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Association between Salt Intake and Hypertension in Adult Populations

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Abstract

Background: *Hypertension is a major contributor to cardiovascular morbidity. Excessive dietary salt intake is a modifiable risk factor for its pathogenesis. In Bangladesh, rising hypertension rates parallel the prevalence of high-salt dietary habits. This study aimed to examine the association between salt intake and hypertension in adults and to assess related knowledge, attitudes, and practices (KAP).*

Methods: *This cross-sectional observational study was conducted at the Department of Cardiology, Bangladesh Medical University (BMU), Dhaka, Bangladesh, from September 2024 to March 2025. A total of 120 adults were enrolled in the study. Data were collected from outpatient department of Cardiology. Salt intake was categorized as <5, 5–10, and >10 g/day. Blood pressure, demographic details, BMI, and KAP metrics were recorded. Statistical analysis was performed using SPSS version 25.0, and a p-value ≤ 0.05 was considered significant.*

Results: *Among the participants, 35.0% were hypertensive. The prevalence of hypertension increased with salt intake: 8.3% (<5 g/day), 27.8% (5–10 g/day), and 61.1% (>10 g/day). A significant association was found between salt intake >10 g/day and hypertension (OR = 15.4; 95% CI: 1.85–128.37; P = 0.01). Although 69.17% of participants acknowledged the health risks of salt, only 20.00% used low-sodium alternatives.*

Conclusion: *High salt intake was significantly associated with hypertension in Bangladeshi adults. Despite this awareness, salt-related practices remain suboptimal. Therefore, public health strategies are urgently needed to curb excessive salt consumption.*

Keywords: *Salt intake, Hypertension, Dietary behavior, Bangladesh, KAP.*

1. INTRODUCTION

Cardiovascular diseases and deaths are greatly influenced by hypertension, which has become a serious public health challenge. Hypertension is occurring more often all around the globe, with the World Health Organization estimating that 1.28 billion adults are affected today [1]. Lung cancer has been called the “silent killer” for not display symptoms before becoming deadly. Dietary salt intake is one of the many modifiable factors that is often studied for its link to the development of hypertension [2].

Sodium chloride, or table salt, is very important in maintaining the right amount of fluid and in vascular resistance. Eating too much salt is related to high blood pressure and a higher risk of heart disease [3]. Several epidemiological and experimental investigations have proven a relationship between consuming large quantities of salt and developing hypertension [4]. Among 32 countries and over 10,000 people, there was a direct connection seen between the average amount of salt eaten and the average systolic blood pressure [5].

In spite of efforts to reduce salt consumption from the WHO’s SHAKE package and others, many people are consuming much more than the recommended 5 grams per day [6]. Eating salty meals is very common in South Asia, which leads to many cases of hypertension [7]. According to surveys in Bangladesh, there is a significant number of adults eating more salt than what is

advised, coinciding with more cases of high blood pressure [8].

Although many studies around the world have studied this issue, there is still not enough local evidence on how salt usage is linked to hypertension among adults in Bangladesh. Factors related to culture, money and how health information is understood could cause differences in how much salt people use and notice its impact on health [9]. Getting to know these factors is important when making public health interventions and policies.

Studies done in urban South Asia have found that both hypertensive people and the general public do not always know enough about salt intake or follow good practices [10]. This research is designed to fill this knowledge gap through the investigation of both links between salt and hypertension and the understanding, opinions and habits (KAP) of salt consumption in Bangladeshi adults. It provides key information that can improve interventions and guide public health programs in places where hypertension management is insufficient. This study aims to highlight the links between what we eat and the risk of hypertension, so that information can be used in improving national health policies.

2. Objective

The objective of this study was to assess the association between dietary salt intake and hypertension among adults.

3. Methodology & Materials

This cross-sectional observational study was conducted at the Department of Cardiology, Bangladesh Medical University (BMU), Dhaka, Bangladesh, from September 2024 to March 2025. A total of 120 adult participants were included in the study. The target population comprised adults attending outpatient services for various health issues unrelated to acute illness or chronic renal disease.

3.1. Sample Selection

3.1.1. Inclusion Criteria

- Adults aged ≥18 years.
- Participants with recorded blood pressure measurements.
- Individuals who provided informed consent.
- Adults with no diagnosed secondary hypertension.

3.1.2. Exclusion Criteria

- Individuals with renal disease or electrolyte imbalance.
- Pregnant women.
- Patients on long-term corticosteroid or diuretic therapy.
- Individuals were unwilling to participate.

3.2. Data Collection Procedure

Data were collected from outpatient department of Cardiology by using a structured questionnaire. Clinical examination, and dietary assessed. Salt intake was estimated based on self-reported dietary habits using a validated food frequency questionnaire. Blood pressure was measured using a calibrated sphygmomanometer following standard protocols. Data on BMI, education, and knowledge, attitude, and practice (KAP) towards salt intake were also recorded. Informed written consent was taken from all participants. Confidentiality and anonymity were maintained throughout the study process.

3.3. Statistical Analysis

Data analysis was performed using SPSS version 25.0. Descriptive statistics were applied for frequencies and percentages. Inferential statistics included chi-square tests to compare categorical variables and binary logistic regression to determine the association between salt intake and hypertension. Odds ratios with 95% confidence intervals were calculated. A p-value ≤ 0.05 was considered statistically significant.

4. Results

Table 1. *Demographic and Clinical Characteristics of Participants (n = 120)*

Variable	Category	Frequency (n)	Percentage (%)
Age Group (years)	18–35	31	25.8
	36–50	52	43.3
	>50	37	30.8
Gender	Male	56	46.7
	Female	64	53.3
Education Level	No formal education	31	25.8
	Primary	54	45.0
	Secondary or higher	35	29.2
BMI Category	Underweight (<18.5)	12	10.0

	Normal (18.5–24.9)	60	50.0
	Overweight (25–29.9)	30	25.0
	Obese (≥30)	18	15.0
Hypertension Status	Normotensive	78	65.0
	Hypertensive	42	35.0

Table 1 presents demographic data including age, gender, education level, BMI, and hypertension status. Most participants were aged between 36 and 50 years (43.3%), followed by those above 50 (30.8%). Female participants (53.3%) slightly outnumbered males (46.7%). In terms of education, 45.0% had primary education, 25.8% had no formal education, and 29.2% had secondary or higher education. BMI distribution showed 50.0% had normal weight, 25.0% were overweight, 15.0% were obese, and 10.0% were underweight. Regarding hypertension, 35.0% of participants were hypertensive, while 65.0% were normotensive.

Table 2. *Salt Intake Levels and Hypertension Prevalence*

Salt Intake Category	Participants (n)	Percentage (%)	Hypertension Prevalence (%)
<5 g/day	12	10	8.30
5–10 g/day	72	60	27.80
>10 g/day	36	30	61.10

Table 2 shows the prevalence of hypertension by salt intake category. Among those consuming <5 g/day of salt, only 8.3% were hypertensive. In contrast, 27.8% of those consuming 5–10 g/day and 61.1% consuming >10 g/day were hypertensive. The data indicate a higher prevalence of hypertension with increased salt intake.

Table 3. *Association between Salt Intake and Hypertension*

Salt Intake Category	Hypertensive (n)	Normotensive (n)	Odds Ratio (OR)	95% Confidence Interval (CI)	p-value
<5 g/day	1	11	Reference	–	–
5–10 g/day	20	52	4.23	0.52–34.58	0.18
>10 g/day	21	15	15.4	1.85–128.37	0.01

Table 3 assesses the strength of association between salt intake and hypertension. Compared to the <5 g/day group, those consuming 5–10 g/day had an odds ratio (OR) of 4.23 (95% CI: 0.52–34.58; p = 0.18). The >10 g/day group had a significantly elevated odds ratio of 15.4 (95% CI: 1.85–128.37; p = 0.01), indicating a strong and statistically significant association between high salt intake and hypertension.

Table 4. *Knowledge, Attitude, and Practice (KAP) Regarding Salt Intake*

KAP Component	Positive Response (n)	Percentage (%)
Aware that high salt intake can lead to hypertension	83	69.17
Believe reducing salt intake is beneficial	92	76.67
Regularly avoid adding extra salt to meals	58	48.33
Use low-sodium alternatives	24	20.00

Table 4 illustrates participants' awareness and behavior related to salt consumption. About 69.17% knew that high salt intake contributes to hypertension, and 76.67% believed that reducing salt intake is beneficial. However, only 48.33% regularly avoided adding extra salt, and just 20.00% used low-sodium alternatives.

5. Discussion

The study investigated how salt intake may be related to hypertension among the patients at the tertiary hospital in Bangladesh. Results suggest that eating a lot of salt is linked to a high risk of hypertension, which agrees with findings from different regions around the world. Out of the participants, those who consumed more than 10 grams of salt daily had a much higher likelihood of hypertension, as shown by an odds ratio (OR) of 15.4, while those who consumed less than 5 grams had a much lower risk. Levine et al. reached similar conclusions to those of He and MacGregor, who pointed out that eating fewer

salt drops high blood pressure by a significant amount in at-risk populations [2]. Mozaffarian et al. reported that nearly 1.6 million people die from heart diseases every year as a result of too much sodium, and this was directly linked to hypertension [3].

Even six to ten grams of salt a day, recorded in this study, was linked to a greater risk of hypertension (4.23), but the connection was not significant ($p = 0.18$). The observations are similar to what Huang and colleagues found in a large group of Chinese people [11], showing a link between sodium intake and blood pressure. For these reasons, both individuals with high salt consumption and those in the moderate middle should be focused on as well.

The review of sociodemographic factors showed that older adults, women and people with high BMIs had a higher chance of hypertension, all of which are important in the cause. Obesity, which affected 15% of the study participants, is associated with salt-sensitive hypertension, as found by Kotchen et al. [12].

Although most people were aware of the connection between salt and high blood pressure (69.17%), only a minority avoided adding more salt (48.33%) and even fewer used less salty products (20.00%). There is a major challenge when practice does not match knowledge. In addition, Webster JL et al. noted that even where people are aware of the risks, lifestyle habits in low- and middle-income countries are not always improved [13].

Because of cultural food choices, having individual taste preferences and limited choices of low-sodium foods, some people may not treat hypertension as seriously as they should. Also, the food industry's actions and poor labelling of processed foods make it more challenging for people to cut down on sodium, as the research by Santos et al. discovered [14].

Given the design of the study, it cannot be certain that there is a direct cause-and-effect relationship. Even so, the results are reasonable and in line with research that looks at how things work in the body. As an example, Guyton suggests that high salt intake causes extra fluid to be kept outside cells, which increases blood pressure over time [15].

A range of international health agencies, for example the WHO, recommend that keeping salt intake low is a highly effective measure to help prevent NCDs [16]. Even so, salt reduction efforts by programs in Bangladesh are not well developed. Initiatives by the government, like the SHAKE package, can only bring about tangible outcomes if they are strongly adopted and put into practice throughout the nation.

The investigation revealed that having secondary or higher education was another important factor, as only a little more than a quarter of the study subjects fit this description. Not having much education often means people do not know how to read health information, which can result in the wrong diet and more frequent chronic disease. Marmot et al. found in their meta-analysis that those with low education levels are more likely to develop hypertension and suffer from cardiovascular illness [17].

RCTs, including the DASH-Sodium trial, found that eliminating or reducing sodium causes a significant drop in blood pressure among people with high or normal blood pressure [18]. Similar findings from the trials back up the results of our observational study and offer support for new policy measures.

It is also worth noting that their reports describe that low-salt campaigns and reformulated foods have reduced the average salt intake and hypertension in people from the UK and Finland [19]. This research has shown the important reason why it is necessary to carry out widespread salt reduction efforts, focusing on people who are unlikely to be aware of the risks. The available information calls for efforts to adjust our habits and make major reforms among healthcare, policymakers and the food industry.

6. Conclusion

This study demonstrated a clear, statistically significant association between high dietary salt intake and the prevalence of hypertension in Bangladeshi adults. Participants who consumed > 10 g of salt daily were at a substantially higher risk of developing hypertension. While awareness of the health effects of salt was moderately high, actual behavioural practices were insufficient. These findings emphasize the need for comprehensive salt-reduction initiatives at the individual and policy levels to mitigate the rising burden of hypertension.

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CONFLICTS OF INTEREST

There are no conflicts of interest.

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