https://doi.org/10.29309/TPMJ/2026.33.03.9922 www.theprofesional.com

ORIGINAL ARTICLE

Salt at the table: A blessing or a curse for cardiovascular disease among people 60-75-year-old aged Karachi, Pakistan. Case- control study.

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ABSTRACT… Objective: To examine the association between discretionary salt use—specifically adding salt at the table—and the risk of cardiovascular disease (CVD) among adults aged 60–75 years in Karachi, Pakistan. **Study Design:** Case-control study. **Setting:** Department of Community Health Sciences, Bahria University Health Sciences, Karachi, Pakistan. **Period:** June 2024 to November 2024. **Methods:** A total of 592 participants were enrolled, including 296 diagnosed CVD patients with chronic hypertension (cases) and 296 age- and gender-matched controls without CVD (controls). Data were collected using a structured, closed-ended questionnaire in English and Urdu via Google Forms. Participants' salt consumption behaviors, blood pressure readings, sociodemographic data, and beliefs about salt use were recorded. Data were analyzed using SPSS version 26. The chi-square test ($p \leq 0.05$) was applied to determine associations between salt use and CVD, and odds ratios (ORs) were calculated to assess risk levels. **Results:** Participants who frequently added salt at the table had significantly higher odds of developing CVD. A total of 72% of CVD cases reported added salt intake compared to 28% of controls ($p = 0.0001$). The odds ratio for CVD among high salt users was 4.894 (95% CI: 3.395–6.926). Additional risk factors included higher blood pressure, lower education, smoking, and a family history of heart disease. **Conclusion:** The study reveals a strong link between discretionary salt use and increased cardiovascular disease risk in older adults. Targeted public health strategies, including dietary counseling and awareness campaigns, are recommended to reduce salt intake and prevent CVD in this age group.

Key words: Cardiovascular Disease (CVD), Case-control Study, Discretionary Salt, Hypertension, Karachi, Older Adults, Salt Intake.

Article Citation: Shahid F, Qureshi M, Hameed S, Qureshi U, Shaikh H, Khan A. Salt at the table: A blessing or a curse for cardiovascular disease among people 60-75-year-old aged Karachi, Pakistan. Case- control study. Professional Med J 2026; 33(03):381-386. https://doi.org/10.29309/TPMJ/2026.33.03.9922

INTRODUCTION

The development of atherosclerosis in the epicardial coronary arteries is one of the characteristics of coronary artery disease (CAD).Thirty-two million deaths from diabetes, cancer, heart disease, and chronic respiratory illnesses (80%) and eighty-three million deaths from non-communicable diseases (20%) were ascribed to these ailments, respectively. Every year, 17.9 million deaths globally are ascribed to CVDs.[1] Dietary factors cause the bulk of CVD deaths in Europe's population. In 2015, dietary factors were responsible for 48% of deaths in women from CVD and 56% of fatalities in men.[2,3]

Over 1.28 billion adults worldwide, or roughly two thirds of the world's population, have hypertension. Only 42% of adults with hypertension are recognized and receiving appropriate treatment, with an estimated 46% of hypertensive adults being ignorant of their illness. High salt consumption and less than 3.5 grams of potassium per day can both lead to hypertension and increase the risk of stroke.[4]

Low sodium intake is advised by several blood pressure guidelines for the general public. The rationale behind this recommendation is that lowering sodium intake, regardless of level, will lower blood pressure and, consequently, reduce the incidence of cardiovascular disease. According to the findings of earlier research, a diet heavy in salt increases blood pressure as well as the risk of death and cardiovascular disease (CVD). It has been demonstrated that promoting behavioral modifications to limit salt intake lowers blood pressure.[5,6] There was a correlation found between masculine gender and alcohol intake and a higher liking for salt.

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Article received on:
24/06/2025
Accepted for publication:
29/08/2025

The elderly and those with Afro-descendant hypertension (HTN) are most sensitive to salt.[7,8]

Many people have the practice of adding salt to their meal either before or after tasting it, despite the fact that a high sodium intake is strongly linked to the occurrence and progression of CVD. Two studies that used sizable, nationally representative samples of UK households estimated that between 31.7% and 40.2% of families' regularly added salt to their meals. According to evidence from national data, over 40% of different racial/ethnic groups in the USA said they regularly added salt to their food.[9,10,11]

The findings of this study could have significant implications for public health strategies aimed at reducing the burden of cardiovascular diseases in Karachi. If the study confirms a strong association between high salt intake and CVD risk, it would underscore the importance of promoting dietary modifications and salt reduction initiatives targeted at older adults. Moreover, the study could serve as a foundation for future research, exploring other lifestyle factors, genetic predispositions, and potential interventions to mitigate the risks associated with high salt consumption among the elderly population in Karachi.

METHODS

It was carried out through structured closed ended questionnaire, developed through Google form. The study was conducted over a period of six month from June'2024 to November'2024 approved by the Institutional Review Board of the Bahria University Health Sciences Campus, Karachi (Ref No: BUHS-IRB # 080-24, Dated: 07/06/2024). Consent was also taken from all the participants.

A total of 592 participants were enrolled in the case-control study after their written consent developed English and Urdu. Out of the 592, 296 cases and 296 controls sample size was calculated by the calculator tool with 95% confidence level, 5% margin of error ,80% statistical power and 1:1 ratio between case and control groups. All 296 cases of CVD diagnosed patients with chronic hypertension (more than 6 months) and use of added salt consumption more than the WHO recommendations were included in the study and they compared to 296 individuals age (plus or minus 2 years) and gender-matched community participants, visitors or relatives of patients from non-cardiac wards those who have not been diagnosed with CVD. History of depression and those lacking informed consent were excluded.

Data was received in the form of excel spreadsheet, was entered and analyzed by using Statistical Package for Social Sciences (SPSS), version 26. Analysis was carried through descriptive statistics to calculate the frequency and percentages of main variables like age, education level, frequency and dietary habits, blood pressure values and family history of heart disease are associated with cardiovascular disease risk Multi-variable analysis was done using the Chi-Square test to compare the added salt intake with and without CVD with all socio-demographic, disease related and medical variables. The results were considered as significant when p value was ≤ 0.05. Matching and restriction techniques help isolate the specific impact of salt consumption on cardiovascular disease outcomes.

RESULTS

The findings of this study highlight that reducing added salt intake at the population level is a viable and impactful strategy for lowering cardiovascular stress. By identifying a strong association between additional salt use and cardiovascular disease (CVD), this research underscores the importance of dietary interventions in public health planning. Furthermore, the study supports the concept of individualized treatment for salt-sensitive individuals. Tailoring dietary advice for these patients can lead to better blood pressure control, particularly in hypertensive individuals, thereby reducing the overall incidence and burden of cardiovascular disease. These outcomes reinforce the need for awareness campaigns, behavior modification strategies, and policy measures aimed at promoting salt reduction, especially in older adults who are at higher risk.

A total of 592 participants were included, with 296 cases (Group A) and 296 age- and gender-matched controls (Group B). Salt consumption patterns varied significantly between the groups (p=0.0001), with a higher proportion of cases using larger salt

quantities. The odds ratio showed that individuals with high salt intake had approximately 4.9 times greater risk of developing cardiovascular disease (CVD). Table 1 presents associations between demographic, behavioral, and clinical variables with CVD status. Significant factors included blood pressure levels, educational status, beliefs about salt, smoking, and family history of heart disease. Notably, 100% of cases had moderate to severe BP elevation, while most controls had normal or mildly elevated BP. There was no significant difference in residence (urban vs. rural).

Analysis showed that 72% of cases reported added salt intake compared to only 28% of controls. A strong association with an OR of 4.894 (95% CI: 3.395–6.926), reinforcing that excess salt consumption substantially increases CVD risk.

TABLE-I

Association between salt intake and cardiovascular disease risk

Variable	Group A (CVD Cases)	Group B (Controls)	P-Value
Age (years)			0.0001
60–65	111 (37.5%)	138 (46.6%)	
66–70	114 (38.5%)	101 (34.1%)	
71–75	65 (22.0%)	35 (11.8%)	
>75	6 (2.0%)	22 (7.4%)	
BP on Check			0.0001
Normal/Mild	—	296 (100%)	
Moderate/Severe	296 (100%)	—	
Education			0.0003
Illiterate/Primary	189 (64%)	160 (54%)	
Secondary+	107 (36%)	136 (46%)	
Residence			0.7
Rural	124 (42%)	128 (43%)	
Urban	172 (58%)	168 (57%)	
Salt Use in Food	203 (69%)	125 (42%)	0.0001
Extra Salt While Eating			0.0001
None	27 (9%)	69 (23%)	
Pinch (300 mg)	109 (37%)	133 (45%)	
Spoon (1700–2300 mg)	160 (54%)	94 (32%)	
Salt Use Frequency			0.0001
Never/Once	60 (20%)	93 (31%)	
≥Twice	236 (80%)	203 (69%)	
Belief: Reduce Salt Helps CVD	Yes: 138 (47%)	200 (68%)	0.0001
Belief: Extra Salt = Heart Risk	Yes: 175 (59%)	68 (23%)	0.0001
Smoking	Yes: 179 (60%)	206 (70%)	0.025
Family History of CVD	Yes: 191 (65%)	107 (36%)	0.0001
Signs of HTN	Yes: 296 (100%)	0 (0%)	0.0001

DISCUSSION

While it is widely believed that a high-salt diet raises blood pressure, not everyone who consumes excess salt develops hypertension (HTN). This variation is due to individual differences in salt sensitivity—those who are salt-sensitive are more likely to experience elevated blood pressure and an increased risk of cardiovascular disease (CVD). Although numerous international studies have linked added salt intake to hypertension and CVD[12], there is a lack of local evidence from Pakistan.

In a Cochrane review of trials on salt reduction, it was discovered that a daily intake of salt caused a drop in blood pressure of 5.4/≥4 wk, or 4.4 g in 2.8 mm Hg for hypertensive people and 2.4/1.0 mm Hg for normotensive people. In hypertensive people, blood pressure decreased by 5.02/2.78 mm Hg, while in normotensive people, it decreased by 1.08/0.24 mm Hg, according to a more current Cochrane study.[13]

Reducing salt intake could lessen the burden of non-communicable diseases (NCDs) in the population. This will contribute to the low-cost global reduction of the burden of NCDs.[14] Strict dietary salt restriction may negatively alter neurohormonal activity, serum lipid levels, and insulin resistance—factors that increase the risk of heart failure and cardiovascular disease.[15]

A lower risk of cardiovascular events or fatalities from cardiovascular disease was linked to sodium excretion of less than 2.3 g/day (as opposed to 3.6–

4.8 g/day), according to the Trials of Hypertension Prevention (TOHP) study.[16]

More than 75% of deaths from CVD occur in low- and middle-income nations.[17] Reducing the sodium content of processed foods may raise the intake of carbohydrates and starches, which in turn may raise blood pressure and the risk of cardiac-metabolic disease in general.[18]

Numerous research' findings have linked inadequate salt intake to an increased risk of death. Elevated salt consumption has also been linked to a higher death rate. The rise in CVD risk factors has also been linked to a lack of knowledge. There is evidence that the risk of CVD is higher in urbanized populations than in rural ones, for both men and women. Nonetheless, there is currently a dearth of research on Pakistani CVD risk factors.[19] Elevated sodium consumption has been linked to increased cardiovascular disease mortality in the whole population. Nevertheless, a previous study indicated that decreased sodium excretion was linked to increased cardiovascular disease mortality. It is recommended to do a primary prevention study that focuses on the entire community. This is because there is limited evidence of a major threshold effect, as the risks of cardiovascular disease increase continuously across the range of blood pressure levels.[20]

Several scientists maintain the belief that higher salt intake is associated with an increased likelihood of developing cardiovascular diseases and experiencing death due to these conditions. Further study may involve the development of optimal strategies for reducing salt intake and establishing objectives for population-wide consumption. There is a lack of research on the correlation between the amount of salt consumed in one's diet and the outcomes of cardiovascular disease in older age groups.[5]

The impact of salt intake on global incidence of cardiovascular disease (CVD) is still uncertain. Recent research and the absence of a definitive randomized controlled trial indicate that reducing salt consumption to low levels can decrease the risk of cardiovascular disease (CVD), which has sparked a renewed discussion about the optimal target for sodium intake. Despite numerous research studies analyzing the correlation between salt intake, blood pressure, and cardiovascular disease (CVD).[21] Recent studies have found that individuals who add salt at the table had a 15% increased risk of heart failure compared to those who do not add extra salt.[22]

The evidence on the relationship between sodium intake and cardiovascular outcomes in older adults is mixed. Some studies found that higher sodium intake was associated with increased blood pressure and CVD risk, while others found a J-shaped association, with both low and high sodium intake associated with higher CVD risk.[23]

Some studies reporting J- or U-shaped associations between sodium intake and cardiovascular risk relied on a single 24-hour urine sodium measurement, which may not reflect usual intake. In contrast, more recent studies using average 24-hour urine sodium values have shown a clear, positive linear relationship between sodium intake and blood pressure, cardiovascular outcomes, and mortality. These findings suggest that earlier inconsistencies were due to methodological differences.[24]

Factors like salt sensitivity, frailty, and underlying health conditions may modify the association between sodium and CVD risk in this age group. A 10-year study examining dietary sodium intake through a food frequency questionnaire in older adults (mean age 73.6 years) found no significant association between sodium intake and mortality, cardiovascular disease (CVD), or heart failure (HF). Despite most participants consuming over 2300 mg/day of sodium, higher intake did not significantly impact outcomes, even after adjusting for demographic, caloric, and BMI factors. Subgroup analyses showed no consistent effects across sex, race, or hypertension status. These findings suggest that, within the observed intake range, sodium consumption may not strongly influence long-term cardiovascular outcomes in older adults.[25]

CONCLUSION

Frequent addition of salt at the table is linked to a higher risk of cardiovascular disease (CVD) in adults aged 60–75. However, the broader relationship

between overall sodium intake and cardiovascular outcomes in this age group remains complex and requires further study. Given the rising CVD burden in low- and middle-income countries, standardized research methods and population-specific interventions are essential to effectively reduce sodium intake and manage CVD risk in older adults.

RECOMMENDATIONS

This study has important public health implications for reducing the CVD burden in Karachi. The strong link between high salt intake and CVD underscores the need for dietary changes and salt reduction efforts, especially in older adults. The findings support targeted awareness campaigns and policy measures to limit discretionary salt use. They also lay the groundwork for future research into other lifestyle, genetic, and preventive factors influencing CVD risk in the elderly.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

SOURCE OF FUNDING

This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors

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1	**Fareeha Shahid:** Data collection.
2	**Muzaiyyena Qureshi:** Writing.
3	**Sarwa Hameed:** Data analysis.
4	**Uzair Qureshi:** Discussion writing.
5	**Hira Shaikh:** Review of manuscript.
6	**Ahmad Khan:** Data analysis.