP < 140/ 90 mm Hg and non-Proteinuric as control (n=20). The experimental group was further categorized into two groups, having 20 women in preeclampsia (Group II n=20 and I ten in eclampsia) (Group III n=10)

Results:

The serum uric acid level in various study group are presented in Table I

Table I

	Control group mg ldl (group-I)	Pre Eclampsia (group-II)	Eclampsia (group-III)
1	4.2	5.4	6.3
2	4.6	5.4	6.4
3	4.5	5.4	6.5
4	4.3	5.4	6.6
5	4.0	5.4	6.7
6	4.0	5.4	6.8
7	4.0	5.4	6.0
8	4.0	5.8	6.0

9	4.0	5.9	6.0
10	4.0	5.0	6.0
11	4.3	5.3	
12	4.4	5.3	
13	4.5	5.3	
14	4.6	5.4	
15	4.4	6.0	
16	4.2	6.0	
17	4.3	6.0	
18	4.4	6.0	
19	4.0	6.0	
20	4.0	6.0	

In Table I shows serum uric acid level studied in various study group showed a significant increase in group II (Preeclampsia n=20) and group III (Eclampsia n=10). Moreover, it was also experimentally found that the individual values of serum uric acid in Preeclampsia were relatively higher than those of the average values of normotensives.

Table II Shows Characteristics of the patient.

Charecteristics	Study Group	Control Group
Number of Women	30	20
Peak blood Pressure mm Hg	>140/90	<140/90
Proteinurea grms/day	≥ 0.3	None
Gestational age weeks	> 20	>20

Table III Number (0 %) of perinatal Complications group studied

Complications	Control Group-I n=20	Pre-Eclampsia Group-II n=20	Eclampsia Group-III n=10
Intrauterine foetal death	0	5 (25%)	5 (25%)
IUGR	0	6 (30%)	8 (40%)

Table III shows in control group no foetal complications, but in preeclampsia group BP >140/90 and uric acid level 5.0% mg dl, the intrauterine growth restriction and IUD, 30% and 25% , In eclampsia group III, Uric acid level 6 mg to 6.3 mg/dl IUGR 40% and IUFD 25% respectively .

Table IV Number (%) of Maternal complications in group studied

Complications	Control Group-I n=20	Pre-Eclampsia Group-II n=20	EclampsiaGroup-III n=10
Maternal Mortality	0	2 (4%)	6(8%)
Caesarean Sections	8 (16%)	10 (20%)	5 (10%)
Eclampsia	0	5(10%)	X

Table IV shows in control group there is no such complication only caesarean section rate in group I (16%) In group II Preeclampsia group maternal mortality 2 (4%) caesarean section 10 (20%) and eclampsia 5 (10%). In group III eclampsia maternal mortality 6(8%), Caesarean section 5 (10%).

Discussion:

Preeclampsia and eclampsia are the two major categories of toxemias of pregnancy. The study may provide possible biochemical parameters in toxemias of pregnancy. Preeclampsia is responsible for approximately 20% of hypertension cases during gestation. Etiology of pre-Eclampsia and eclampsia includes abnormal trophoblast invasion, coagulation abnormalities, vascular endothelial damage, cardiovascular mal adaptation, immunological phenomena, genetic predisposition and dietary deficiency or excesses. Increased uric acid level in pre eclampsia and eclampsia are also due to increased purine catabolism. Serum uric acid levels were seen to be increased significantly both pre eclampsia and eclampsia. Hyperuricemia is associated with the severity of the preeclampsia and foetal out come. Increased uric acid concentration precedes the signs and symptom of the disease frequently antedates any change in glomerular filtration rate. A correlation between high serum uric acid and severity of disease and perinatal mortality has been suggested earlier. It has been proposed that increased production of uric acid and occurs in addition to altered renal handling⁹. Therefore, high serum uric acid levels act as both marker of preeclampsia and also a protective agent against free radicals preeclampsia leads to altered renal excretion of uric acid leading to increased level of serum uric acid¹⁰. According to a study in women with preeclampsia who developed convulsion, there in variably was a further rise in the plasma

uric acid level¹¹. Monitoring the serum uric acid levels, we were able to identify a serum uric acid value that could be used to differentiate hypertensive disease. Hence monitoring of plasma uric acid level in those with pre eclampsia will help to predict those women that will develop eclampsia. Elevated serum uric acid level have also been interpreted to act as an important cofactor involved in the pathogenesis and manifestation of pre eclampsia disorder¹². It has been proposed recently that increased oxidative stress and formation of reactive oxygen species, as another contributing source of hyperuricemia noted in pre eclampsia¹³. Uric acid possessing water soluble or hydrophilic antioxidant characteristics, may delay or inhibit cellular damage mainly through the free radical scavenging property, it also presents strong antioxidant activity towards reactive oxygen species in aqueous phase¹⁴. Uric acid thus may function as a marker of oxidative stress tissue injury dysfunction. Elevated serum uric acid concentrations predict the development of hypertension. A review inferred that uric acid and its level generally increases once the disease manifests and plasma levels of uric acid may often correlate with disease severity¹⁵. Compared to other bio marker of preeclampsia. Under study such FL T- 1, PIGF (Placental growth factor), SENG (Soluble endoglin), uric acid is much cheaper, widely available and has much better sensitivity and specificity.

References

1. Eliand E et al. Preeclampsia 2012, Journal of pregnancy 2012: 1-7, 2012. Do I: 10.1155,2012/586 578
2. Cunningham, F. et al. Hypertensive disorders in pregnancy. Willeams obstetrics 21 Edition 2001; P 567-617
3. Robson SC. Hypertension and renal disease in pregnancy. In: Dewhurst's Text book of obstetrics and Gynaecology for post graduates. 6th Ed;(Edmands DK, Ced) black well Scientific Publications Ltd, London.PP.166-188(1999).
4. Dannq, BaviennaG, et al: The clinical utility of serum uric acid measurements in Pre Eclampsia and transient hypertension pregnancy. Pan Minerva Med 2000;42:101-3
5. Varma TR; Serum uric acid levels as an index fetal prognosis in pregnancies Complicated by Pre-Eclampsia of pregnancy. IntJ Gynaecolobstet 1982;20:401-8

6. Voto LS, UiaR, et al. Uric acid level: a useful index of the severity of Pre-Eclampsia and Perinatal Prognosis. *J Perinatal Med* 1988;16:123-6
7. Laxmi Naragan et al. Study of Serum uric acid levels in pregnancy induced hypertension *Int J Pharm Bio Sci* 5(4): (B) 97-103,2014
8. Fay R A. Bromhan DR et al and uric acid in the Prediction of Pre-Eclampsia. *Am J Obstet Gynaecol.* 152: 1038-1039 (1985)
9. Boyle J A, CompleeUS. Serum uric acid levels in normal Pregnancy with Observations in the renal Excretion of urate in pregnancy *J din Pclhol* 19: 501-503(1966)
10. Dis ha S. Ajesh D, Hina O. Serum uric acid as a Prognosis marker of pregnancy induce of hypertension. *J South Asian Fed of Obstetrics and Gynaecology.* 4: 130-133,(2012)
11. Wak we VC and Abudu OQ. Estimation of plasma uric acid in pregnancy induced hypertension is the test relevant? *Apr J Med Sc*28: 155-158(1999)
12. Kang Dnk-Hee, Finch J. *Journal of Hypertension.* 22; 229-235(2004)
13. Many A, Hubel CA. Hyperuricemia and Xanttive Oxidase in Pre-Eclampsia, revisited. *Am J Obstet Gynaecol.* 174: 288-291(1996)
14. Ames BN, Cath CartR. *Pruc Nati Aead Sci USA* 78: 6858-6862(1981)
15. Anna we and Brown MA could uric acid have pathogenic role in pre-Eclampsia *Nature Revess Nephro Laxy.*6:744-748

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