



Serum Sodium And Potassium in Newly Diagnosed Essential Hypertensives

Aravind C

Associate Professor, Department of General Medicine, Sri Lakshmi Narayana Institute of Medical Sciences (Affiliated to Bharath University, Chennai), Osudu, Pondicherry

*** Arul Murugan S**

Asistant Professor, Department of General Medicine, Sri Lakshmi Narayana Institute of Medical Sciences (Affiliated to Bharath University, Chennai), Osudu, Pondicherry * Correspondence Author

Chaitanya

Senior Resident, Department of General Medicine, Kakatiya Medical College, Waranagal

ABSTRACT

Background

Essential hypertension is the major risk factor for cerebral, coronary and renal vascular diseases. Etiology for essential hypertension is not known. Many theories were postulated. The present study attempts to focus the serum sodium and potassium level among isolated newly diagnosed essential hypertensives that were free from any other illnesses or under any medication and to correlate electrolyte status with the blood pressure.

Methodology

Seventy newly diagnosed essential hypertensive patients attending the medicine OPD or admitted to the medical wards of Sri Lakshmi Narayana Institute of Medical Sciences for the period of three months from august 2015 to October 2015 were studied. Thirty healthy people were kept as controls. This control group comprised of normotensive individuals who were attendants of patients with primary hypertension living in the same environment other than their own siblings. Fasting serum sodium and potassium were estimated (flame photometer) in seventy hypertensives (m=38, f=32; mean age 53.1 ± 5.37) and thirty healthy controls (m=20 f=10; mean age 51.5 ± 5.38). Efforts were also made to find out an association between body mass index and waist circumference with systolic and diastolic blood pressure.

Conclusion

Mean serum sodium level was elevated significantly among hypertensives where as serum potassium level was significantly lower among them when compared to healthy controls. 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. Changing life styles 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.

KEYWORDS

Hyper tension, Body Mass Index, Renal failure, Myocardial infarction

INTRODUCTION

Essential hypertension is the major risk factor for coronary, cerebral and renal vascular diseases. Etiology for essential hypertension is not known. Many theories were postulated^(1,2). The present study attempts to focus the serum sodium and potassium level among isolated newly diagnosed essential hypertensives that were free from any other illnesses or under any medication and to correlate electrolyte status with the blood pressure^(3,4).

Hypertension is one of the most common worldwide diseases afflicting humans and is one of the leading causes of mortality and morbidity among adults worldwide. Hypertension still remains the prime risk factor for cerebral, coronary and peripheral vascular diseases. Essential hypertension constitutes more than 90% of hypertension⁽⁵⁾.

Hypertension also presents as an incidental finding because of which is frequently sub optimally managed or sometimes even ignored. Although substantial progress has been made in the awareness, prevention and treatment of Cardiovascular diseases in the last decade, hypertension is usually underestimated and undiagnosed time and again⁽⁶⁾.

The problem of hypertension is an emerging health issue in India. When most of the people get to know that they are suffering from hypertension, they already have advanced into a stage with target organ damage, a fatal stroke or end stage renal failure or a myocardial infarction⁽⁷⁾.

Our distant ancestors had ingested a low sodium, high potassium diet⁽⁸⁾ and consequently our kidneys are adapted to conserve sodium and excrete potassium⁽⁹⁾.

In countries like India, people usually consume a diet rich in sodium and less in potassium. We are familiar that an acute high dietary intake of sodium in the form of a salty⁽¹⁰⁾ meal, causes a temporary rise in blood pressure and is usually associated with several other significant diseases⁽¹¹⁾. In developed countries, diets are usually rich in sodium, essentially due to the salt added to manufactured foods and low in sources of potassium such as fruits and vegetables.

Numerous research studies have proved that a positive relationship exists between serum sodium levels and blood pressure and a negative relationship between serum potassium levels and blood pressure. Also a reduced intake of sodium and greater intake of potassium or both concomitantly may

be successful in prevention or even in treatment of hypertension.

Separate data on serum sodium and serum potassium levels amongst Indian hypertensives were limited and therefore the present study was carried out.

MATERIALS AND METHODS

Methods

Thirty newly diagnosed essential hypertensive patients attending the medicine OPD or admitted to the medical wards of Sri Lakshmi Narayana Institute of Medical Sciences for the period of three months from august 2015 to October 2015 were studied. Thirty healthy people were taken as controls and the group consisted of normotensive individuals who were attendants of patients with primary hypertension living in the same environment other than their own siblings.

Inclusion Criteria

- Patients above 20 years
- Males and females
- Patients with essential hypertension

Exclusion Criteria

- Patients less than 20 years
- Diabetes mellitus
- Renal failure
- Pregnancy
- Females on oral contraceptive pills
- Secondary hypertension
- Patients on anti hypertensives
- Patients on non-steroidal anti-inflammatory drugs

Investigations

- Patient's height and weight
- Body Mass Index (BMI)
- Serum sodium and potassium levels
- Blood urea & serum creatinine levels
- Random blood sugar
- Urine microscopy, albumin, sugar
- Chest X-ray
- 12 lead electrocardiogram
- Fundus examination

All the patients were subjected to detailed history taking, thorough physical examination and biochemical tests done to rule out cases of secondary hypertension. Patient's height and weight were measured and the body mass index was calculated.

Patients were asked to desist from smoking or consuming coffee or tea for at least thirty minutes before measuring blood pressure and adrenergic drugs like phenylephrine in nasal decongestants or in eye drops for papillary dilation were to be avoided.

Fasting serum sodium and potassium were estimated (flame photometer) in seventy hypertensives (m=38, f=32; mean age 53.1 ± 5.37) and thirty healthy controls (m=35 f=35; mean age 51.5 ± 5.38). Efforts were also made to find out an association between body mass index and waist circumference with systolic and diastolic blood pressure.

The proposed classification of weight by BMI in Asian adults is that a BMI <18.5 classified as underweight, 18.5 – 22.9 as normal, ≥ 23 as overweight and ≥ 25 as obese.

Statistical Analysis:

The data was entered in Microsoft excel and analyzed statistically. Student 't' tests were applied for significance and considered significant if 'p' value was below 0.05.

RESULTS

Mean BMI in the hypertensive group is 27.73 ± 3.28 and in the control group is 22.36 ± 2.12 and thus a significant differ-

ence exists in BMI between cases and control group.

Table 1: BMI with respect to grade of hypertension

| BMI | Grade I Hypertension | Grade II Hypertension |
|-----------|----------------------|-----------------------|
| <18.5 | 2 | 1 |
| 18.5-22.9 | 1 | 4 |
| 23-24.9 | 3 | 5 |
| >25 | 6 | 8 |
| Total | 12 | 18 |

There was no statistically significant difference in BMI among Grade I and Grade II hypertensives.

Table 2: Serum sodium levels in males and females with Grade I and Grade II hypertension.

| Hypertension | Males | | Females | |
|--------------|--------|------|---------|------|
| | Mean | S.D. | Mean | S.D. |
| Grade I | 142.23 | 4.17 | 143.97 | 5.68 |
| Grade II | 144.12 | 5.68 | 142.76 | 6.48 |

Serum sodium levels in grade II hypertensive males was 144.12 ± 5.68 and in females, it was 142.76 ± 6.48 . Although serum sodium levels were found to be high in males compared to females, it was not statistically significant

Table 3: Serum potassium levels in males and females with grade I and grade II hypertension

| Hypertension | Males | | Females | |
|--------------|-------|------|---------|------|
| | Mean | S.D. | Mean | S.D. |
| Grade I | 3.76 | 0.42 | 3.88 | 0.68 |
| Grade II | 3.89 | 0.30 | 3.84 | 0.38 |

Serum potassium levels in grade I hypertensive males was found to be 3.76 ± 0.42 and in females was 3.88 ± 0.68 . Serum potassium levels in grade II hypertensive males was 3.78 ± 0.37 and in females was 3.81 ± 0.41 . Though there exists a difference between the two groups, it was not statistically significant.

Table 4: Serum sodium and potassium levels with respect to Grade of hypertension

| Grade of Hypertension | Serum Sodium | Serum Potassium |
|-----------------------|--------------|-----------------|
| Grade I | 142.4 | 3.72 |
| Grade II | 142.5 | 3.80 |

Mean serum sodium level in grade I hypertension is 142.4 ± 5.93 and in grade II hypertension is 142.5 ± 6.61 and is not statistically significant. Mean serum potassium in grade I hypertension is 3.72 ± 0.32 and in grade II hypertension is 3.80 ± 0.38 and is not statistically significant

DISCUSSION

Hypertension is one of the major causes of mortality and morbidity among adults worldwide. Hypertension is the most frequent form of cardiovascular disease found in nearly 25% of adults and its prevalence increases with age. It still remains the major risk factor for cerebral, coronary and peripheral vascular disease. Essential hypertension consists more than 90% of hypertension case population⁽⁵⁾. Patients were studied on the basis of clinical parameters and simple biochemical investigations. Serum sodium and potassium levels were estimated for all the cases and controls in the present study.

Serum sodium levels among Hypertensive patients

In India, there is more intake of dietary salt. But not everyone has essential hypertension. The less prevalence of hypertension among those taking large quantity of salt may be related to chronic adaptation of body towards clearance of sodium by the kidneys and this part requires further molecular studies. In addition to hereditary predisposition and high dietary sodium intake and lower potassium intake, the handling of these salts by the kidneys play a significant role in the pathogenesis of essential hypertension⁽¹²⁻¹⁴⁾.

Salt intake was more in the tropical countries to overcome sodium loss through sweating. The consumption of salt now

is more than earlier days. People consume more than actually required amount of salt (2 vs. 8-10 g/day/person) which contributes to the develop hypertension in a genetically susceptible population.

In the present study, the mean serum sodium level was estimated in the control and study groups. Results were compared with that of other studies. Serum sodium was found to be more in the hypertensive group than in the controls though both were within the normal range. Our study was supported by Jan et al., Srinagar, Kashmir, in which 135 hypertension patients and equal number of healthy controls were taken for the study. Serum sodium was higher in the hypertensive group than the control group and considered to be a factor responsible for the causation or perpetuation of blood pressure⁽¹⁵⁾. In the Dietary Approaches to Stop Hypertension (DASH) trial, 412 patients with mild-moderate hypertension (range 120–159/80–95 mm Hg) were randomized to the DASH diet (which is rich in vegetables, fruits, and low-fat dairy products) or control diet⁽¹⁶⁾. Each group received increasing dietary sodium levels (50, 100, 150 mmol/24-hr) for 30 days in a crossover design. Compared with the control diet during high dietary sodium intake, the DASH diet and low dietary sodium intake lowered systolic BP by 11.5 mm Hg in those with hypertension (12.6 mm Hg for blacks; 9.5 mm Hg for others). Kawasaki et al, found that 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 and that half of the patients fed with high dietary sodium intake showed an increase in blood pressure by more than 10%⁽¹⁷⁾.

Serum potassium levels among Hypertensive patients.

In the present study, serum potassium levels were estimated in control group and hypertensive group. Serum potassium was found to be lower in the study group when compared with the control group though both were within the normal range. The mean serum potassium in the study

In a study done by Bulpitt et al., among 2328 men and 1496 women in the age group of 35 and 64 years screened for hypertension, their plasma sodium and potassium concentrations were measured. Those patients on antihypertensives or diuretics were excluded from the study. After adjusting for age, BMI and other variables, plasma potassium level was found to be negatively associated with systolic and diastolic blood pressure in men and women. A drop in plasma potassium of 1 mmol/l was associated with a rise in systolic blood pressure in women of 7 mmHg (p less than 0.001) and diastolic blood pressure of 4 mmHg (p less than 0.001). In men, it was 4 mmHg (p less than 0.01) and 2 mmHg (p less than 0.05)⁽¹⁸⁾

BMI and Hypertension

In the present study, the mean BMI among the study group was 27.73± 3.28 and among the control group was 22.36 ± 2.12 and found to be statistically significant which shows that overweight and obesity do play a role in the development of essential hypertension.

In a study conducted by Huanget al., it showed that even a small amount of weight gain is associated with a marked rise in the incidence of hypertension⁽¹⁹⁾. This study showed a positive correlation between BMI and blood pressure which supported the present study.

CONCLUSION

Mean serum sodium level was elevated significantly among hypertensives where as serum potassium level was significantly lower among them when compared to healthy controls. 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.

Changing life styles 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.

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