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Original Article

Study of correlation between oxidative stress parameters and severity of pre eclampsia

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ABSTRACT

ABSTRACT: Back ground: Preeclampsia is characterized by hypertension and proteinuria. Hypertensive disorders are the most common medical complications of pregnancy. In preeclampsia, oxidative stress is exaggerated. This was undertaken to correlate oxidative stress parameters and severity of preeclampsia. Methods: Twenty five (25) subjects were randomly selected who are attending hospital. Blood samples collected analysed for total antioxidant capacity (TAC) and Malondialdehyde(MDA) and correlated with Diastolic Blood Pressure(DBP), Proteinuria Uric acid and other parameters. Results: Subjects with proteinuria show significant increase in TAC values. There is a positive correlation between DBP and proteinuria. Uric acid and TAC were significantly correlating with DBP. Conclusion: Oxidative parameters like TAC were strongly co-relating with DBP, proteinuria and uric acid levels which indicates severity of Pre-eclampsia.

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1. Introduction

Pre-eclampsia, a syndrome peculiar to pregnancy characterized clinically by hypertension and proteinuria. [1] In India the incidence of preeclampsia is reported to be 8-10 per cent of the pregnancies. [2] Pregnancy-induced hypertension or Pre-eclampsia (diastolic blood pressure >90 mm Hg) occurring after week 20 of gestation with proteinuria (either ≥ 300 mg protein per day or an urinary protein/creatinine ratio ≥ 30 mg/mmol). [3]

Hypertensive disorders are the most common medical complications of pregnancy, with a reported incidence ranging from five to ten per cent. [4] Hypertension in pregnancy affects mostly after twentieth week of gestation and frequent occurrences are seen near term. This contributes significantly to the cause of maternal and perinatal mortality and morbidity. [5] The low blood pressure goal had a greater beneficial effect in persons with higher baseline proteinuria.[6]

Preeclampsia is disease of theories, the exact etiology is not known. Various theories have been proposed to explain the possible etiology like immunological, genetic and oxidative stress theories. The most widely explored theory is oxidative stress theory.[7]

Oxidative stress is a normal phenomenon in normotensive pregnancy; however, in preeclampsia, oxidative stress is exaggerated may result in a greater potential for endothelial oxidative damage. [8, 9] It has been reported that higher MDA/total antioxidant capacity(TAC) ratio is indicative of oxidative stress in women with preeclampsia, [9] It has been suggested that uncontrolled lipid peroxidation may play a role in the etiology of the PIH .elevated lipid peroxidation markers like urine (the isoprostane 8,12-epi-iPF2 α -VI) or plasma (8-epi-prostaglandin F2 α and MDA) are the markers of oxidative stress. [10]

Thus we undertook this study to find correlation between oxidative stress and preeclampsia also to correlate oxidative stress parameters and severity of preeclampsia.

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2. Material and Methods

The study was conducted at Department of OBG, Sri Siddhartha Medical College, Tumkur. Twenty five (25) subjects were randomly selected who are attending hospital. After explaining the study details subjects who are willing, informed consent was taken. Institutional ethical committee clearance was obtained.

In all pre-eclamptic patients routine investigations like haemoglobin, platelet count, urine for albumin, sugar and microscopy, blood urea, serum creatinine, uric acid and LFT were performed.

Blood sample was collected in the heparinized tubes for each individual in the study group, and plasma was separated by centrifugation at 1500 rpm for 10 min, and the sample was then stored at -80°C until further analysis of total antioxidant capacity (TAC) and Malondialdehyde(MDA). The total antioxidant status of the plasma was measured using a novel automated colorimetric measurement method for TAC developed by Erel. [11] Blood Pressure monitored by using aneroid manometer in semi recumbent position.

Oxidative stress parameters (TAC, MDA) were correlated with Proteinuria and Diastolic Blood pressure and Uric acid in pre-eclamptic patients.

Statistical analysis was done using R software. Wilcoxon test was used to find the difference between the two groups. Spearman's rank correlation used to study correlation between various oxidative parameters. Values shown are ρ (rho) values and values in the in parenthesis are p values. Differences were considered statistically significant at $p < 0.05$.

3. Results

We have studied the correlation between oxidative stress

tabulated. The Mean ages of subjects were 24.08 ± 3.88 . We have observed there is increase in both Systolic and Diastolic Blood pressure (DBP), Uric acid and TAC levels. MDA levels are within normal limits.

Table-1 shows comparison of parameters between the pregnant women with and without Proteinuria. Subjects with proteinuria show significant increase in TAC values. ($p < 0.05$)

In plot of means (Figure -1) there is a positive correlation between DBP and proteinuria. As the protein level increases DBP also increases.

In Table -2 Values shown as ρ (rho) values and values in the in parenthesis are p values. Uric acid and TAC were significantly correlating with DBP ($P < 0.001$). Meta analysis showed the same. MDA levels were within normal limits.

TABLE 1: Comparison Of Parameters Between The Pregnant Women With And Without Proteinuria

VARIABLES	with prot N=18		without Prot N=7
	Mean $\pm$ sd	Mean $\pm$ sd	P Value
Systolic BP (mmhg)	153.00 $\pm$ 19.39	140.86 $\pm$ 7.20	0.18
Diastolic BP (mmhg)	101.44 $\pm$ 13.01	91.43 $\pm$ 3.78	0.10
Uric acid mg/dl	6.28 $\pm$ 1.30	5.81 $\pm$ 0.63	0.14
Birth wt (kg)	2.36 $\pm$ 0.56	2.03 $\pm$ 0.67	0.47
TAC (micromol/l)	921.67 $\pm$ 86.25	852.86 $\pm$ 91.05	0.02*
MDA (nmol/l)	2.08 $\pm$ 0.48	2.16 $\pm$ 0.40	0.27

Significant codes: $< 0.001^{***}$; $< 0.01^{**}$; $< 0.05^{*}$

Wilcoxon test was used to find the difference between the two groups using R software

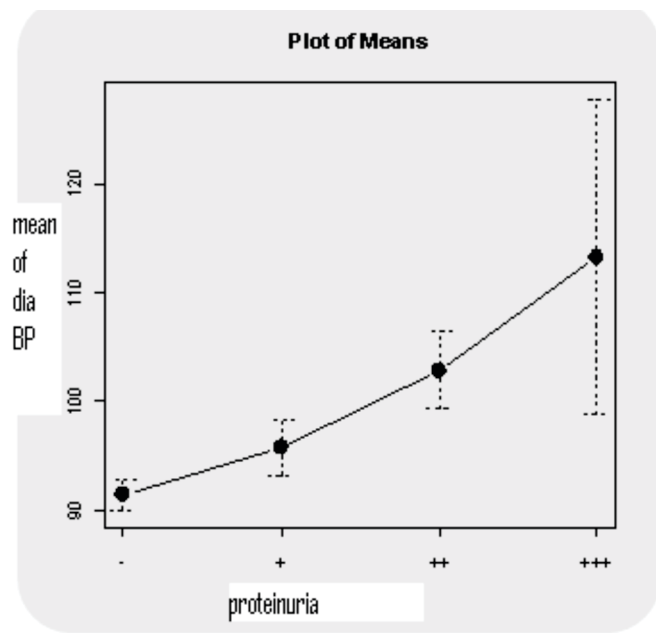
TABLE- 2: Spearman's Rank Correlation between Various Parameters

	BIRTH WT	DIA BP	MDA	TAC	URIC ACID
BIRTH WT	–	–	0.02(0.90)	-0.05(0.80)	0.02(0.74)
DIABP			0.39(0.84)	0.49(0.01)	-0.04(0.05)*
MDA	0.02(0.90)	0.39(0.84)	–	**0.06(0.75)	-0.13(0.51)
TAC	-0.05(0.80)	0.49(0.01)	0.06(0.75)	–	0.22(0.28)
URICACID	0.02(0.74)	** -0.04(0.05)*	-0.13(0.51)	0.22(0.28)	--

Values shown are ρ (rho) values and values in the in parenthesis are p values

Significant codes: $< 0.001^{***}$; $< 0.01^{**}$; $< 0.05^{*}$

Figure-1 Plot of Means showing correlation between DBP and Proteinuria



4. Discussion

Oxidative stress is a potential indicator in preeclampsia. We have studied the total antioxidant capacity (TAC) and Malondialdehyde (MDA) which indicates the severity of preeclampsia. Other related parameters like DBP, Birth weight and uric acid also studied.

In preeclampsia can increase oxidative stress and potential free radical damage increases the vasospasm which in turn increases the peripheral resistance, hence DBP increases. [12] Pankajdesai

Levine et al [13] in their study observed that the baseline characteristics of the 82 women with a rise in diastolic blood pressure of ≥ 15 mm Hg in association with proteinuria did not differ significantly from those of the other normotensive women. In our study there was strong co-relationship between DBP and Proteinuria.

Oxidative stress parameters particularly increased TAC significantly. Increased lipid peroxidation may be the cause for elevated TAC. We have also observed DBP correlating with the TAC and uric acid. It has also been hypothesized and reported that reduction in the antioxidant activity may enhance endothelial cell oxidative damage but several studies of various systems have produced conflicting results. [14, 15]

One of the first biomarkers of lipid peroxidation found to be elevated in the plasma of women with preeclampsia was Malondialdehyde (MDA), a major metabolite of lipid peroxide breakdown. [16] in our study MDA levels are normal.

In our study there is increase in serum uric acid values. The rise in uric acid in pre-eclampsia is

reflection of kidney damage, but a sign of antioxidative response, possibly related to the pathogenesis of pre-eclampsia. [15].

To summarise, oxidative parameters like TAC were strongly co-relating with DBP, proteinuria and uric acid levels which indicates severity of Pre-eclampsia.

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