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SERUM CREATININE LEVEL IN HYPERTENSIVE PATIENTS: A STUDY FROM UTTARAKHAND, INDIA

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ABSTRACT: Chronic Kidney diseases are increasingly recognized as a problem worldwide. Incidence of chronic kidney diseases is doubled in last fifteen years. The kidney is both cause and victim of hypertension. Hypertension is a serious risk factor for chronic kidney disease. The purpose of this study was to measure serum creatinine level in hypertensive patients as an indicator of kidney functioning and compared it with normal healthy controls. This study was carried out in Shanti Prapann Sharma Government Hospital, Rishikesh. In present study, the volunteers were selected from General Medicine department of Government hospital Rishikesh from May 2009 to May 2010. A total of 120 volunteers were recruited for this study. Out of them 70 were hypertensive subjects (38 males and 32 females) and 50 were normotensive subjects (27 males and 23 females). Hypertension was defined as per the recommendations of JNC7th Report. After 12 hours fast the blood samples were collected with the help of trained laboratory technician from all individuals without anticoagulant and centrifuged at 3000 rpm for 5 minutes. The serum was collected in fresh vial and standard method was followed for estimation of serum creatinine. The results conclude that the serum creatinine levels in hypertensive subjects were higher and statistically significant ($p < 0.000$).

INTRODUCTION: Chronic Kidney diseases or chronic renal diseases are increasingly recognised as a problem worldwide. Incidence of chronic kidney diseases is doubled in last fifteen years. The most common, but not only, causes of chronic kidney diseases are diabetes mellitus and hypertension ¹. Hypertension is a chronic medical condition in which the systemic arterial blood pressure is elevated ². Majority of hypertensive patients are asymptomatic and if left untreated, so many complications develop and become fatal.

It may lead to heart and kidney diseases ³. Many people with chronic kidney diseases do not realize that they have a problem until their kidney functions decreased to more than 25% of normal. Serum creatinine is a most sensitive indicator of impaired kidney functions⁴. It is a by- product of muscle energy metabolism that is filtered from the blood by the kidneys and is excreted into the urine ⁵.

Kidney diseases can readily be detectable and treatable so early diagnosis of mild chronic renal insufficiency through the determination of serum creatinine is most important for combating morbidity and mortality of hypertension. Hypertension is now found on its increasing way in urban as well as in rural areas of Uttarakhand ^{6, 7, 8}. So this study was conducted to assess the renal functions in patients of hypertension by measuring

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of serum creatinine and compared it with normal healthy controls in the study area i.e. Rishikesh, Uttarakhand, India.

MATERIALS AND METHODS:

Study Area: This study was carried out from May 2009 to May 2010 in Departments of General Medicine and Pathology of nearby Shanti Prapann Sharma Govt. Hospital in Rishikesh. The volunteers/subjects were selected from General Medicine Department of Government Hospital, Rishikesh, Uttarakhand, India. The volunteers/subjects were informed by the oral communication regarding the aim and objectives of the present study. Both written and verbal consent have been taken from each of the participant before including study.

Ethical issues: Ethical clearance was obtained from the management of Govt. Hospital, Rishikesh (U.K), India. Consent forms were given and duly filled by the volunteers/subjects to seek their permission before been sampled and only volunteers/subjects that agreed by signing the forms that were sampled for this study. Information on clinical signs of patients was obtained using verbal interviews and clinical records of volunteers/subjects.

Case Study: Two groups were included in the study as follows:

1. **Hypertensive Cases:** 70 hypertensive volunteer subjects (38 males and 32 females) with the age range of 31-78 years.

2. **Normotensive Controls:** 50 normotensive volunteer subjects (27 males and 23 females) with no history of diabetes, hypertension, cardiac or renal diseases with age range of 30-79 years.

Hypertension was defined as per the recommendations of JNC7th Report⁹. After 12 hours fast the blood samples were collected with the help of trained laboratory technician of hospital from all individuals without anticoagulant and centrifuged at 3000 rpm for 5 minutes in pathology department. The serum is collected in fresh vial and standard alkaline picrate method has been followed for the estimation of serum Creatinine¹⁰. Serum creatinine was investigated on semi-auto analyzer by using commercially available reagent kit.

Statistical Analysis: The collected data were analyzed by Statistical Package for Social Science (SPSS) Software version 16.0. All values were expressed as mean \pm S.D. Statistical significance of difference between hypertensive cases and normal healthy control groups was evaluated by using Student's t test. A p-value of < 0.05 was considered as significant.

RESULTS: Total 120 subjects comprising of 70 hypertensive cases and 50 controls were included in the present study. Measurements of blood pressure, serum creatinine were done in both the groups. The result of the study is given below as shown in **Table 1**.

TABLE 1: AGEWISE DISTRIBUTION IN CASES AND CONTROLS

Age in years	Cases		Controls	
	Male	Female	Male	Female
30-39	04	02	06	07
40-49	06	07	07	05
50-59	09	10	06	05
60-69	09	03	04	02
70-79	10	10	04	04
Total	38	32	27	23

The hypertensive cases were in the age group of 31-78 years. The mean age of hypertensive subjects was 57.11 years (SD \pm 13.48 years) whereas the controls were in the age group of 30-79 and mean

age was 50.54 years (SD \pm 14.42 years). Out of 70 cases 38 were males and 32 were females and in case of 50 controls 27 were males and 23 were females.

The blood pressure was calculated separately as systolic blood pressure and diastolic blood pressure. The mean systolic blood pressure (SBP) of hypertensive subjects was 156.57mmHg (SD ± 24.61 mm of Hg) and that of controls was 113.52 mmHg (SD ± 3.47 mm of Hg).

The mean systolic blood pressure was found to be higher in hypertensive subjects than controls (p < 0.05). Mean diastolic blood pressure (DBP) of hypertensive cases was 95.11mmHg (SD ± 7.21 mm of Hg) and that of controls was 73.66 mmHg (SD ± 3.32 mm of Hg). The mean diastolic blood pressure of hypertensive cases was found to be higher than controls (p < 0.05). The results are shown in Table 2 and Figure 1.

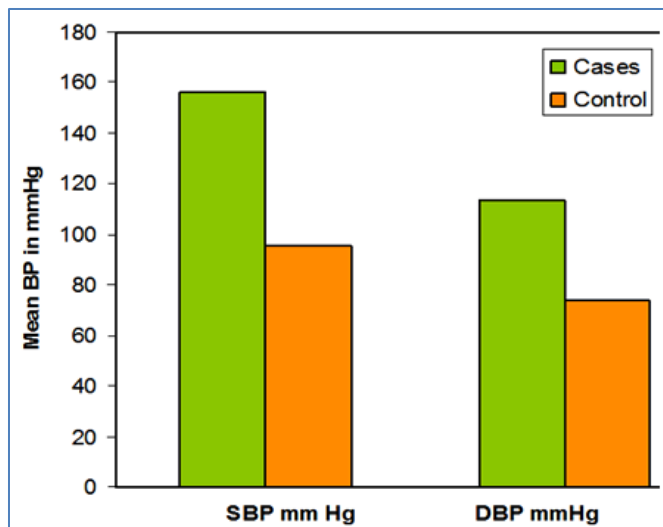


FIGURE 1: COMPARISON AND MEAN VALUES FOR SBP AND DBP BETWEEN CASES AND CONTROLS

TABLE 2: COMPARISON OF MEAN SBP AND MEAN DBP BETWEEN CASES AND CONTROLS

Variables	Cases		Control		t value
	Mean	SD	Mean	SD	
SBP(mmHg)	156.57	24.61	113.52	3.47	12.267 (S)*
DBP(mmHg)	95.11	7.21	73.66	3.32	19.594 (S)*

*(S)- statistically significant (p < 0.05)

The mean serum creatinine level of hypertensive cases was 1.13 (SD ± 0.54 mg/dl) and that of control was 0.78 (SD ± 0.12 mg/dl). The mean

serum creatinine of hypertensive cases was higher than normal healthy controls (p < 0.000). The results are shown in Table 3 and Figure 2.

TABLE 3: COMPARISON OF MEAN SERUM CREATININE BETWEEN HYPERTENSIVE CASES AND HEALTHY CONTROLS

Subjects	No. of Cases	Serum Creatinine
Hypertensive	70	1.13 ± 0.54
Healthy Controls	50	0.78 ± 0.12
Significance		p < 0.000

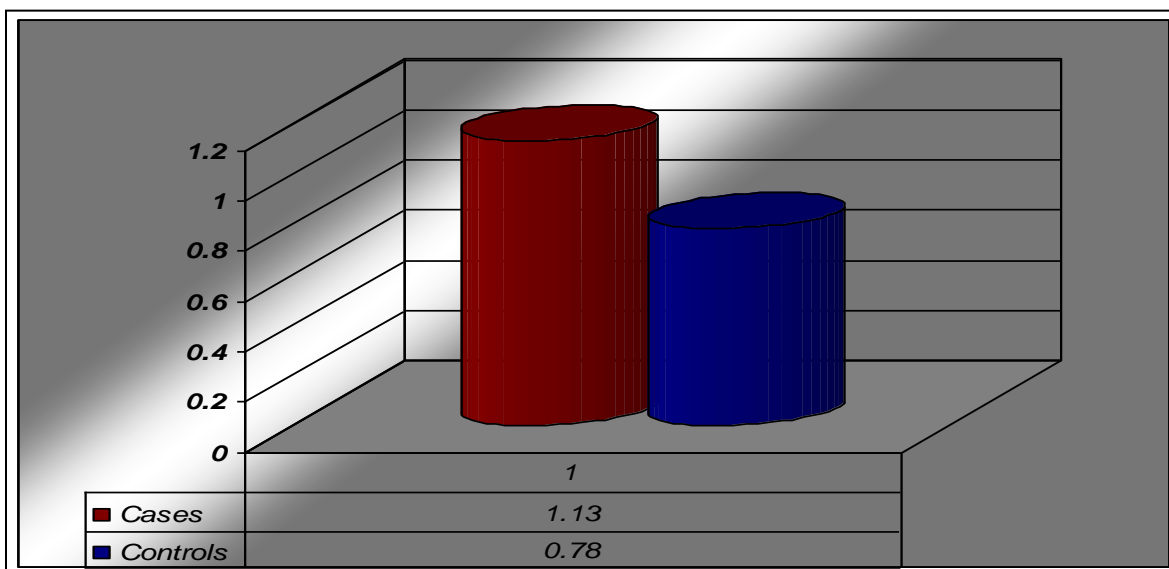


FIGURE 2: COMPARISONS OF MEAN SERUM CREATININE LEVELS IN HYPERTENSIVE CASES AND CONTROLS

DISCUSSION: Several studies worldwide have been done on serum creatinine in relation to the risk of chronic kidney disease such as chronic renal failure (CRF) and end stage renal disease (ESRD), but a few studies are in relation to hypertension have been found yet. The observations of our study are discussed as below:

In our study serum creatinine was higher in hypertensive cases than normal healthy controls i.e. 1.13 ± 0.54 mg/dl vs 0.78 ± 0.12 mg/dl, $p < 0.000$. The creatinine difference was found statistically significant. Similar findings were obtained in multiple risk factor intervention trial (MRFIT), which showed that no relationship was seen between blood pressure at baseline and serum creatinine levels, but in hypertensive patients showed greatest increase in serum creatinine over 6 years follow up¹¹.

Similarly findings of study by Nagah et al in Sudan have shown that mean values of serum creatinine was higher in hypertensive cases than normotensive controls i.e. 141.3 ± 39.0 μ mol/L vs 52.4 ± 18.0 μ mol/L and the difference was statistically significant. They found elevated serum creatinine and protein, in addition to presence of protein in urine might to be direct effect of hypertension and its related complication on renal function¹². A 9 years follow up study on 897 subjects in hypertension conducted by Rosanky et al, have shown that essential hypertensive subjects had a considerably high rate of turn down in renal function compared with normotensive subjects¹³.

The results of National Health and Nutrition Examination Survey third (NHANESIII) have shown that serum creatinine level is an indicator of chronic renal disease and was found common and strongly related to inadequate treatment of hypertension¹⁴.

A study done in Japan by Ishida and co-workers, to know the effect of high BP on renal function by estimating serum creatinine as a marker of kidney functioning and shown that high serum creatinine level are accelerated in hypertensive subjects and in those with proteinuria and especially in those in whom both are present¹⁵.

In contrast, study by Kadri *et al*, showed that serum creatinine was higher in hypertensive subjects than normotensive subjects but the differences were not statistically significant¹⁶. A study done by Wannamethee *et al*, have shown that elevated serum creatinine was found in 13.8% of hypertensive cases and in 8.6% of normotensive subjects (test of difference, $p < 0.001$). The serum creatinine levels in male hypertensive cases was higher than male normotensive control i.e. 0.95 ± 0.05 mg/dl vs 0.89 ± 0.05 mg/dl ($p = 0.396$). The difference was not found statistically insignificant¹⁷. Another study done by Sarkar and co-workers have shown that serum creatinine was higher in hypertensive cases than normotensive control group i.e. 0.86 ± 3.20 mg/dl vs 0.79 ± 4.01 mg/dl, $p = 0.990$ but the difference was not statistically significant¹⁸.

Present study shows that serum creatinine level was higher in hypertensive cases than normal healthy controls in. So it is concluded that hypertensive patients are more prone to develop elevated serum creatinine level and chronic kidney diseases. Hence to prevent the chronic kidney disease and other consequences in hypertension, it is needed to plan the estimation of serum creatinine in daily clinical practice.

LIMITATION OF THE STUDY: Small sample size was an important limitation of present study. So large scale cross sectional study may be planned for more accurate assurance.

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