

To study the levels of serum sodium and potassium in newly diagnosed essential hypertensive patients

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Abstract

Background: Essential hypertension comprises more than 90% of hypertension. Unfortunately even in developed nations like the United States, around fifty million subjects are diagnosed with hypertension. An acute high intake of sodium in the form of salty meals, leads to a temporary rise in blood pressure and is associated with several other significant diseases. The present study was conducted with the aim to study the levels of serum sodium and potassium in newly diagnosed essential hypertensive patients. **Materials and methods:** The study consisted of 100 newly diagnosed primary hypertensive patients attending the medicine OPD. Around 100 healthy people were kept as controls. Subjects below 30 years of age or subjects with any other co morbidities were excluded from the study. All the peripheral pulses were checked. The blood pressure was measured using the standard guidelines. Overnight (12 hour) fasting blood sugar, urea, serum creatinine, sodium and potassium were estimated. All the data thus obtained was arranged in a tabulated form and analysed using SPSS software. **Results:** There were 8% underweight subjects with Grade II hypertension. Overweight subjects were 6% with Grade I hypertension and 14% with Grade II hypertension. The mean systolic pressure was 174.15 ± 15.10 amongst cases and 104.23 ± 6.36 amongst the controls. The mean sodium level amongst the cases was 146.45 ± 4.55 while that amongst the controls was 169.8 ± 3.25 . **Conclusion:** Our study shows a positive correlation between hypertension and sodium levels. Hypertensive subjects had increased sodium levels.

Keywords: Hypertension, Sodium, Potassium, Overweight

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Introduction

An increased arterial pressure is the commonest public health concerns and regardless of its extensively recognized high incidence and related danger; it remains inadequately managed amongst majority of the subjects[1]. Essential hypertension comprises more than 90% of hypertension. Adequate control of hypertension remains intangible due to the asymptomatic nature of the condition for the initial 15 – 20 years even if it progressively leads to damage of the cardiovascular system[2]. Unfortunately even in developed nations like the United States, around fifty million subjects are diagnosed with hypertension. Amongst these, 70% are aware of this fact, but 50% receive the treatment and only 20% have it under control[2]. Primary hypertension is due to the combined action of internal derangements (chiefly in the kidney) and the external environment. Sodium, the main extracellular ion, has long been regarded the crucial environmental factor in this disorder[3,4]. An acute high intake of sodium in the form of salty meals[5], leads to a temporary rise in blood pressure and is associated with several other significant diseases[6]. The studies have shown that a reduced intake of sodium and increased intake of potassium or both together may be effective in prevention or even managing hypertension[7].

The present study was conducted with the aim to study the levels of serum sodium and potassium in newly diagnosed essential hypertensive patients

Materials and methods

The present prospective comparative study was conducted from Jan-2021 to Jun-2021. The study was approved by the institutional ethical board and all the subjects were informed about the study, a written consent was obtained from them in their vernacular language. The study consisted of 100 newly diagnosed primary hypertensive patients attending the medicine OPD or admitted to the medical wards and were categorised as the study group. Around 100 healthy people were kept as controls. The control group comprised of normotensive individuals that were the attendants of patients with primary hypertension living in the same environment other than their own siblings. Subjects below 30 years of age or subjects with any other co morbidities were excluded from the study. Pregnant females were also not included in the study. All the patients were subjected to detailed history taking, careful physical examination and biochemical analysis to exclude secondary hypertension. Patient's height, weight and hip and waist circumferences were measured. The body mass index was calculated using the formula $\text{Weight} / \text{Height in Meter}^2$. All the peripheral pulses were checked. The blood pressure was measured using the standard guidelines. Urine albumin, sugar, microscopy and pH was done for all the subjects. A twelve lead electrocardiogram and chest x ray were also taken. Overnight (12 hour) fasting blood sugar, urea, serum creatinine, sodium and potassium were estimated. All the data thus obtained was arranged in a tabulated form and analysed using SPSS software. Unpaired 't' test, Fisher's Exact test, and TWO

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way ANOVA test was done for analysis. P value of less than 0.05 was considered significant.

Results

Table 1 shows the BMI distribution amongst the subjects. There were 8% underweight subjects with Grade II hypertension. There were 8%

subjects with Grade I hypertension and 30% subjects with Grade II hypertension that had Normal weight. Overweight subjects were 6% with Grade I hypertension and 14% with Grade II hypertension. There were 30% subjects with Grade II hypertension that were obese.

Table 1: BMI distribution amongst the subjects

BMI	Grade I hypertension	Grade II Hypertension
Underweight <18.5	0	16(8%)
Normal 18.6 – 22.9	16 (8%)	60 (30%)
Overweight 23 – 24.9	12 (6%)	28(14%)
Obese >25	8(4%)	60(30%)

Table 2 shows the mean blood pressure amongst the cases and controls. The mean systolic pressure was 174.15 ± 15.10 amongst cases and 104.23 ± 6.36 amongst the controls. The mean Diastolic pressure was 104.29 ± 5.07 amongst cases and 72.6 ± 4.25 amongst the controls.

Table 2: Distribution of blood pressure

BP	Cases	Controls
Systolic Pressure	174.15 ± 15.10	104.23 ± 6.36
Diastolic Pressure	104.29 ± 5.07	72.6 ± 4.25

Table 3 shows the Levels of Sodium and Potassium amongst the subjects. The mean sodium level amongst the cases was 146.45 ± 4.55 while that amongst the controls was 169.8 ± 3.25 . There was a significant difference amongst the cases and controls as the p value was less than 0.05. The mean potassium level amongst the cases was 4.02 ± 0.42 while that amongst the controls was 4.30 ± 0.31 . There was no significant difference amongst the cases and controls as the p value was more than 0.05.

Table 3: Levels of Sodium and Potassium amongst the subjects

Ion level	Case	Control	P value
Sodium	146.45 ± 4.55	169.8 ± 3.25	<0.05
Potassium	4.02 ± 0.42	4.30 ± 0.31	>0.05

Discussion

Hypertension is called the “silent killer” because, very often, it doesn’t come with warning signs or symptoms. In countries like India, people usually consume a diet rich in sodium and less in potassium. Hypertension is the commonly observed cardiovascular condition in almost 25% of adults and increases in prevalence with advancing age. It is the prime risk factor for coronary, cerebral and peripheral vascular diseases[8]. In addition to the transmissible predisposition and increased sodium intake and decreased potassium intake, the renal management of these ions also play a crucial role in the pathogenesis of primary hypertension[9]. Studies have shown that a decreased intake of sodium and increased potassium intake or both together may be effective in prevention or even treatment of hypertension[7]. In our study, the mean sodium level amongst the cases was 146.45 ± 4.55 while that amongst the controls was 169.8 ± 3.25 . There was a significant difference amongst the cases and controls as the p value was less than 0.05. The mean potassium level amongst the cases was 4.02 ± 0.42 while that amongst the controls was 4.30 ± 0.31 . There was no significant difference amongst the cases and controls as the p value was more than 0.05. In a study by Priyanka et al,[7] serum sodium was higher and serum potassium was lower in hypertensive group respectively than in the control group and mean and standard deviation were 146.9 ± 4.58 and 3.77 ± 0.36 respectively in hypertensive group. Serum sodium was significantly more among hypertensive group and correlated positively with blood pressure unlike serum potassium which was lower and correlated negatively with blood pressure. In our study, there were 8% underweight subjects with Grade II hypertension. There were 8% subjects with Grade I hypertension and 30% subjects with Grade II hypertension that had Normal weight. Overweight subjects were 6% with Grade I hypertension and 14% with Grade II hypertension. There were 30% subjects with Grade II hypertension that were obese. The blood pressure also correlated positively with serum sodium; body mass index and waist circumference where as negatively correlated with serum potassium. Body mass index was significantly more in those with stage II hypertension. However it was independent of gender and electrolyte status[10]. Study by Kumar A et al, the mean

systolic and diastolic blood pressure for hypertensive patients was 160.80 ± 10.88 and 100.68 ± 6.72 respectively. Serum sodium was significantly more among hypertensives and was independent risk factor. Serum potassium was significantly in the range of lower limit of normal value and somehow it correlated negatively with blood pressure[11]. Changes in lifestyle is the major factor that is responsible of the increase in the incidence of hypertension[12]. When genetic susceptibility combined with lifestyle alterations impacts an individual, it results in hypertension.

Conclusion

Essential hypertension is a major risk factor for cerebral and cardiovascular disease. The etiology of essential hypertension is still not clearly understood. Our study shows a positive correlation between hypertension and sodium levels. Hypertensive subjects had increased sodium levels.

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