

## Evaluation of Serum Sodium And Potassium Levels in Newly Diagnosed Patients of Essential Hypertension At Rims, Ranchi, Jharkhand, India

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### Abstract

**Introduction:** Essential hypertension comprise more than 90% of hypertension. It is a emerging health problem in india. Many studies have shown that a positive correlation between serum sodium and blood pressure and a negative correlation between blood pressure and serum potassium.

**Objective:** To evaluate serum sodium and potassium levels and correlate them with blood pressure in newly diagnosed patients of essential hypertension

**Method:** Data for the study was collected from twenty five newly diagnosed essential hypertensive patients attending the medicine opd/ admitted to the clinicians ward of RIMS, Ranchi, Jharkhand for the period of six month . The healthy control group comprise twentyfive healthy persons, age and sex matched to cases

**Result:** Serum sodium was higher and serum potassium was lower in cases than control group. The mean systolic and diastolic blood pressure for hypertensive patients was 160.80+- 10.88 and 100.68+- 6.72 respectively

**Conclusion:** Serum sodium was significantly more among hypertensives an it was independent of associated risk factor. Serum potassium was significantly in the range of lower limit of normal value and some how it correlated negatively with blood pressure

**Keywords:** Essential hypertension, serum potassium, serum sodium, BMI, risk factor

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### I. Introduction

Hypertension is called the “ silent killer” because, very often, it doesn’t come with warning signs or symptoms. It is a chronic condition of concern due to its role in causation of coronary heart disease ( account for 20- 50% of all death ), stroke and other vascular complication. Essential hypertension comprise more than 90% of hypertension . Globally, the overall prevalence of hypertension in adult aged 25 years and above was around 40% in 2008 [ 1 ]. In india, the prevalence of hypertension was varying from 17 to 21% in all the states with marginal rural- urban differences. Overall pattern of prevalence was found increasing with age groups in all states. It was comparatively more prevalent in executive and service categories in all the states [2]. Although our understanding of the pathophysiology of hypertension has increased in 90% to 95% Of cases, etiology is still mostly unknown cardiovascular disease account for a large proportion of all deaths and disability worldwide [3 ]. According to annual health survey report 2011- 2012 of Jharkhand, prevalence of hypertension was 789/ 1 lakh of people [ 4 ]. Worldwide, hypertension is estimated to cause 7.5 million death, about 12.8% of the total of all annual death. This account for 57 million DALYs or 3.7% of total DALYs.

In country like india, people will have a diet rich in sodium and poor in potassium. We have known for over 2000 years that an acute high dietary sodium intake in the form of a salty [ 5 ] meal, results in a temporary increase in blood pressure and is associated with several other important diseases [ 6 ]. Awareness status of hypertension in india is poor [ 7 ]. It is established fact that hypertension imposes an accelerated risk of atherogenesis. Decrease in urinary Na/ K molar ratio was strong predictor of lowering blood pressure, so decreased Na intake and increased potassium intake or both together may be effective in prevention or even treatment of hypertension [ 8 ]. Risk factor like cigarette smoking raises blood pressure, probably through induced release of catecholamines from adrenergic nerve ending. Numerous study have shown that smoker having larger waist hip ratio than non smokers [ 9 ].

So after having data of serum sodium and serum potassium, it will be helpful in proper treatment and other aspects of hypertension, which is a global concern.

## II. Materials And Methods

The work is carried out in the clinician wards of Rims, ranchi, Jharkhand in collaboration with department of biochemistry Rims between march 2017 to august 2017. A total of 50 persons ( 25 cases of hypertension and 25 controls ) are included in study.

### Inclusion criteria

1. Patients below 20 years of age.
2. Patients with renal compromise.
3. Patients with known cause of hypertension.
4. Patients with diabetes mellitus.
5. Pregnancy.
6. Females on oral contraceptives medication.
7. Patients with acute diarrheal diseases.
8. Patients on NSAID agents, antihypertensive, diauretics, beta blockers.

All the patients were subjected to detailed history taking, biochemical assessment and careful physical examination to exclude secondary hypertension. Patients body mass index and hip- waist circumference were measured. peripheral pulses like femoral and carotid were checked to detect any evidence for atherosclerosis. An ocular fundus examination was done to detect hypertensive retinopathy. Before measuring the blood pressure, patients were informed to refrain from smoking or drinking tea or coffee for at least half an hour. The blood pressure was measured using the following guidelines.

### Guidelines for blood pressure measurement:

- A. Posture:** sitting posture are usually adequate for routine follow-up. Patient should sit quietly with back supported for five minutes and arm supported at the level of heart. Patient > 65 years of age at 1<sup>st</sup> visit measure bp at 1 and 3 min after assumption of the standing position in which orthostatic hypotension may be frequent or suspected.
- B. Circumstances:** no caffeine, smoking for preceding an hour. No adrenergic exogenous like nasal decongestants.
- C. Equipment:** cuff size should encircle and cover 2/3rds of the arm length. Aneroid gauges of manometer should be calibrated every six month against mercury manometer.

Urine albumin, sugar, microscopy, and pH were done for all the subject. A twelve lead electrocardiogram and chest x ray were also taken. Overnight fasting blood glucose, urea and serum creatinine was estimated by AU480 autoanalyser. Serum sodium and potassium was estimated by direct ion selective electrode method.

## III. Result

The cases was diagnosed by the physician of RIMS and classified as following-

**Hypertension ( stage 1 )**- 140 to 150 mm Hg ( systolic ) and/ 90 to 99 mm Hg ( Diastolic )

**Hypertension ( stage 2 )**-  $\geq$  160 mm Hg ( systolic ) and/  $\geq$  100 mm Hg [ 10 ].

The controls was of healthy individuals comprising doctors, nurses, medical student, and staff of RIMS.

Body mass index was independent of gender and electrolyte status, but it was more in patients of stage 2 hypertension.

**( BMI ) Table no - 1**

BMI	Stage 1 hypertension		Stage 2 hypertension	
	NO.	%	No.	%
Underweight < 18.5		14	3	12
Normal 18.6 – 22.9		312	5	20
Overweight 23 – 24.9		28	3	12
Obese > 25		14	7	28

Alcoholism and smoking were noticed only in men in this area, so stastical analysis was not done for these risk factors, only no. of cases and controls which having addiction of these risk factor are listed here.

**Risk factor: Table no 2.**

	Alcohol		smoking		Both	Family history	
	Yes	No	Yes	No		Yes	No
Cases	9	16	10	15	6	6	19
Control	5	20	12	13	6	-	25

**Systolic and diastolic bp: Table no 3.**

Blood pressure	Cases		control	
	Mean	SD	Mean	SD
Systolic	163.80	10.88	127.80	5.51
Diastolic	100.68	6.72	79.84	7.36

Mean and standard deviation of serum sodium among cases was 145.44+/- 5.67 mmol/L while in control group it was 137.80 +/- 3.46 mmol/L respectively.

**Serum sodium levels in cases and controls: Table no 4.**

Serum sodium	Case		Control		P value
	Mean	SD	Mean	SD	
	145.44	5.67	137.80	3.46	0.945

Serum potassium in the study population varied from 3.2 to 4.8 mmol/L and in the control from 3.0 to 5.2 mmol/L. The mean and standard deviation of serum potassium in cases and controls are given below in table no 5-

Serum potassium	case		control		P value
	Mean	SD	Mean	SD	
	3.90	0.39	4.29	0.63	0.829

**P value for serum sodium and potassium:** serum level for sodium and potassium are high and low respectively, but P value are high for both, it mean that both these data are not statistically significant.

#### IV. Discussion

Hypertension is one of the leading cause of death mong adult all over the world. It remains the major risk factor for coronary, cerebral, cerebral and peripheral vascular disease [ 11 ]. Patients were studied on the basis of clinical parameters and simple biochemical investigation. Serum sodium and potassium was done for all the patients. In our region, there is excessive intake of dietary salt. But in spite of that not everyone has essential hypertension [ 12 ]. The rarity of hypertension among those consuming large amount of salt may probably be related to chronic adaptation of body system towards renal clearance of sodium. So in addition to the hereditary predisposition and high sodium intake and lower potassium intake, the renal handling of these cations also play an important role in pathogenesis of essential hypertension [ 13 ].

Salt intake was more in the tropical countries by and large in order to overcome sodium loss through sweating. In modern days the consumption of salt is more than earlier days in view of various food preparations or a combination of them, as man is tuned more to taste of the food. Such an amount of salt consumption contributes for the development of hypertension in a genetically susceptible population. In our study the mean serum sodium and potassium were estimated in the control and study groups. Results were compared with other studies.

The mean and standard deviation of serum sodium among cases was 145.44 +/- 5.67 while in control group it was 137.80 +/- 3.46 respectively. Our study was supported by Jan et al., Srinagar, Kashmir. In this study serum sodium was higher in the hypertensive group and considered to be a factor responsible for the causation or perpetuation of blood pressure [14]. Kawasaki et al. found the effect of very low sodium (10 meq/day) or a high (200 meq/day) dietary sodium intake on blood pressure in patients with essential hypertension. They found that half of the patients fed with high dietary sodium intake displayed a rise in blood pressure > 10% [15]. In our study serum potassium was estimated in control and study groups and compared between them. Serum potassium was found to be lower in the hypertensive group when compared with the control group even though both were within the normal range. The mean serum potassium in the study group was 3.90 +/- 0.39. The mean potassium in the control group was 4.29 +/- 0.63. A study was carried out by Bulpitt et al. according to those studies, a decrease in plasma potassium of 1 mmol/l was associated with an increase in systolic and diastolic blood pressure by 7/4 mm Hg in women and 4/2 mm Hg in men respectively [16].

**BMI and hypertension:** a study conducted by Huang stated that even a small amount of weight gain is associated with a marked increase in the incidence of hypertension [17]. This study showed a positive correlation between BMI and blood pressure which supported our study.

## V. Conclusion

Serum sodium was significantly more among hypertensive and also correlated positively with the level of blood pressure. Serum potassium was significantly less among hypertensive and it correlated negatively with blood pressure. Serum sodium and potassium were independent of body mass index. Changing life style have modified the food habits, making people to consume food rich in sodium but low in potassium. As a result genetically susceptible population when exposed to high sodium content coupled with low potassium in their diet, hypertension becomes overt [19].

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