

Evaluation of oxidative stress and other biochemical markers in female subjects suffering from chronic renal failure and chronic renal failure with hypertension

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ABSTRACT

The current study was performed in the Department of Medical Biochemistry, M. G. M. Medical College, Indore (M.P.) to assess the trend of antioxidants and some important biochemical markers in female subjects suffering from chronic renal failure and chronic renal failure with hypertension. The blood samples were analyzed for sodium, potassium, protein, creatinine, urea, superoxide dismutase, glutathione reductase, glutathione peroxidase, catalase, and malondialdehyde. Highly significant ($P < 0.001$) increased results were observed in case of serum potassium ions, creatinine, urea and plasma malondialdehyde. Serum sodium ions, protein, superoxide dismutase and haemolysate glutathione reductase, glutathione peroxidase and catalase were decreased highly significantly ($p < 0.001$) in chronic renal failure and chronic renal failure with hypertension groups when compared with age matched female healthy control group.

Key words: Chronic Renal Failure, Hypertension.

INTRODUCTION

Hypertension is an important public health challenge in the United States because of its high prevalence and concomitant increased risk of cardiovascular-renal disease,¹ and estimated that in the United States 50 millions have hypertension,² and 20 millions have chronic renal failure.³ Kidneys are vital in pathogenesis of hypertension.⁴ As a consequence the prevalence and incidence of hypertension also increases with age. The relationship between age and hypertension has been consistently demonstrated in cross-sectional survey as well as in longitudinal cohort studies conducted in western population^{5,6}. Estimation of chronic kidney disease are also age dependent because chronic kidney disease was present in about 8% of the Framingham population, but increased to 20% in elderly.⁷ Chronic renal failure and chronic renal failure with hypertension in females are associated with the changes in biochemical markers in the form of sodium, potassium, protein, creatinine,

urea, superoxide dismutase, glutathione reductase, glutathione peroxidase, catalase and malondialdehyde which are useful tools for the diagnosis of morbid groups.

MATERIALS AND METHODS

The clinical material for present study comprised 20 patients of chronic renal failure, 20 chronic renal failures with hypertension admitted in medicine ward M Y Hospital, M. G. M. Medical College, Indore and 20 age matched female healthy control group. The age ranges were taken from 40 to 70 years. Blood samples were collected from the patients at the time of admission as well as from individuals of female healthy control group. Clinical investigations were performed in the Department of Medical Biochemistry, M. G. M. Medical College, Indore (M.P.). Serum protein, creatinine, urea and superoxide dismutase were estimated by biuret, Jaffe's, diacetyl monoxime and Misra H P et al methods respectively. Plasma

malondialdehyde and haemolysate glutathione reductase, glutathione peroxidase, and catalase, were estimated by Jean CD at al method (1983), Horn H D (1963), Hafeman D G method (1974) and

Asror K Sinha method (1972) respectively. Serum electrolytes were estimated by using flame photometer. Obtained data were analyzed statistically by using student "t" test.

Table 1: Mean \pm S. D. values and significant test between female healthy control group v/s chronic renal failures

S. No.	Parameters	Healthy control group (20) Mean \pm S. D.	Chronic renal failure (20) Mean \pm S. D.	P - values
Electrolytes				
1	Sodium (mEq./L.)	142 \pm 2.68	120.2 \pm 4.43	P<0.001
2	Potassium (mEq./L.)	4.31 \pm 0.46	6.6 \pm 0.50	P<0.001
Biochemical:				
3	Protein (mg/dl)	7.19 \pm 0.17	6.36 \pm 0.17	P<0.001
4	Creatinine (mg/dl)	0.76 \pm 0.10	3.41 \pm 1.31	P<0.001
5	Urea (mg/dl)	26.2 \pm 5.30	57.65 \pm 7.31	P<0.001
Antioxidants:				
6	Superoxide dismutase (EU/mg protein/ml)	12.76 \pm 1.33	8.76 \pm 0.62	P<0.001
7	Glutathione reductase (EU/gm protein)	19.35 \pm 0.57	16.37 \pm 0.50	P<0.001
8	Glutathione peroxidase (EU/mg Hb%)	9.36 \pm 1.06	6.71 \pm 0.43	P<0.001
9	Catalase (EU/mg protein/ml)	5.8 \pm 0.43	3.77 \pm 0.39	P<0.001
Oxidant product:				
10	Malondiadehyde (nano mol/ml)	3.2 \pm 0.48	5.41 \pm 0.95	P<0.001

P<0.001; (Highly significant)

Table 2: Mean \pm S. D. values and significant test between female healthy control group v/s chronic renal failures with hypertension.

S. No.	Parameters	Healthy control group (20) Mean \pm S. D.	Chronic renal failure (20) Mean \pm S. D.	P - values
Electrolytes:				
1	Sodium (mEq./L.)	142 \pm 2.68	111.65 \pm 8.38	P<0.001
2	Potassium (mEq./L.)	4.31 \pm 0.46	6.6 \pm 0.56	P<0.001
Biochemical:				
3	Protein (mg/dl)	7.47 \pm 0.29	6.10 \pm 0.19	P<0.001
4	Creatinine (mg/dl)	0.76 \pm 0.10	4.76 \pm 0.78	P<0.001
5	Urea (mg/dl)	26.2 \pm 5.30	57 \pm 6.62	P<0.001
Antioxidants:				
6	Superoxide dismutase (EU/mg protein/ml)	12.76 \pm 1.33	8.8 \pm 0.37	P<0.001
7	Glutathione reductase (EU/gm protein)	19.35 \pm 0.57	16.32 \pm 0.62	P<0.001
8	Glutathione peroxidase (EU/mg Hb%)	9.36 \pm 1.06	6.76 \pm 0.34	P<0.001
9	Catalase (EU/mg protein/ml)	5.8 \pm 0.43	3.79 \pm 0.24	P<0.001
Oxidant product:				
10	Malondiadehyde (nano mol/ml)	3.2 \pm 0.48	5.8 \pm 0.83	P<0.001

P<0.001; (Highly significant)

RESULTS

1. Table number 1 and 2 are showing levels of biochemical markers in female chronic renal failure and chronic renal failure with hypertensive patients and age matched female healthy control group.
2. We observed, highly significance ($p < 0.001$) increased biochemical markers values were found in the form of serum potassium ions, creatinine, urea and plasma malondialdehyde as compared to female healthy control group.
3. Other biochemical markers such as serum sodium ions, protein, superoxide dismutase, and haemolysate glutathione reductase, glutathione peroxidase catalase were decreased highly significantly ($p < 0.001$) in female chronic renal failure and chronic renal failure with hypertensive patients when compared to age matched female healthy control group.

DISCUSSION AND CONCLUSION

Hypertension is a complex disorders resulting from the combined effects of genetic, environmental and demographic factors⁸. Hypertension is more prevalent in women⁹. Epidemiological study have consistently identified an important and independent link between high blood pressure and impaired renal function¹⁰.

Hypertension is common in individuals with renal disease. The prevalence of hypertension varies with the causes of the underlying renal disease¹¹. Hypertension is associated with higher prevalence of chronic renal disease^{12,13}.¹⁴ Hypertension is an important presenting feature of renal disease and is probably the most important factor contributing to the progression of renal failure¹⁵. Increased oxidative stress and inflammation manifest in chronic renal failure^{16,17}.

History of female chronic renal failure and chronic renal failure with hypertension, the serum creatinine, urea, potassium ions and plasma malondialdehyde levels were found increased^{18,19,20}. In the present study, the results were found to be same i.e. hyperkalemia and increased creatinine, urea and plasma malondialdehyde levels. Chronic renal failure and chronic renal failure with hypertension are characterized by decreased sodium ions, superoxide dismutase, glutathione reductase, glutathione peroxidase and catalase²¹. In the present study, all the above sated parameters in chronic renal failure and chronic renal failure with hypertensive patients were found to be decreased when compared with normal male healthy control age matched individuals. So it is concluded that chronic renal failure and chronic renal with hypertension are associated with increased in some of the parameters on one side and decreased in some others on the other hand.

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