

Research Article

Correlation between malondialdehyde (MDA) and uric acid levels in preeclampsia

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ABSTRACT

Background: Hypertensive disorders of human pregnancy, such as preeclampsia, complicates a sizeable percentage of all pregnancies, need its early indication and warning. The aim of present study was to determine the association between lipid peroxidation product, serum malondialdehyde (MDA) and serum uric acid levels in preeclampsia and find out any association between these two parameters in preeclampsia.

Methods: Thirty preeclampsia and thirty gestational age matched normotensive pregnant women attending Narayana General Hospital, Nellore were included in the study. Serum MDA levels were measured by Thiobarbituric acid reactive substances (TBARS) method and serum uric acid levels were estimated by automated chemistry analyser using commercial kits.

Results: Serum MDA (Mean±SEM 24.4±2.38 vs 7.9± 0.28 nmol/ml, p value < 0.000) and serum uric acid levels (7.2 ± 0.25 vs 3.9 ± 0.14 mg/dl, p value <0.000) were significantly elevated in preeclampsia cases when compared with that of normotensive pregnant women. A weak positive correlation between serum uric acid and serum MDA (r value 0.065, p value 0.734) was noticed in preeclampsia.

Conclusion: Serum MDA and uric acid may be included as additional markers for screening and progression of preeclampsia, thereby helpful in effectively treating the condition at an early stage.

Keywords: MDA, Uric acid, Preeclampsia

INTRODUCTION

Hypertensive disorders during pregnancy complicate 7-10% of total pregnancies, out of which 70% are preeclamptic. It increases perinatal mortality by five fold and kills 50,000 women worldwide.¹ Preeclampsia is a multisystem disorder characterised by hypertension to the extent of 140/90 mm of Hg or more, proteinuria (\geq 300 mg /day) and oedema induced by pregnancy after 20th week. Without intervention, preeclampsia progresses to eclampsia. Despite considerable research, the

pathophysiology of preeclampsia remains unclear.² However, oxidative stress has been attributed to be the causative factor of preeclampsia.³ Lipid peroxidation is event of oxidative stress. Low density lipoproteins are more susceptible for free radical oxidation leading to generation of Malondialdehyde (MDA). This can be the major factor that induces endothelial dysfunction.⁴ Slemons and Begort first observed an association between serum uric acid and the presence of pregnancy induced hypertension (PIH). Stander and Cadden were first to demonstrate a high correlation between the

severity of PIH and serum uric acid concentrations.⁵ Uric acid is a marker of oxidative stress, tissue injury and renal dysfunction. Soluble uric acid impairs nitric oxide generation in endothelial cells. Hyperuricemia induces endothelial dysfunction and may induce hypertension and vascular disease in preeclampsia.⁶ Thus the present study was undertaken to measure MDA and uric acid levels and find out any association between these two parameters in preeclampsia.

METHODS

Thirty cases of Preeclampsia and thirty Normotensive Pregnant women attending antenatal clinic at Narayana General Hospital, Nellore were enrolled for the study after taking informed consent. Both cases and controls were primigravida, between 18 – 30 yrs of age and were in their third trimester.

Inclusion criteria: Women with Preeclampsia diagnosed based on definition of American College of Obstetricians and Gynecologists (ACOGs) : 1) Systolic Blood Pressure greater than 140 mm of Hg or rise of at least 30 mm of Hg or 2) Diastolic Blood Pressure greater than 90 mm of Hg or rise of at least 15 mm of Hg (manifested on two occasions at least 6 hrs apart) and 3) Proteinuria of 300 mg or greater in 24 hrs urine collection or protein concentration of 1 gm/litre (on two occasions at least 6 hrs apart).⁷ Subjects with normal pregnancy were normotensive and had no proteinuria.

Exclusion criteria: Illness like anemia, diabetes mellitus, essential hypertension, renal insufficiency, cardiovascular disease were excluded from study. 5 ml of venous blood samples were collected, the serum was separated and analysed for Malondialdehyde (MDA), a lipid peroxidation product, by Thiobarbituric acid reactive substances (TBARS) method and serum uric acid by Automated Chemistry Analyser [HUMASTAR 300 (Human Gm BH Germany)] using available commercial kit.

Statistical analysis: Data was analysed using statistical software SPSS version 20. Values are expressed as mean \pm SEM (standard error of mean). Comparison of values between cases and controls was done using Student's t test. Correlation between two parameters was done using Pearson's correlation test. A p value of less than 0.05 was considered statistically significant.

RESULTS

In the present study, the serum MDA (Mean \pm SEM 24.4 \pm 2.38 vs 7.9 \pm 0.28 nmol/ml) and serum uric acid levels (7.2 \pm 0.25 vs 3.9 \pm 0.14 mg/dl) were significantly increased in preeclampsia cases compared to that of normotensive pregnant women respectively. And a weak positive correlation between Uric acid and MDA was observed in preeclampsia cases. (r = 0.065, p < 0.734).

DISCUSSION

Pregnancy creates oxidative stress and stress level increase in preeclampsia. In our study, the lipid peroxidation product malondialdehyde (MDA) levels were significantly increased in preeclamptic women as compared to that of normotensive pregnant women (p value < 0.000). Similar observations were noted by others.^{8,9,10} This suggests that free radicals play an important role in pathophysiology of preeclampsia. Also evidences point that oxidative stress is a mediator of endothelial cell dysfunction.¹¹

Also, we observed that the mean values of serum uric acid were significantly elevated in preeclamptics compared to that of normotensive pregnant women (p value < 0.000). Similar observations were noted by others.^{8,12,13,14,15,16} Uric acid is a water soluble and a weak serum antioxidant. The rise in uric acid in preeclampsia is not merely a nonspecific reflection of kidney damage, but a sign of antioxidative response, possibly related to the pathogenesis of preeclampsia.⁸ Recently increased oxidative stress and formation of reactive oxygen species (ROS) have been proposed as another contributing source of hyperuricemia observed in preeclampsia, apart from renal dysfunction. Also, we noted a weak positive correlation between uric acid and MDA levels in preeclampsia (r value 0.065, p value 0.734), similar to findings noticed by Shikha Saxena et al.¹⁰ But Apama A. Sagare et al.¹⁵ noticed a strong positive association between uric acid and MDA in preeclampsia. In contrast to our study a weak negative correlation between uric acid and MDA was noted in preeclampsia by Dhananjaya BS et al.¹⁷ Plausible culprit of this accumulation of uric acid may lie with increase ROS generation. ROS affects on three distinct sites to produce increased serum uric acid. Firstly its action on placental tissue leads to excessive lipid peroxidation and endothelial damage with the result of decreased nitric oxide release. Secondly, on renal tissue endothelial cell injury provides characteristic lesions i.e. glomerular endotheliosis resulting in decreased renal urate clearance. Lastly, developing fetal tissue under hypoxic condition triggers xanthine oxidase activity which in turn increase purine catabolism leading to increased uric acid release into maternal circulation. Thus overall effect of increased uric acid noted may be the cumulative effect of ROS induced oxidative damage on various tissues.¹⁵

CONCLUSION

We conclude that the endothelial disturbing factors like lipid peroxides and uric acid could be the possible causes in the pathogenesis of preeclampsia. This association may be significant in understanding the pathological process of preeclampsia and may help in developing strategies for prevention and early diagnosis of preeclampsia.

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Ethical approval: The study was approved by the Institutional Ethics Committee

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