The Habitual Additional Sodium Intake among Hypertensive Patients Visiting a Tertiary Health-care Center, Indore, Madhya Pradesh

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Abstract

Background: Hypertension prevalence is related to dietary sodium chloride intake. People are consuming much more sodium than is physiologically necessary. The consumption of processed food in urban India has led to a prevalence of 24%–30% of hypertension. The people have a special liking of such type of foods. This study aimed at assessing consumption of sodium among the study subjects to compare habitual additional consumption of sodium among hypertensive and normotensive patients and to find its associate factors impacting hypertension.

Materials and Methods: The hospital based, cross-sectional study was conducted on patients attending the outpatient department of general medicine. The sample size was 520 patients. Habitual additional intake of each patient was assessed by a food frequency table.

Results: As the age advances, the proportion of hypertensive patients increases (P < 0.05). Among hypertensive patients, 38.65% were not doing exercise (P < 0.05). The body mass index >25 was found among 11.92% normotensives and among 25.38% hypertensives (P < 0.05). There were 23% of hypertensive patients who could not receive dietary advice (P < 0.05). Habitual additional sodium consumption is more among 15–25 years age group (P < 0.05). Habitual additional sodium intake mean for those who were taking a pinch of salt is higher (P < 0.05). Habitual additional sodium intake is found to be significantly impacted by younger age, diagnosis, and lack of dietary advice (P < 0.05, P < 0.05, and P < 0.05).

Conclusion: Most of the age groups are consuming more than 2 g habitual additional sodium which is more than the World Health Organization-recommended maximum levels. The dietary advice was given to hypertensives that had a positive impact on habitual additional sodium intake.

Keywords: Dietary advice, habitual additional sodium, hypertension, pinch of salt

INTRODUCTION

Hypertension is a condition in which arterial blood pressure (BP) is chronically elevated. High BP is a trait as opposed to a specific disease and represents a quantitative rather than a qualitative deviation from the norm.[11]

The probability that a middle-aged or elderly individual will develop hypertension in his or her lifetime is 90%.[2] Worldwide, raised BP is estimated to cause 7.5 million deaths, about 12.8% of the total deaths. This accounts for 3.7% of the total DALYS. Globally, the overall prevalence of raised BP in adults aged 25 years and over was around 40% in 2008.[3] Hypertension doubles the risk of cardiovascular diseases, including coronary heart disease (CHD), congestive heart failure, ischemic hemorrhagic stroke, renal failure, and peripheral arterial disease.[2] Among populations, hypertension prevalence is related to dietary sodium chloride intake, and the age-related increase in BP may be augmented by a high sodium chloride intake.[3]

Therefore, elevated sodium intake has been associated with a number of noncommunicable diseases. Populations around the world are consuming much more sodium than is physiologically necessary. The average sodium intake among adults is 3.5 g/day. The World Health...
Organization (WHO) recommends a reduction in the sodium intake, i.e. <2 g/day sodium (5 g/day) to reduce BP and the risk of cardiovascular disease, stroke, and CHD in adults (>16 years). These recommendations apply to all individuals, with or without hypertension (including pregnant and lactating women). Salt intake is more in tropical countries. In India, it averages 15 g/day. The rising trend in the consumption of processed food in India has led to a prevalence of 24%–30% in urban areas and 12%–14% in rural areas of hypertension.

Indore city in Madhya Pradesh is known for salty foods, i.e. ready to eat snacks. The people in Indore have a special liking of such types of foods in between the meals as well as along with meals. This study aimed at assessing actual fact of this consumption of sodium among the study subjects and to compare habitual additional consumption of sodium among hypertensive and normotensive patients, and in addition, to this to find the associate factors of additional sodium intake impacting hypertension.

**Materials and Methods**

**Study place**
This study was planned in the Department of Community Medicine and General Medicine of Sri Aurobindo Medical College and PG Institute, Indore, Madhya Pradesh, India.

**Study design and study period**
After obtaining clearance from the Institutional Ethics Committee, this hospital-based cross-sectional study was conducted on patients attending the outpatient department (OPD) in the department of general medicine. The investigator conducted the OPD twice in a week to collect the data which was continued for a period of 3 months. At the end of 3 months, a total of 520 study subjects were enrolled in the study.

All the patients who consented to participate in the study and fulfilled the desired prerequisites were clinically examined and were interviewed individually using a predesigned semi-structured questionnaire.

**Questionnaire**
The questionnaire consisted of two parts:
- Part I included personal information and demography and Part II consisted of a food frequency table[7]
- In Part I, all the patients were asked about their personal information and clinically examined. BP of all the patients was recorded using a calibrated sphygmomanometer (mercury). BP was taken in a sitting position in the upper arm keeping the sphygmomanometer at the heart level.

The patients were categorized as normotensive, prehypertensive, old hypertensive, and newly diagnosed hypertensive. New hypertensive patients were diagnosed as hypertensive on the day of visit to the OPD with BP systolic >140 and diastolic >90 mmHg. Old hypertensive patients were those who were already on the treatment for hypertension. Prehypertensive patients with systolic BP had 120–139 mmHg or diastolic 80–90 mmHg and normotensive patients had <120 systolic and <80 diastolic.[6]

Body mass index (BMI) was calculated using the standard formula.[8]

Part II includes a food frequency questionnaire which consists of two main components: a food list and a frequency response section. The participants were asked how often each food item was consumed. Frequency of less than once a month was not considered. For all other frequency of use, sodium consumption was estimated on daily basis. The frequency of consumption of the food items specified in the table was inquired from each participant and noted in the food frequency questionnaire, as shown in the Table 1. The total additional consumption of sodium intake by the subjects per day was calculated for each patient in milligrams accordingly.

**Data analysis**
The data were analyzed by Chi-square, ANOVA, independent t-test, and multivariate linear regression using Statistical Package for the Social Sciences (SPSS Inc. SPSS for Window, Version 20, Chicago [trial version], USA). The test was considered as statistically significant at P < 0.05.

**Results**
Of 520 patients enrolled in the study, there were 234 males and 286 females. Of the total patients, 260 were found to be hypertensive, of which 197 were old hypertensive and 63 newly diagnosed. Among hypertensive patients, those who were not doing exercise were substantial 201 and doing exercise were 59. Among normotensives, 219 were not doing exercise, but 41 were doing the exercise. This difference is found to be statistically significant (P < 0.05) and shows the importance of exercise. The BMI >25 was found among 62 normotensives and among 132 hypertensive. This is a significant finding.

| Table 1: Sodium content of the food items |
|-----------------------------------------|
| Food items                             | Sodium content (mg approximately) |
| Papad** 1 piece                        | 23** |
| Pickle 1 spoon                         | 2000** (assuming 5 g salt contains 2 g sodium) |
| Senv** 100 mg                          | 124** |
| Biscuit 2 pieces                       | 271** |
| Bread 1 piece                          | 148** |
| Samosa*** 1 piece                      | 816** |
| Additional pinch of salt               | 100** |

**Papad are typically made from lentils and sodium bicarbonate salt, Senv-made of chickpea is an Indian snack, Samosa-a triangular savory pastry fried in oil filled with potato spices, The sodium content as written on packet.
There were 13 hypertensive patients consuming more than 8 g/day additional sodium. Maximum, 117, patients were consuming 2–4 g habitual additional sodium, of which 63 were normotensives and 54 hypertensive.

The habit of taking a pinch of salt was found both among hypertensives and normotensives. There were 186 hypertensive patients (36.15%) and 193 normotensive patients (37.11%) having the habit of taking a pinch of salt during meals.

Around 27% of the hypertensive patients and 23% among normotensives had comorbidities. The dietary advice was given to 140 hypertensive patients and 16 nonhypertensive patients. There were 120 hypertensive patients who could not receive dietary advice. The difference was found to be statistically significant ($P < 0.001$). All patients should have received the dietary advice in the hospital OPD, but here, only 30% of the patients were able to receive dietary advice.

The mean values and results of ANOVA/independent $t$-test of habitual sodium intake in terms of various medicosocial factors are represented in Table 2.

The results of analysis by ANOVA revealed a significant relation or difference among age group and addition of pinch of salt with respect to habitual additional sodium intake ($P < 0.001$).

Habitual additional consumption is more among 15–25 years age group. The mean consumption of habitual additional sodium is higher among males than females but statistically insignificant. Unemployed people and unskilled workers’ mean consumption of habitual additional sodium intake is least 1479 and 1558 mg, respectively.

Habitual additional sodium intake mean for those who were taking a pinch of salt was higher. Those who were taking dietary advice consumed less sodium (1339 mg).

The mean habitual additional sodium was highest among normotensives (1688). It shows that their habit of consumption has not changed yet.

Table 3 shows multivariate linear regression analysis of various medicosocial factors which can influence habitual additional sodium intake. The variance in habitual additional sodium intake is accounted for age, diagnosis, and dietary advice.

Habitual additional sodium intake is found to be significantly impacted by younger age, by diagnosis or undiagnosed cases, and by lack of dietary advice.

**DISCUSSION**

In this study, the mean consumption of habitual additional sodium is more among younger age group. This is a known fact that this age group is a big consumer of ready to eat food.

Younger individuals are not as sodium sensitive as older individuals. During aging process, the kidneys have ability to excrete excess sodium in the urine diminishes. Therefore, more sodium is retained by the blood. As the arteries get stiff as a process of aging, the extra fluid in blood causes an increase in BP.$^{[14]}$

Among the older individuals, those who have low renin hypertension and high sympathetic activity have a greater frequency of salt-sensitive hypertension.$^{[15]}$

Normotensive (1688 mg) and old hypertensive (1594 mg) patients consume more habitual additional sodium as compared to prehypertensive and new hypertensive patients. Normotensive individuals are not disciplined for dietary salt because of unawareness. Old hypertensive individuals feel that they are already on medication, so no need to be dietary disciplined.

There is a significant impact on the diagnosis of hypertension by different amounts of sodium consumed by patients.

A study in Iran on hypertensive patients above the age of 30 years consume nearly twice the recommended dose of sodium.$^{[16]}$

Two studies in China with intervention of sodium diet show a correlation of BP with high sodium intake.$^{[17,18]}$ Multiple meta-analysis and systemic reviews of randomized controlled trials have shown a strong positive association between sodium intake and systemic BP.$^{[19]}$

According to William B et al., if BP increases during a period of high dietary sodium or declines during a period of low sodium, the individual is salt sensitive.

These all studies conclude that salt is a necessary if not sufficient cause of hypertension.$^{[15]}$

The dietary advice was given to 26.92% of the hypertensive patients in this study. Those who took the dietary advice consumed less mean habitual additional sodium (1339 mg).

However, in a study in the USA, 60.5% received dietary advice.$^{[20]}$

There is a huge difference as far as dietary advice is concerned. This can be attributed to the lack of awareness among some practitioners; however, time constraint due to long queues in the hospital OPD might be the major culprit.

The average intake of sodium by those who took the advice was (maximum allowable 2000 mg + additional intake 1339 mg) 3339 mg which was closer to the intake in a study in the USA.$^{[20]}$

In this study, maximum, 117, patients were consuming 2000–4000 mg habitual additional sodium. It means 5–10 g additional salt. If they are consuming minimum 5 g salt, then it will be 10–15 g of salt per day.$^{[21–23]}$

In this study, males are consuming 3 g of habitual additional sodium ($2 + 1.8 = 3.8$ g) and female are consuming 1.5 g of habitual additional sodium ($2 + 1.5 = 3.5$ g), i.e. 8.75–9.5 g of salt. Similarly,
it was expressed in a study in USA where the average consumption of males was 10.4 g/day and average women consumption was 7.3 g/day.\[18\]

**Conclusion and Limitations**

Most of the age groups are consuming >2 g habitual additional
sodium which is already more than the WHO-recommended maximum levels.[4]

The dietary advice was given to hypertensives that had a positive impact on habitual additional sodium intake.

This is a hospital-based study.

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Conflicts of interest
There are no conflicts of interest.

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Table 3: Various medicosocial factors influencing habitual additional sodium intake

| Variables                  | Coefficient B | P   |
|----------------------------|---------------|-----|
| Constant                   | 2385.781      | 0.00|
| Age                        | -215.752      | 0.00|
| Diagnosis                  | -313.518      | 0.01|
| Sex                        | -244.603      | 0.26|
| Associated comorbidities   | 239.971       | 0.09|
| Alcohol                    | 54.517        | 0.83|
| Exercise                   | -37.104       | 0.87|
| Dietary follow-up          | -535.92       | 0.01|
| BMI                        | -24.131       | 0.80|
| Occupation                 | -23.75        | 0.63|
| Literacy                   | 103.393       | 0.06|

BMI: Body mass index