

Relationship of Serum Sodium and Potassium Level in Newly Diagnosed Hypertension Patients

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Abstract

Introduction: Hypertension (HTN) is one of the most common worldwide diseases afflicting humans and is one of the leading causes of mortality and morbidity among adults worldwide. HTN remains the prime risk factor for cerebral, coronary, and peripheral vascular diseases.

Aim: This study aims to study the serum sodium and potassium level in newly diagnosed hypertensive according to stages of HTN.

Materials and Methods: Sixty newly diagnosed patients were included in the study; they were divided into two groups according to stages of HTN. Serum sodium and potassium levels are measure and analyzed.

Results: In 60 patients, 60% of patients were diagnosed as Stage 1 HTN and 40% as Stage 2 HTN. The mean serum sodium level of Stage 1 HTN patients was 136.48 ± 12.26 and Stage 2 HTN patients was 146.21 ± 11.24 mmol/L. The mean potassium level of Stage 1 HTN patients was 3.82 ± 1.64 and Stage 2 HTN patients was 4.12 ± 1.23 mmol/L.

Conclusion: Serum sodium was much higher in hypertensives, and it also had a favorable relationship with blood pressure (BP). Serum potassium levels were considerably lower in hypertensives, and it was negatively associated with BP.

Key words: Newly diagnosed hypertension, Serum potassium, Serum sodium

INTRODUCTION

Hypertension (HTN) is a significant risk factor for cardiovascular disease (CVD) and represents a worldwide public health challenge. Known risk factors for HTN include genetic and environmental factors, such as family history, age, unhealthy diet, overweight, reduced physical activity, and excess alcohol intake.^[1,2]

In an analysis of worldwide data for the global burden of HTN, 20.6% of Indian men and 20.9% of Indian women were suffering from HTN in 2005.^[3] The rates for HTN in percentage are projected to go up to 22.9 and 23.6 for Indian men and women, respectively, by 2025.^[3] Recent studies from India have shown the prevalence of HTN as 25% in urban and 10% rural people in India.^[4] According to the World Health

Organization 2008 estimates, the prevalence of raised blood pressure (BP) in Indians was 32.5% (33.2% in men and 31.7% in women).^[5] However, only about 25.6% of treated patients had their BP under control in a multicenter study from India on awareness, treatment, and adequacy of control of HTN.^[6]

Known risk factors for HTN include genetic and environmental factors, such as family history, age, unhealthy diet, overweight, reduced physical activity, and excess alcohol intake.^[1] Although the previous studies have shown that inadequate intake of potassium or excess sodium intake may elevate BP, the associations between dietary potassium and sodium and BP in normotensive participants remain unclear.

In a 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 meal results in a temporary increase in BP and is associated with several other important diseases.

Aim

This study aims to study the serum sodium and potassium level in newly diagnosed hypertensive according to stages of HTN.

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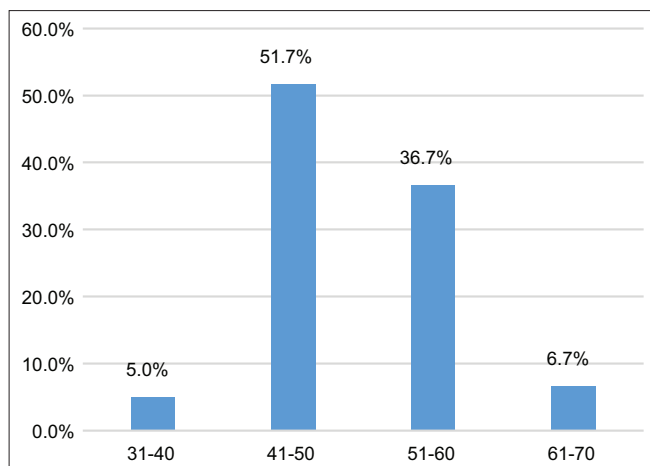


Figure 1: Age group distribution

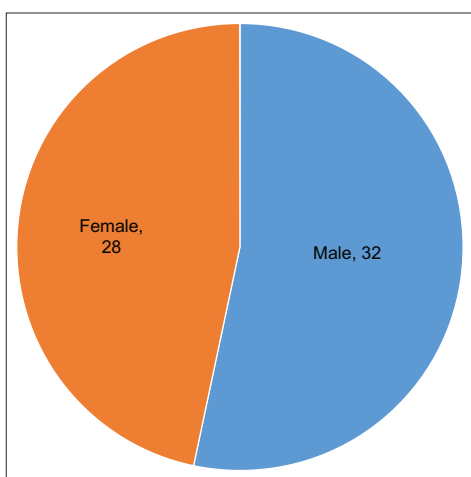


Figure 2: Gender distribution

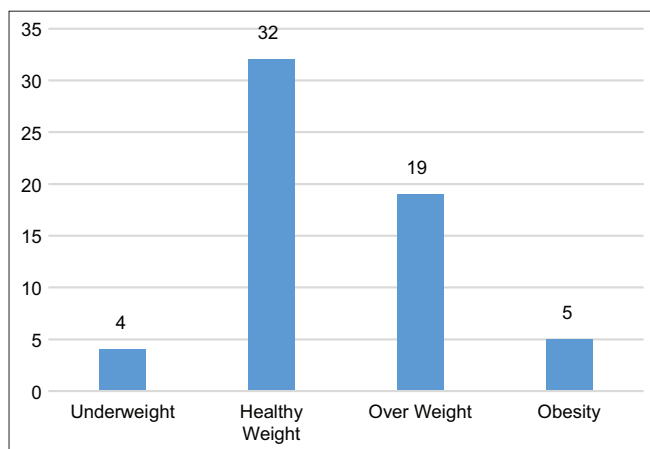


Figure 3: Body mass index distribution

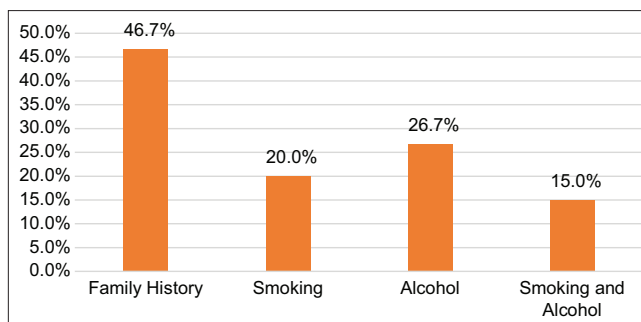


Figure 4: Risk factors distribution

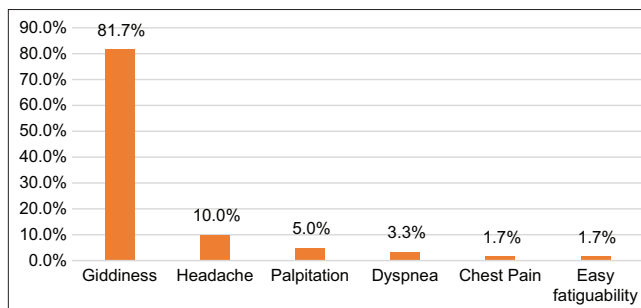


Figure 5: Symptoms distribution

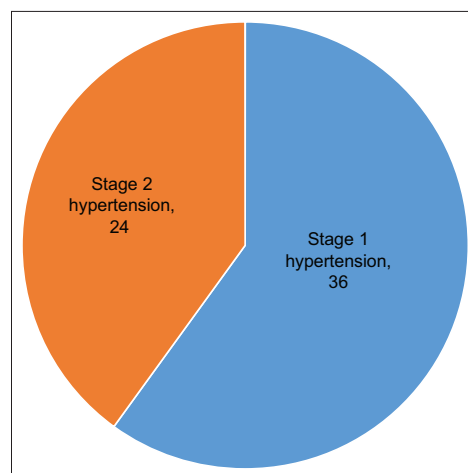


Figure 6: Stage of hypertension distribution

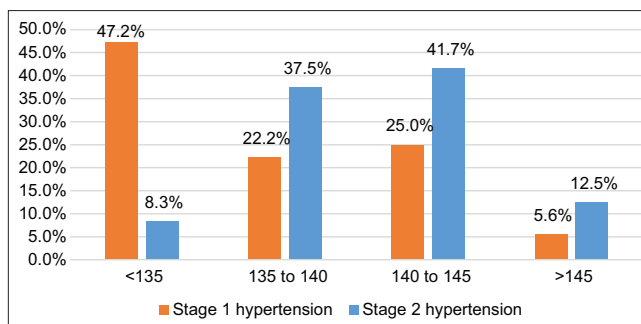


Figure 7: Serum sodium level distribution

MATERIALS AND METHODS

This cross-sectional study was conducted in the Department of Internal Medicine, Government Medical College Hospital, Virudhunagar, from January 2019 to

December 2019 in patients with newly diagnosed HTN. Inclusion Criteria: Patients with newly diagnosed HTN and

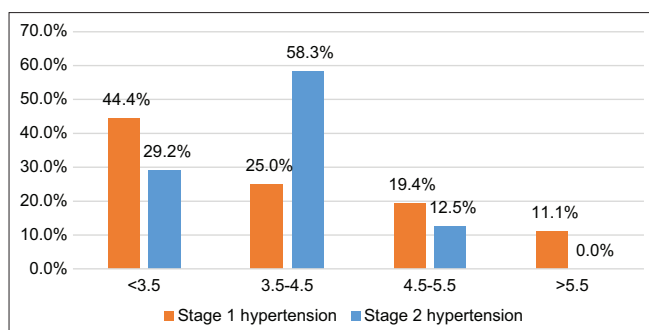


Figure 8: Serum potassium level distribution

patients above 18 years of age, both males and females, BP $\geq 140/90$ mmHg (According to JNC 8) were included in the study. Exclusion criteria: Patients with drug-induced sodium and potassium imbalance and with any comorbid were excluded from the study. A detailed history of the patient was taken regarding the symptoms, duration of symptoms. The body mass index (BMI) was calculated using the formula Weight/Height in m^2 . Patients were informed to refrain from smoking or drinking tea or coffee for at least 30 min before measuring BP. Optimal BP was defined as a mean systolic BP <120 mmHg and a mean diastolic BP <80 mmHg. Normal BP was defined as a mean systolic BP of 120–129 mmHg and mean diastolic BP of 80–84 mmHg. Pre-HTN was defined as a mean systolic BP of 130–139 mmHg and mean diastolic BP of 85–89 mmHg. Serum potassium and sodium levels were measured in the institute laboratory. Data collected were analyzed by appropriate statistical methods.

RESULTS

In this study, 60 patients were included, the average age of the patients was 54.26 years [Figure 1]. The majority of the patient in the study was male, 53.3% [Figure 2]. The mean BMI in the study patient was 24.5 ± 2.91 , the maximum number of patients was in the healthy weight group [Figure 3]. About 46.7% of patients had a family history of HTN, 28% of male patients had both smoking and drinking alcohol habits [Figure 4]. About 81.7% of patients have giddiness followed by headache and palpitation symptoms [Figure 5]. About 60% of patients were diagnosed as Stage 1 HTN and 40% as Stage 2 HTN [Figure 6]. The mean serum sodium level of Stage 1 HTN patients was 136.48 ± 12.26 and Stage 2 HTN patients was 146.21 ± 11.24 mmol/L. There is a statistically significant difference in serum sodium level between Stage 1 HTN and Stage 2 HTN patients ($P = 0.017$) [Figure 7]. The mean potassium level of Stage 1 HTN patients was 3.82 ± 1.64 and Stage 2 HTN patients was 4.12 ± 1.23 mmol/L. There is a statistically significant difference in serum potassium

level between Stage 1 HTN and Stage 2 HTN patients ($P = 0.043$) [Figure 8].

DISCUSSION

HTN is the cause of 50% of incidences of CVDs worldwide.^[7] Several factors were affecting the development of BP, including high salt intake, low K⁺ intake, obesity, lack of exercise, and excess alcohol intake. In this article, we studied the effect of serum Na⁺ and K⁺ on the development of HTN.

Several mechanisms exist by which sodium and potassium can influence BP, and evidence indicates that the interaction between these ions plays an essential role in developing HTN. Some studies have indicated that the combined effects of low sodium and high potassium intakes on BPs, HTN, and related factors may be larger than the effects of either sodium or potassium alone.^[8] A study by Kesteloot and Joossens revealed that serum potassium and sodium levels were negatively related to BP.^[9] Increased dietary intake of potassium and sodium may subsequently increase potassium and sodium levels in the blood.^[10,11] Some studies have suggested that the ratio of sodium to potassium is more important than either electrolyte alone, however, other studies have found a positive correlation between the sodium-potassium ratio and BP.^[12]

Kawasaki *et al.* found the effect of very low sodium (10 mEq/day) or a high (200 mEq/day) dietary sodium intake on BP in patients with essential HTN. They found that half of the patients fed with high dietary sodium intake displayed a rise in BP $>10\%$.^[13]

In a study was carried out by Bulpitt *et al.* (1981), according to them, decreasing plasma potassium 1 mmol/L was associated with an increase in systolic and diastolic BP by 7/4 mmHg in women and 4/2 mmHg in men, respectively.^[14]

CONCLUSION

Serum sodium was much higher in hypertensives, and it also had a favorable relationship with BP. On the other hand, serum potassium levels were considerably lower in hypertensives, negatively associated with BP.

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Anbuvel: Sodium and Potassium Level in Newly Diagnosed HTN Patients

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