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ANALYSIS OF SALT CONSUMPTION PATTERNS AND HYPERTENSION RISK IN LOW-INCOME FAMILIES

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ABSTRACT
Hypertension is a non-communicable disease with a high prevalence, especially in low-income communities. Excessive salt consumption is a significant factor in increasing the risk of hypertension. This study aims to analyze the relationship between salt consumption patterns and the risk of hypertension in low-income families in Metenggeng Village, Bojongsari District. The study design was cross-sectional, involving 66 respondents selected through purposive sampling. Data were collected using a structured questionnaire that had previously been tested for validity (all items r-count > 0.361) and reliability (Cronbach's Alpha = 0.711), ensuring the instrument was both valid and reliable, along with blood pressure measurements. Analysis was performed using the Chi-Square test. The results showed that most respondents with high salt consumption were more likely to experience high blood pressure (78.6%) compared to respondents with low salt consumption (42,1%). With a p-value of 0.003 (<0.05), we conclude that excessive salt consumption patterns are significantly associated with increased blood pressure, thus requiring interventions such as nutritional education and salt restriction to prevent hypertension in vulnerable groups.

Keywords: health risks; hypertension; low-income families; salt consumption patterns

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INTRODUCTION

Public health has undergone a major epidemiological transition in recent decades, with disease patterns shifting from communicable diseases to non-communicable diseases (NCDs) (Bhattacharya et al., 2022; Balafa & Kalaitzidis, 2021). This transition is strongly influenced by changes in lifestyle, urbanization, and improvements in life expectancy across populations. Among NCDs, hypertension has become a leading global concern due to its high prevalence and serious long-term consequences. Often called the "silent killer," hypertension tends to remain asymptomatic in its early stages, which delays diagnosis and management. However, if left uncontrolled, hypertension leads to critical complications such as myocardial infarction, stroke, kidney disease, and vision loss (Filippini et al., 2022). The World Health Organization (WHO) estimates that millions of people worldwide live with undiagnosed or uncontrolled hypertension, resulting in an enormous burden on both healthcare systems and economic productivity (Wang et al., 2023).

Hypertension is clinically defined as a persistent increase in arterial blood pressure, with systolic values ≥140 mmHg and diastolic values ≥90 mmHg (Filippou et al., 2022). Prolonged elevation of blood pressure damages blood vessels and vital organs, making hypertension a major risk factor for cardiovascular morbidity and mortality. Beyond its medical implications, the disease also carries economic consequences, including increased direct medical costs and indirect costs related to disability and reduced workforce productivity. The chronic nature of hypertension, requiring long-term treatment and monitoring, further amplifies its socioeconomic impact, particularly in resource-limited settings (Kim et al., 2021).

The etiology of hypertension is multifactorial. Risk factors are generally categorized as non-modifiable and modifiable. Non-modifiable factors include age, sex, and genetic predisposition (Charchar et al., 2024), while modifiable factors are largely associated with behavioral and lifestyle patterns, such as dietary habits, lack of physical activity, chronic stress, smoking, and alcohol intake (Zhou et al., 2021). Among these, salt intake is considered one of the most significant contributors. Sodium directly influences fluid retention and vascular tone, leading to increased blood pressure. High salt intake has been consistently linked with hypertension, while reducing sodium consumption has shown significant benefits in lowering blood pressure, especially among salt-sensitive individuals (Ojangba et al., 2023; Carey et al., 2022).

Modern lifestyles further exacerbate this issue. Rapid urbanization, fast-paced work environments, and the increasing reliance on processed and fast foods have altered dietary patterns globally. Processed meals are often high in sodium, saturated fats, and low in essential nutrients, fiber, and micronutrients (Chailimpamontree et al., 2021). Irregular eating patterns, low intake of fruits and vegetables, and the habit of skipping breakfast also increase susceptibility to hypertension (Huda et al., 2025). At the same time, technological advancement and digitalization have reduced opportunities for physical activity, with many individuals spending long hours sedentary in front of screens (Verma et al., 2021). Additionally, social and occupational stress adds to the risk of elevated blood pressure. Alarmingly, hypertension is no longer confined to adults; early signs are increasingly observed in adolescents and children due to poor lifestyle choices, representing a new challenge in NCD prevention and control (Hunter et al., 2022).

Despite the growing prevalence of hypertension, awareness of prevention strategies remains low, particularly in low-income communities with limited access to education and health information (Carey et al., 2022). Health education plays a pivotal role in raising awareness and fostering behavior change. Counseling on reducing dietary salt, maintaining ideal body weight, engaging in regular physical activity, and adopting stress management techniques are vital preventive measures (Hunter et al., 2022). The involvement of healthcare providers doctors, nurses, and community health workers along with the use of mass and social media, can greatly enhance the reach and effectiveness of educational programs (Fuchs & Fuchs, 2021). With consistent health promotion efforts and the participation of families and communities, sustainable lifestyle changes can be achieved, which ultimately reduce the prevalence of hypertension (Ellison & Welling, 2021).

A comprehensive response to hypertension requires a multidisciplinary approach that integrates medical, social, cultural, and economic perspectives. Evidence-based public health interventions and policies, such as regulating sodium levels in processed foods and promoting physically active lifestyles, have shown promising results at the population level (Ojangba et al., 2023b) (Charchar et al., 2024b). Collaboration across government, healthcare systems, educational institutions, private sectors, and communities is essential for effective and sustainable outcomes. Without collective efforts, hypertension control will remain suboptimal, particularly in rural and underserved settings (Zhou et al., 2021).

Several studies have demonstrated the effectiveness of dietary modifications and education in managing hypertension. For instance (Isnaini et al., 2025) found that the DASH (Dietary Approaches to Stop Hypertension) diet significantly reduced both systolic and diastolic blood pressure. A scoping review by (Isnaini et al., 2025) highlighted the importance of family-centered education in improving self-efficacy, knowledge, quality of life, and reducing blood pressure among older adults. Local studies also revealed that educational interventions enhanced community knowledge and improved self-management practices (Isnaini & Purwito, 2019; Isnaini & Lestari, 2018). However, these studies have not specifically addressed the association between salt consumption and hypertension among low-income rural households with limited nutritional awareness. This research gap indicates the need for context-specific investigations that combine dietary assessments with direct blood pressure measurements in rural communities.

Based on this background, the present study aims to analyze the relationship between household salt consumption patterns and the risk of hypertension, as well as to identify socioeconomic factors influencing dietary behaviors among low-income families in Metenggeng Village, Bojongsari District.

METHOD

This study employed a quantitative design with a cross-sectional approach to examine the association between salt consumption patterns and the risk of hypertension among low-income families. The research was conducted in Metenggeng Village, Bojongsari District, where the majority of the population has low household income. Data collection was carried out in July 2025.
The study population consisted of low-income families with an income below the regional minimum wage (UMR). A total of 194 individuals aged 30–60 years, both with and without hypertension, were identified as the target population. Sampling was performed using purposive sampling, and the sample size of 66 participants was determined using Slovin's formula. Inclusion criteria included male and female respondents from low-income households who consented to participate, while exclusion criteria were individuals with severe comorbidities or complications.

The independent variable was salt consumption pattern, assessed using the Semi-Quantitative Food Frequency Questionnaire (SQ-FFQ). Respondents were asked about their daily salt intake (measured in teaspoons/day) and the frequency of consuming salt-rich foods. Demographic data such as age, sex, education, occupation, family income, and history of hypertension were also collected through structured questionnaires. Salt consumption was classified as "normal" if intake was <5 g/day (equivalent to <1 teaspoon/day) and "high" if intake was ≥5 g/day .

Prior to the main study, the questionnaire was tested for validity and reliability with 30 respondents. Validity testing was performed using Pearson's correlation, with a significance level of 5% and r-table value of 0.361. All seven items showed r-count values greater than 0.361 (ranging from 0.498 to 0.681), indicating that all items were valid. Reliability testing was conducted using Cronbach's Alpha, resulting in a coefficient of 0.711, which is above the threshold of 0.600. This demonstrates that the questionnaire items were consistent and reliable, falling within the "high" reliability category (Sugiyono, 2019).

The dependent variable was hypertension risk, measured through blood pressure assessment using a validated digital sphygmomanometer. Blood pressure measurement was performed while the respondent was seated in a relaxed position. Systolic blood pressure ≥139 mmHg and/or diastolic ≥ 89 mmHg was categorized as hypertension (Sustrani & Syamsir, 2005). Additionally, body weight and height were measured to calculate body mass index (BMI) as a supporting indicator.

Data were analyzed using both univariate and bivariate approaches. Univariate analysis was performed to describe the characteristics of respondents, salt consumption levels, and blood pressure distribution. Bivariate analysis was conducted using the Chi-Square test to determine the association between salt consumption pattern and hypertension risk, with a significance level set at $p<0.05$.

RESULT

Respondent Characteristics

Table 1. shows that most respondents were in the age range of 51–60 years (54.6%), with a mean age of 50.34 years and a range of 33–60 years. The majority of respondents were female (91%), while only 9% were male. In terms of education, almost all respondents had only primary education (97%), while 3% had secondary education. With respect to occupation, the largest group were housewives (60.6%), followed by traders (19.7%). Farmers and entrepreneurs accounted for 6% each, while teachers (3%) and hair laborers (4.5%) were the smallest groups. Regarding income, most respondents (70%) earned less than 2 million, while 30% earned more than 2 million. In

relation to dietary habits, 57.6% reported low salt consumption, while 42.4% reported high salt consumption. For blood pressure status, 57.6% of respondents were hypertensive, and 42.4% had normal blood pressure.

Table 1.
Respondent Characteristics (n = 66)

Characteristic	Category	f	%
Age (years)	30–40	9	13.6
	41–50	21	31.8
	51–60	36	54.6
Gender	Male	6	9.0
	Female	60	91.0
Education	Primary	64	97.0
	Secondary	2	3.0
Occupation	Farmer	4	6.0
	Trader	13	19.7
	Entrepreneur	4	6.0
	Housewife	40	60.6
	Teacher	2	3.0
	Hair laborer	3	4.5
Income	Low (< 1–2 million)	46	70.0
	High (> 2 million)	20	30.0
Salt Consumption	Low	38	57.6
	High	28	42.4
Blood Pressure	Normal	28	42.4
	Hypertension	38	57.6

Relationship Between Salt Consumption and Hypertension

Table 2.
Relationship Between Salt Consumption and Blood Pressure (n = 66)

Salt Consumption	Normal BP	Hypertension	Total	p-value
Low	22 (57.9%)	16 (42.1%)	38 (100%)	
High	6 (21.4%)	22 (78.6%)	28 (100%)	0.003
Total	28 (42.4%)	38 (57.6%)	66 (100%)	

Table 2. shows that among respondents with low salt consumption, 57.9% had normal blood pressure and 42.1% were hypertensive. In contrast, among those with high salt consumption, 21.4% had normal blood pressure and 78.6% were hypertensive. The Chi-square test produced a p-value of 0.003 (< 0.05), indicating a significant relationship between salt consumption and blood pressure.

DISCUSSION

The bivariate analysis in this study revealed a significant association between salt consumption and blood pressure among respondents. Those with high salt intake were more likely to develop hypertension (78.6%) compared to respondents with low salt intake (42.1%). The analysis yielded a p-value of 0.003 (<0.05), indicating a statistically significant relationship between the level of salt consumption and blood pressure. This finding suggests that uncontrolled salt intake constitutes a major risk factor for hypertension, particularly among low-income families who tend to consume high-salt foods due to their affordability, long shelf life, and ease of preparation.

This relationship indicates that the increase in one component of blood pressure (systolic or diastolic) is accompanied by an increase in the other, thereby elevating the overall risk of hypertension. The evidence reinforces the argument that low-income families are more vulnerable to hypertension due to excessive salt consumption, which should be understood as a pressing public health concern.

The high prevalence of hypertension among low-income families in Metenggeng Village reflects a complex and urgent public health problem. Hypertension, as a noncommunicable disease, is closely linked to lifestyle, particularly sodium-rich dietary patterns. The World Health Organization (WHO) recommends that daily salt intake should not exceed 5 grams; however, many Indonesians consume far beyond this threshold. The situation is aggravated in low-income families, who frequently consume inexpensive processed foods rich in salt, such as instant noodles, salted fish, and packaged foods. Previous research has consistently emphasized that high salt intake significantly increases the risk of hypertension, especially among socially and economically vulnerable groups (Purwono et al., 2020).

The present findings confirm a significant correlation between salt intake and systolic blood pressure in low-income families in Metenggeng Village. Increased sodium intake corresponds with elevated systolic pressure, supporting the physiological mechanism whereby excessive sodium raises plasma volume, induces fluid retention, and increases vascular wall pressure. This interpretation aligns with the theory of hypertension pathophysiology, which posits that excessive salt consumption disrupts the renin–angiotensin aldosterone system (RAAS) and thereby worsens blood pressure regulation (Hermawati et al., 2025). These findings suggest that daily dietary habits are a crucial determinant in the development of hypertension.

Salt consumption also demonstrated a significant association with diastolic blood pressure. This indicates that excessive sodium not only elevates systolic pressure the peak pressure during cardiac contraction but also influences diastolic pressure, which reflects vascular tone during cardiac relaxation. In other words, excessive salt has a comprehensive impact on overall blood pressure stability. This is particularly concerning for low-income families, who often lack routine health checkups, resulting in undiagnosed or late-detected hypertension. Amaliah et al. (2024) also observed that excessive salt consumption was linked to increased prevalence of hypertension in rural communities where health awareness and dietary literacy remain low.

The high risk of hypertension in this population cannot be explained solely by salt consumption, but also by limited knowledge and health literacy. Low nutritional literacy prevents individuals from understanding the health risks of excessive salt consumption and from checking nutritional labels on packaged foods. As a result, their daily sodium intake often exceeds WHO recommendations. Additionally, cultural cooking practices that rely heavily on salt as a flavor enhancer further elevate sodium intake. Ronzon et al. (2025) similarly highlighted that lower socioeconomic status is associated with unhealthy dietary patterns, which increase susceptibility to chronic diseases such as hypertension.

Lifestyle factors also contribute to the worsening of hypertension risk. Many low-income families engage in sedentary activities, either due to occupational demands or limited opportunities for physical exercise. Lack of physical activity amplifies the negative effects of excessive salt intake by reducing vascular elasticity and contributing to metabolic dysfunction. This is consistent with the study of Wijayanti et al. (2025) which found a significantly higher risk of hypertension among individuals who combined high salt consumption with low levels of physical activity.

The findings also highlight the importance of household-level dynamics. In most low-income households, women particularly mothers play the primary role in food preparation. Thus, their knowledge and attitudes toward healthy eating greatly influence family dietary patterns. Teddu et al. (2024) emphasized that empowering women within households has a strong impact on shifting food consumption behaviors toward healthier options, including the reduction of excessive salt use.

Although the primary focus of this study is dietary salt, the broader health system context cannot be ignored. The high prevalence of hypertension in low-income families suggests that current promotive and preventive health programs have not been sufficiently effective in addressing this issue at the community level. Syahrizal et al. (2025) showed that community-based health

promotion programs can improve public compliance with dietary restrictions and blood pressure monitoring.

CONCLUSION

This study confirmed a significant association between excessive salt consumption and increased blood pressure among low-income families in Metenggeng Village ($p = 0.003$). Respondents who consumed more salt had a higher proportion of hypertension compared to those with lower intake. The results indicate that exceeding the WHO daily salt limit of ≤5 grams contributes to higher systolic and diastolic pressure, which increases the likelihood of hypertension in this community.

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