



ESTIMATION OF 24 HOUR EXCRETION OF URINARY SODIUM IN HYPERTENSIVE PATIENTS DIAGNOSED RECENTLY

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ABSTRACT **Introduction:** Hypertension is more common risk factor than diabetes, dyslipidemia and smoking in the pathogenesis of cardiovascular disease. Impaired Na⁺ excretion is the predominant mechanism in pathogenesis of HTN. Blood pressure related diseases are leading causes of morbidity and mortality throughout the world. About 57% of mortality in stroke patients and 24% of mortality in coronary heart disease are due to hypertension. **Materials And Methods:** This study was conducted in patients with Hypertension in outpatient department and in General Medicine wards of Govt. General Hospital, Siddhartha Medical college, Vijayawada. It is a Prospective Analytical study with 100 People (Cases:70 and Controls:30) conducted during January-2022 to may-2022. **Results:** A total of 100 participants were included in this study as subjects. Out of these 70 cases, 26 cases fall under stage I and remaining 44 fall under stage II hypertension. The study shows that there is significantly higher Serum Sodium level between hypertensives and the controls. There is statistically significant 24 hours Urine Sodium levels in hypertensives over controls. **DISCUSSION:** Some studies found that there is a positive correlation between Sodium excretion and blood pressure, whereas others have found it to be false. In this study, Serum Sodium levels were measured in both Cases and Control Groups and it had been compared with each other along with other studies. Though the Serum sodium levels were in the desired range, the level of Serum Sodium was found to be higher in Cases compared to that of Control group. A study was carried out on arterial pressure and body content of electrolytes by Lever et al in a sample of 212 patients (91 - essential hypertension and 121 - normal control). Plasma levels of sodium was observed to be consistent with the degree of arterial pressure in the Case Group. **CONCLUSION:** There is significantly high Serum Sodium levels among hypertensives. And the level of Serum sodium was proportional to the blood pressure levels. There is a significant increase in the incidence of Hypertension among Subjects with consumption of high Sodium and low Potassium diet. Hence, it is recommended to restrict dietary Sodium and to increase intake of Potassium rich nutrients as a preventive measure for Primary Hypertension.

KEYWORDS : Hypertension, Serum Sodium, Urine Sodium.

INTRODUCTION

Blood pressure related diseases are leading causes of morbidity and mortality throughout the world. An estimated 47 percent of coronary heart disease events and 54 percent of strokes can be attributed to elevated BP. The level of BP in an individual and, more broadly, in a population reflects a combination of multiple influences, genetic factors that raise BP and others that lower BP, environmental factors (diet, weight), physiologic characteristics (eg., age), and clinical factors (eg., kidney function). Of these, diet, including sodium intake, is one of the few determinants of BP that individuals can modify. Dietary sodium reduction also blunts the age-related rise in BP. Because BP rises with age, approximately 90 percent of adults eventually become hypertensive. About 57% of mortality in stroke patients and 24% of mortality in coronary heart disease are due to hypertension (HTN). HTN, being a modifiable risk factor makes it important in the management of major cardiovascular and cerebrovascular disorders. Decrease of even 2mm Hg prevents 1.51 lakh stroke deaths and 1.53 lakh coronary heart disease deaths in India^{1,2}. Among various modifiable risk factors, hypertension is the most predominant risk factor for early cardiovascular and renal diseases. Hypertension is more common risk factor than diabetes, dyslipidemia and smoking in the pathogenesis of cardiovascular disease. Hypertension is frequently associated with Physical inactivity, obesity and excess sodium intake. The Na⁺ reabsorption and release of renin from the JG apparatus are mainly mediated by the sympathetic system³. Impaired Na⁺ excretion is the predominant mechanism in pathogenesis of HTN⁴.

MATERIALS AND METHODS

This study was conducted in patients with Hypertension in outpatient department and in General Medicine wards of Govt. General Hospital, Siddhartha Medical college, Vijayawada.

Study Design : Prospective Analytical study.

Sample Population : 100 People (Cases:70 and Controls:30)

Period Of Study : January-2022 to may-2022.

70 patients with elevated blood pressure as per JNC VIII guidelines are included and 30 Controls were randomly selected from the attendants that were accompanying cases (except siblings).

Inclusion criteria

1. Patients newly diagnosed with hypertension but not initiated with treatment.
2. Blood Pressure >140/90 mmHg on three different occasions (As per JNC VIII guidelines).
3. Patients with age more than 18 years.

Exclusion criteria:

1. Secondary hypertension patients
2. Patients with Hypertension already on treatment
3. Patients on NSAID's and diuretics.
4. Patients with malignant hypertension.
5. Patients with congestive heart failure.
6. Females on OCPs (estrogen containing pills).

RESULTS

A total of 100 participants were included in this study as subjects. Out of 100 subjects, 70 were considered cases and 30 subjects were controls. Out of these 70 cases, 26 cases fall under stage I and remaining 44 fall under stage II hypertension

The subjects considered for this study fall under the age group between 40 and 60 years. The mean age of the cases was found to be 53.7 with a standard deviation of 4.88. The mean age of the controls was found to be 51.9 with a standard deviation of 4.72.

Out of 70 cases 38 were males and 32 were females. Among 30 controls 20 were males and 10 were females. Among cases 14 males and 12 females fall under stage I hypertension and 24 males and 20 females fall under stage II hypertension.

Risk factors between Stage-I and Stage-II Hypertensives

	Smoking		Alcohol		Both	Family history	
	Yes	no	yes	No		Yes	No
stage I	10	16	4	21	4	3	23
stage II	14	30	7	38	5	9	35

There is no significant difference in the prevalence of risk factors between Stage-I and Stage-II Hypertensives.

Study on Serum sodium between Cases and Controls, Comparison of 24 hour Urine Sodium excretion between cases and controls

Serum sodium	Cases	Controls	P = 0.00001
Mean	141.80	138.96	
S.D	2.91	2.59	
Urine sodium	Cases	Controls	P=0.001
Mean	232.89	188.10	
S.D	70.15	47.04	

The above Table shows significant variation in statistics of serum sodium levels between Cases and Control. The study shows that there is significantly higher Serum Sodium level between hypertensives and the controls. The mean of Serum Sodium is statistically higher among stage II hypertensives compared to Stage I hypertensives. The principal objective of this study is to observe 24 hour Urine Sodium between Cases and Controls. There is statistically significant 24 hours Urine Sodium levels in hypertensives over controls. (P=0.001).

DISCUSSION

Several factors have been implicated in the cause of hypertension. High sodium consumption and decreased potassium intake, have been shown to contribute to the development of hypertension.⁵

The amount of sodium and potassium excreted is determined on based on consumption.

Some studies found that there is a positive correlation between Sodium excretion and blood pressure, whereas others have found it to be false.^{6,7}

In this study, Serum Sodium levels were measured in both Cases and Control Groups and it had been compared with each other along with other studies. Though the Serum sodium levels were in the desired range, the level of Serum Sodium was found to be higher in Cases compared to that of Control group.

The statistical Mean and SD of Serum Sodium levels in Cases Group was 141.80±2.91 mEq/l whereas in the group of Controls was 138.96±2.59 mEq/l (p=0.00001). The support for this study had been RA Jan, et al (2006), Srinagar(Kashmir).⁸

Their study included a total of 270 subjects out of which 135 were hypertensive patients and the other half was healthy controls of age and sex with similar range. Serum Sodium levels in Cases Group was 140±2.90 mEq/l whereas in the group of Controls was 138.50±1.12 mEq/l. Serum sodium levels were found to be elevated the group of hypertensives than that of the group of controls.

A study was carried out on arterial pressure and body content of electrolytes by Lever et al in a sample of 212 patients (91 - essential hypertension and 121 - normal control)⁹. Plasma levels of sodium was observed to be consistent with the degree of arterial pressure in the Case Group.

In study conducted by Williams et al, the relationship of total body sodium, chlorine and potassium in 30 patients was established with primary hypertension. They concluded that there exists a direct relationship between Serum Sodium levels and blood pressure among the Study Group¹⁰.

Another study conducted by Bulpitt, 2328 men and 1496 women within an age range of 35 - 64 years were monitored for elevated blood pressure and serum sodium levels were measured. It was concluded that plasma sodium levels were positively correlated to that of degree of blood pressure. And for every 1mmol/l elevation of Serum Sodium results in an increase of 1mmHg of blood pressure among Study population.¹¹

In this study the statistical mean and SD of 24 hour urine sodium levels in cases was 232.89±70.15 mEq/l and control group was 188.10 ±

47.04 mEq/l (p= 0.001). The mean and SD for 24 hour urine sodium levels in Stage-1 was 208.92±59.64 mEq/l and Stage-2 hypertensives was 247.04 ±72.64 mEq/l (p=0.027). This shows there is a positive correlation between Sodium excretion and blood pressure which is more significant in Stage-2 hypertensives.

Our study was supported by RA Jan, et al (2006), Srinagar(Kashmir). In that study the statistical mean and SD for 24-hour Urine Sodium Levels was highly elevated among hypertensives and normal subjects as determined to be 424±150.50 and 337±121.50 respectively (p < .001). This elevation was attributed to the increased intake of salt among that population (an average of 27 g/day consumption) and correlates with a studies conducted in Japan (where an average was found to be 11- 27 g/day).¹² Increased 24-hr urinary sodium levels had been established in various studies as well.^{13,14}

Study conducted by Tuomilehto et al¹⁵ conducted in eastern Finland on a total group of 234 population (148-hypertensives and 83-normotensives) where 24-hour Urine sample was collected from group undergoing the cardiovascular survey. The statistical mean 24-hour Urine Sodium levels was found to be 197 mmol in both hypertensive and normotensive men group, whereas in women group it was found to be 179 mmol and 174mmol normotensive and hypertensive respectively.

As established in our study, various other studies also support that there is statistical significance between increased 24-hour Urine sodium levels in population with elevated blood pressure.^{16,17}

There is a genetic association between Sodium and hypertension which can be extended to our study as well.¹⁸ Dietary intake of low salt has been associated with decrease in the incidence of hypertension as seen with the antihypertensive effect of thiazides due to loss of sodium and extra cellular fluid.^{19,20}

Age dependent factors such as glomerular filtration rate, renal perfusion and hemodynamics and responsiveness to RAAS as supported by Norma K Hollenberg. Age impacts the capability to preserve sodium, and hence age associated factors must be taken into consideration while interpreting the results.

As our subjects fall within the age group of 40 to 60 years, we didn't consider to study age related differences in excretion of sodium in urine. In our study, there was no significant variation in 24-hour Urine Sodium levels between males and females.

CONCLUSION

- 1) There is significantly high Serum Sodium levels among hypertensives. And the level of Serum sodium was proportional to the blood pressure levels. This observation is independent of risk factors and gender.
- 2) Dietary intake of excessive Sodium and low Potassium along with increased 24 Hour Urine Sodium levels and low 24 Hour Urine Potassium levels in Hypertensive Subjects showed significant role in the pathogenesis of Hypertension.
- 3) With increase in Body mass index, there is an increase in incidence of Hypertension. Urine Sodium excretion was found to be independent of B.M.I.
- 4) There is a significant increase in the incidence of Hypertension among Subjects with consumption of high Sodium and low Potassium diet. Hence, it is recommended to restrict dietary Sodium and to increase intake of Potassium rich nutrients as a preventive measure for Primary Hypertension.

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