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Serum Uric Acid- A Better Marker for Hypertensive Disorders of Pregnancy

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Abstract

Introduction: *Hypertensive disorders are one of the most common complications of pregnancy; usually occurs after 20 weeks of gestation. Defective endovascular trophoblastic invasion and exaggerated oxidative stress is implicated in pathogenesis of hypertensive disorders of pregnancy.*

Materials and Methods: *In the present study, a total of ninety four pregnant women with gestational age≥ 32 weeks attending antenatal clinic of Obstetrics and Gynecology were enrolled. Of the 94 pregnant women 30 were grouped under gestational hypertension (BP≥140/90), 30 under preeclampsia (BP≥140/90, proteinuria ≥1+) and 34 normotensive pregnant women as controls.*

Results: *In our study we observed serum uric acid as a better marker in predicting gestational hypertension with a cutoff of 3.2mg/dl, sensitivity of 93.33%, specificity of 94.12% and area under curve of 0.966. In preeclampsia with cutoff of 4.2mg/dl, sensitivity of 93.33%, specificity of 100% and area under curve of 0.989. The creatinine in gestational hypertension with a cutoff of 0.5mg/dl, sensitivity of 96.67%, specificity of 67.65% and area under curve of 0.870. In preeclampsia with cutoff of 0.7mg/dl, sensitivity of 76.67%, specificity of 97.06% and area under curve of 0.955.*

Conclusion: *As uric acid is involved in pathogenesis of preeclampsia, measurement of uric acid helps us in diagnosing and management of preeclampsia far before the onset of symptoms. Hence an early detection might reduce maternal and fetal mortality and morbidity due to hypertensive disorders of pregnancy.*

Key Words: *Serum uric acid, serum creatinine, preeclampsia, gestational hypertension.*

Introduction

Hypertensive disorders are one of the most common complications of pregnancy; usually occurs after 20 weeks of gestation. Defective endovascular trophoblastic invasion and exaggerated oxidative stress is implicated in pathogenesis of hypertensive disorders of pregnancy.[1][2,3,.]

It is a micro vascular disorder and multiorgan syndrome. Being microvascular disorder, kidneys are most commonly involved. Uric acid is an indicator of oxidative stress marker and creatinine is an indicator of renal function[4] Therefore in hypertensive disorders of pregnancy serum uric acid and creatinine levels are elevated.

Very few studies have mentioned cut off values of uric acid and creatinine in predicting hypertensive disorders of pregnancy. Hence we have taken up this study to find the cutoff values of uric acid and

creatinine in predicting hypertensive disorders of pregnancy and to see the diagnostic efficiency of serum uric acid and creatinine in hypertensive disorders of pregnancy.

Aims & Objectives

1. To compare serum uric acid and creatinine levels in gestational hypertension and preeclampsia with normal pregnant women.
2. To evaluate the efficiency of uric acid as better marker in differentiating PE and gestational hypertension from normal pregnancy.

Materials & Methods

This is a cross sectional study done in Mediciti institute of medical sciences, Ghanpur from Jan 2016to Aug 2016. The study was approved by Institutional ethics committee and informed consent was obtained from all the participants. It includes gestational hypertension (BP>140/90), Preeclampsia (BP >140/90 with proteinuria ≥1+) and Eclampsia (PE with convulsions).[5] A total of ninety four pregnant women with gestational age≥ 32 weeks attending antenatal clinic of Obstetrics and Gynecology were enrolled. Of the 94 pregnant women 30 were grouped under gestational hypertension (BP≥140/90), 30 under preeclampsia (BP≥140/90, proteinuria ≥1+) and 34 normotensive pregnant women as controls.

Pregnant women with chronic hypertension, renal failure, diabetes mellitus, gout, thyroid dysfunction and multiple pregnancy were excluded from the study. Under strict aseptic conditions blood samples were collected by venous puncture into properly labelled tubes.

Serum uric acid was estimated by Uricase enzymatic colorimetric method on randox X-imola-3 and creatinine by Modified Kinetic Jaffes reaction on Dade Bering Xp and plus Auto-analyser. The inter and intra assay coefficient of variation (CV) was maintained less than 5%.

Statistical Analysis

Data was processed on MS excel work sheet and analysis was carried out using medcalc version 12.7.5.0 statistical software. The results were analyzed by one way ANOVA. A two tailed probability value of <0.05 was taken as indicating significance. The critical values for serum uric acid and creatinine were obtained by hypothetical receiver operating characteristic (ROC) curves.

Results

The results were expressed as Mean±SD. The mean maternal age and gestational age of gestational hypertension and preeclampsia groups did not significantly differ from those of the normotensive group (P>0.05). The mean systolic and diastolic blood pressure were statistically significant (P<0.05) between the groups with higher values in preeclampsia and gestational hypertension compared to normotensive group.

The mean serum uric acid levels were significantly increased in gestational hypertension (4.4±0.98 mg%) and PE(5.76±1.3mg%) as compared to controls (2.91±0.44mg%) with a p<0.0001. The mean serum creatinine levels were significantly increased in gestational hypertension (0.71±0.13mg%) and PE(0.88±0.24mg%) as compared to controls (0.57±0.09mg%) with a p<0.0001. Table I is showing the demographic, blood pressure, laboratory parameters of the pregnant women of the three groups included in the study.

In our study we observed serum uric acid as a better marker in predicting gestational hypertension with a cutoff of 3.2mg/dl, sensitivity of 93.33%, specificity of 94.12% and area under curve of 0.966. In preeclampsia with cutoff of 4.2mg/dl, sensitivity of 93.33%, specificity of 100% and area under curve of 0.989. The creatinine in gestational hypertension with a cutoff of 0.5mg/dl, sensitivity of 96.67%, specificity of 67.65% and area under curve of 0.870. In preeclampsia with cutoff of 0.7mg/dl, sensitivity of 76.67%, specificity of 97.06% and area under curve of 0.955. Table II and III are

showing the results of ROC analysis showing the diagnostic performance of uric acid and creatinine in predicting gestational hypertension and Preeclampsia.

On the whole serum uric acid appeared as a better marker than creatinine with more area under the curve. Fig I and II are ROC curves showing diagnostic performance of uric acid and creatinine respectively in predicting gestational hyperten-nsion. Fig III and IV are ROC curves showing diagnostic performance of uric acid and creatinine respectively in predicting preeclampsia. Fig V is showing more area under the curve of uric acid in Hypertensive disorders of pregnancy.

Table I: Demographic, blood pressure, laboratory parameters of the pregnant women of the three groups included in the study done at MIMS from Jan to Aug 2016

Parameter	Control Mean ± SD	PE Mean ± SD	Gestational hypertension Mean ± SD	P-Value
Age(years)	23.3 ± 2.47	22.3 ± 2.12	23 ± 3.4	0.267#
Gestational weeks	36.51 ± 3.53	34.96 ± 4.29	36.66 ± 3.07	0.145#
Systolic BP(mm of Hg)	112.6 ± 6.65	148 ± 9.96	139.6 ± 6.14	<0.001*
Diastolic BP(mm of Hg)	72.64 ± 6.18	100.6 ± 10.8	94.33 ± 6.26	<0.001*
Uric Acid(mg/dl)	2.91 ± 0.44	5.76 ± 1.30	4.41 ± 0.978	<0.0001*
Creatinine(mg/dl)	0.567 ± 0.09	0.883 ± 0.239	0.713 ± 0.133	<0.0001*
(P<0.05 * significant; P>0.05 # non-significant)				

Table II: Results of ROC analysis showing the diagnostic performance of uric acid and creatinine in predicting gestational hypertension.

Parameter	Cut Off Value	Sensitivity (%)	Specificity (%)	Area Under Curve	Positive Predictive Value (%)	Negative Predictive Value (%)
Uric Acid	3.2 mg%	93.33	94.12	0.966	77.77	92.85
Creatinine	0.5 mg%	96.67	67.65	0.87	48.33	75

Table III: Results of ROC analysis showing the diagnostic performance of uric acid and creatinine in predicting Preeclampsia

Parameter	Cut Off Value	Sensitivity (%)	Specificity (%)	Area Under Curve	Positive Predictive Value (%)	Negative Predictive Value (%)
Uric Acid	4.2 mg%	93.33	100	0.989	96.5	94.2
Creatinine	0.7 mg%	76.67	97.06	0.955	83.87	87.87

Fig I: ROC curves showing diagnostic performance of uric acid in predicting gestational hypertension
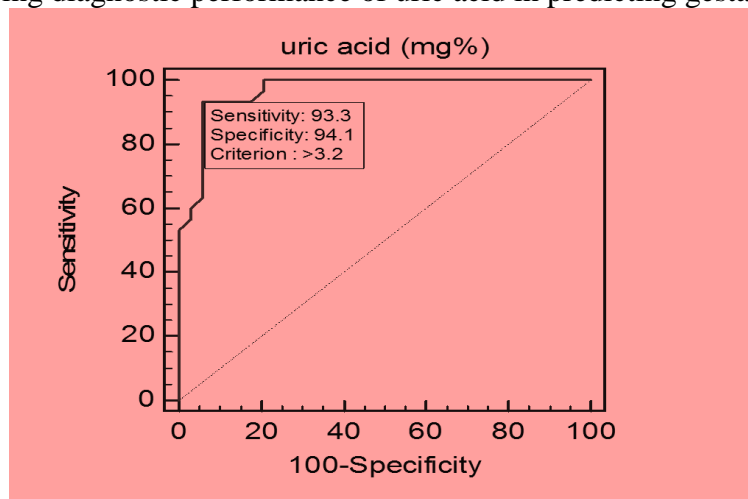
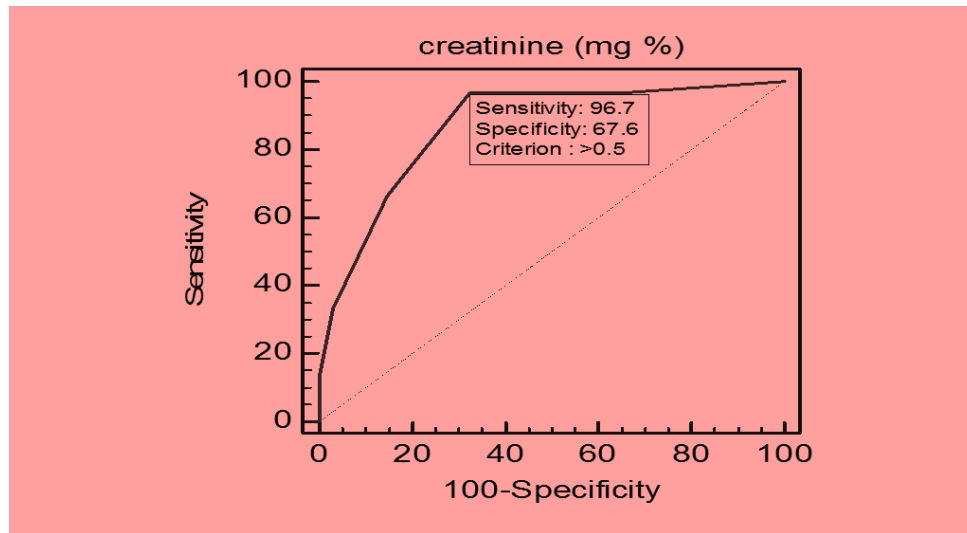**Fig II:** ROC curves showing diagnostic performance of creatinine in predicting gestational hypertension

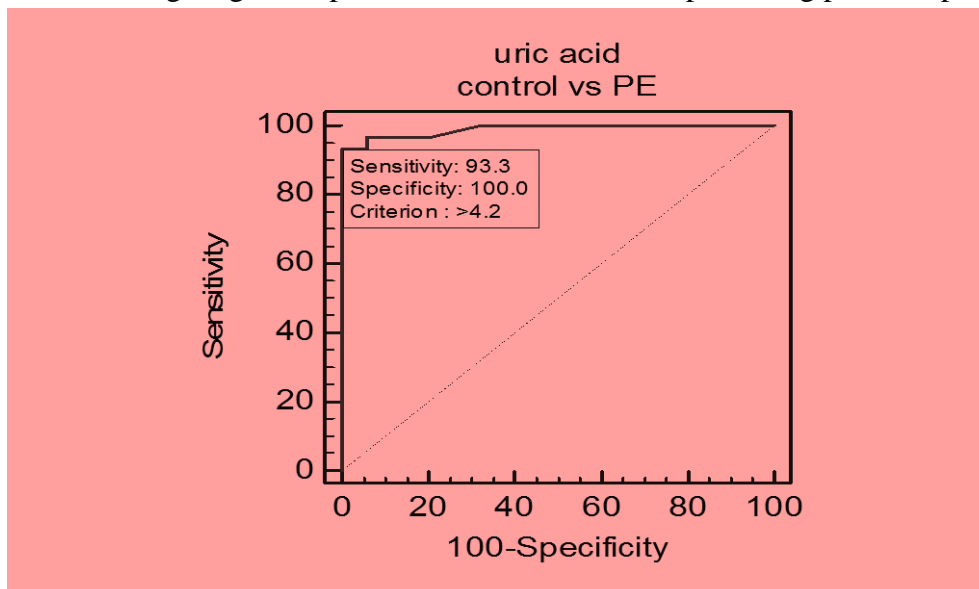**Fig III:** ROC curves showing diagnostic performance of uric acid in predicting preeclampsia

Fig IV: ROC curves showing diagnostic performance of creatinine in predicting preeclampsia
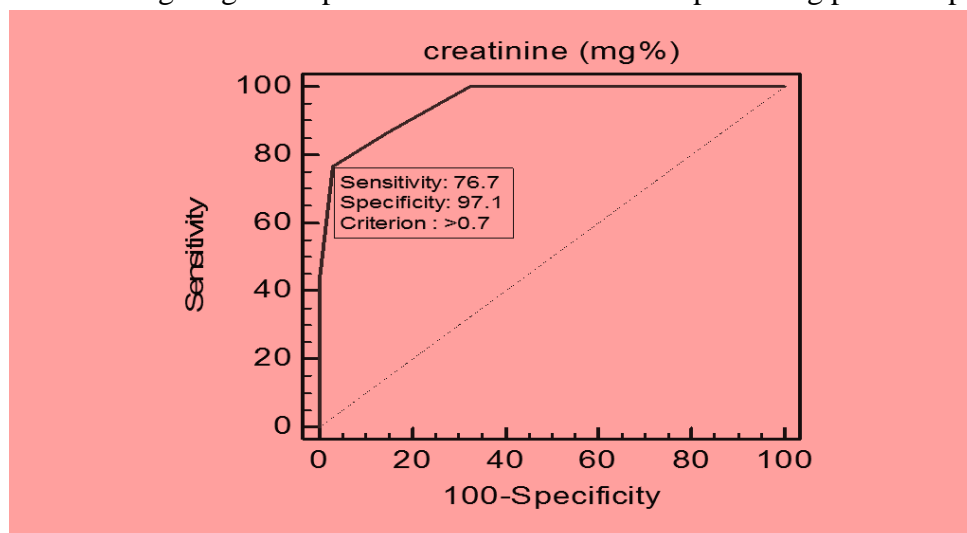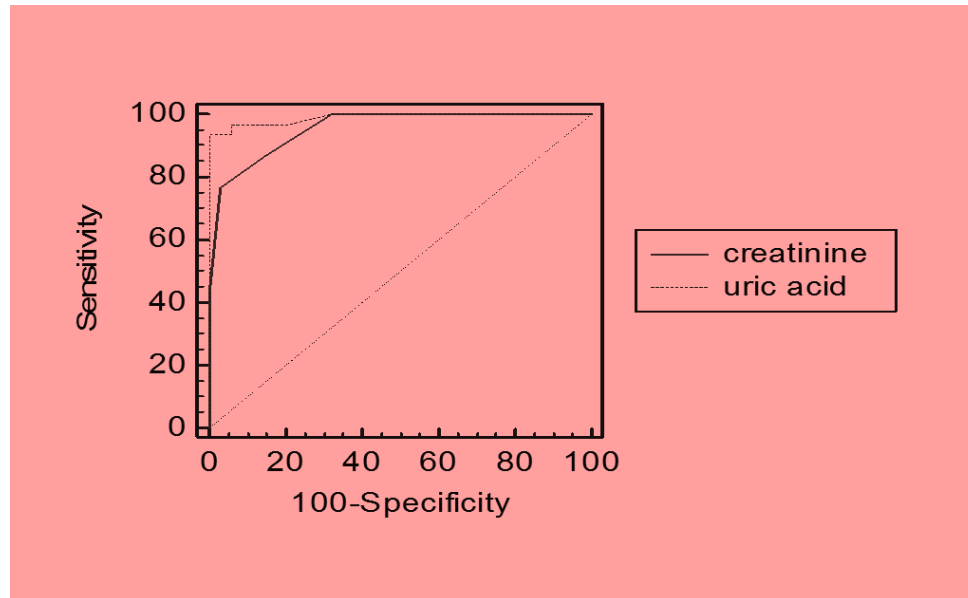
Fig V: ROC curves showing diagnostic performance of uric acid and creatinine in predicting Hypertensive disorders of pregnancy

Conclusion

Various studies have mentioned elevated levels of uric acid in gestational hypertension and preeclampsia.[1,2,3] Only few studies have mentioned a cutoff values of uric acid and creatinine in predicting gestational hypertension and preeclampsia.

As uric acid is involved in pathogenesis of preeclampsia, measurement of uric acid helps us in diagnosing and management of preeclampsia far before the onset of symptoms. Hence an early detection might reduce maternal and fetal mortality and morbidity due to hypertensive disorders of pregnancy.

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