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Oxidative stress is the primary event in hypertension and chronic renal failure; evaluation of other biochemical markers

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ABSRACT

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 parameters in male 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 malonialdehyde. Highly significant ($p<0.001$) increased results were observed in case of serum potassium ions, creatinine, urea and haemolysate glutathione reductase, glutathione peroxidase and catalase were decreased highly significantly ($p<0.001$) in morbid groups when compared with age matched male healthy control group.

Key words: Hypertension, Chronic renal failure

INTRODUCTION

Hypertension is an important public health challenge in the United States because of its high prevalence and concomitant increased in risk of cardiovascular-renal disease[1], and estimated that in the United State 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 elederly[7]. Chronic renal failure and Chronic renal failure with hypertension are associated with the changes in biochemical parameters in the form of sodium, potassium, protein, creatinine, urea, superoxide, dismutase, glutathione reductase, glutathione peroxidase, catalase, and malondialdehyde which are useful tool for the diagnosis of morbid groups.

MATERIAL 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 ages matched healthy control group. The age range was taken from 40 to 70 years. Blood was collected from the patients at the time of admission as well as from individuals of male 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 malondialdehye and haemolysate glutathione reductase, glutathione peroxidase, and catalase, were estimated by Jean

Table 1: Mean ± S.D. values and significant test between male healthy control v/s male chronic renal failures

S. No.	Parameters	Healthy control group (20) mean±S.D.	Chronic renal failure (20) mean±S.D.	P-values
Biochemical				
1.	Protein (mg/dl)	6.68±0.30	6.26±0.12	P<0.001
2.	Creatinine (mg/dl)	0.94±0.144	3.47±1.22	P<0.001
3.	Urea (mg/dl)	24.15±5.122	63.5±9.02	P<0.001
Electrolytes				
4.	Sodium (m/Eq./L.)	139.49±2.45	123.95±2.96	P<0.001
5.	Potassium (m/Eq./L.)	4.4±0.49	6.7±0.57	P<0.001
Antioxidants				
6.	Supeoxidse dismutase (EU/gm protein/ml)	11.08±0.50	8.65±0.50	P<0.001
7.	Glutahione reductase (EU/gm protein)	19.32±0.61	16.85±0.55	P<0.001
8.	Glutathione perodixase (EU/gm Hb%)	8.5±0.48	6.87±0.43	P<0.001
9.	Catalase (EU/mg protein/ml)	5.88±0.47	3.85±0.39	P<0.001
Oxidant product				
10.	Malondialdehyde (nano mol/ml)	3.22±0.47	5.62±0.85	P<0.001

P<0.001; (Highly significant)

Table 2: Mean ± S.D. values and significant test between male healthy control v/s male chronic renal failures with hypertension

S. No.	Parameters	Healthy control group (20) mean±S.D.	Chronic renal failure (20) mean±S.D.	P-values
Biochemical				
1.	Protein (mg/dl)	7.17±0.30	6.44±0.16	P<0.001
2.	Creatinine (mg/dl)	0.91±0.144	3.09±1.01	P<0.001
3.	Urea (mg/dl)	24.15±5.122	58.25±6.67	P<0.001
Electrolytes				
4.	Sodium (m/Eq./L.)	139.49±2.45	111.65±10.7	P<0.001
5.	Potassium (m/Eq./L.)	4.4±0.49	6.6±0.56	P<0.001
Antioxidants				
6.	Supeoxidse dismutase (EU/gm protein/ml)	11.08±0.50	8.8±0.32	P<0.001
7.	Glutahione reductase (EU/gm protein)	19.32±0.61	16.79±0.40	P<0.001
8.	Glutathione perodixase (EU/gm Hb%)	8.5±0.48	6.76±0.30	P<0.001
9.	Catalase (EU/mg protein/ml)	5.88±0.47	3.71±0.24	P<0.001
Oxidant product				
10.	Malondialdehyde (nano mol/ml)	3.22±0.47	5.44±0.52	P<0.001

P<0.001; (Highly significant)

C.D., *et al* method (1983), Horn H.D. (1963), Hafeman D.G. (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.

RESULTS

- Table number 1 and 2 are showing levels of parameters in chronic renal failure and chronic renal failure with hypertensive patients and age matched male healthy control group.
- We observed; Increased levels of serum creatinine, urea, potassium ions, and plasma malondialdehye were found to be highly significant ($p<0.001$) in chronic renal failure and chronic renal failure with hypertension as compared to healghy male control group.
- Other biochemical parameters such as serum protein, sodium ions, 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 hypertensive patients when compared to age matched male healthy control group.

DISCUSSIONS

Hypertension in common in individuals with renal disease. The prevalence of hypertension varies with the causes of the underlying renal disease[8]. Hypertension is associated with higher prevalence of chronic renal disease[9-11]. Over the last 10 to 20 years, the study of hypertension and its sequel of the at the tissue level, as apposed to the level of whole-body physiology has become increasingly common[12]. Hypertension with renal disease may be due in large part to reduced renal blood flow and glomerular filtration rate. Prevalence of hypertension varied inversely with glomerular filtration rate in chronic renal failure[13] and hypertensive subjects exhibited increased renal vacuolar resistance[14]. Increased oxidative stress and inflammation manifest in chronic renal failure[15-16].

Patients with history of chronic renal failure and chronic renal failure with hypertension, the serum creatinine, urea, potassium ions and plasm malondialdehye levels were found increased[17-19]. In the present study, the results were found to be same i.e. hyperkalemia, and increased creatinine, urea and plasm malondialdehyde levels. Chronic renal failure and chronic renal failure with hypertension are characterized by decreased[19-20] sodium ions, protein, superoxide dismutase, glutathione reductase, glutathione peroxidase and catalase. In the present study, all the above stated 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 same of the parameters on one side, and decreased in some others on the other hand.

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