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Original Research Paper

The correlation between dietary patterns and the incidence of hypertension among the elderly

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Abstract
Hypertension is a chronic health problem that commonly occurs in the elderly and is significantly influenced by daily dietary patterns. A diet high in sodium, saturated fats, and sugar can increase the risk of hypertension and exacerbate the health conditions of older adults. This study aimed to determine the correlation between dietary patterns and the incidence of hypertension among the elderly. The study employed a correlational design with a cross-sectional approach. The sample was selected using a total sampling technique, involving 50 elderly individuals with hypertension. The research instrument utilized was a Food Frequency Questionnaire (FFQ). Data were analyzed using the Spearman's Rank test. The majority of the elderly participants exhibited poor dietary patterns, accounting for 30 individuals (60%). Furthermore, most of the participants experienced Stage II Hypertension (n=31, 62%). The Spearman's Rank test revealed a p-value of 0.000 with a correlation coefficient of 0.538. There is a significant correlation between dietary patterns and the incidence of hypertension among the elderly. It is recommended that healthcare professionals provide regular nutritional education and counseling to the elderly and their families to promote healthier dietary habits and prevent hypertension-related complications.

Keywords: dietary patterns; elderly; hypertention

1. Introduction

Hypertension is a major health issue among the elderly, significantly increasing morbidity and mortality through complications like stroke, heart failure, and chronic kidney disease (Anshari, 2020). Globally, over 1.2 billion adults have hypertension WHO (2021), with Indonesian prevalence reaching 57.8% in individuals aged 65–74 years and 64% in those over 75 years (Kemenkes, 2024). Dietary patterns, specifically high intakes of sodium, saturated fats, and sugar, are primary determinants of elevated blood pressure (Guyton & Hall, 2019).

Although numerous studies have discussed the risk factors for hypertension in general, there are limited studies specifically examining the correlation between dietary patterns and the incidence of hypertension among the elderly at the community level, particularly in rural areas. In fact, dietary modifications are often easier to implement than physical activity interventions, which are frequently restricted in the elderly due to physical and health limitations (Simamora et al., 2023). A preliminary study at the Posyandu (Integrated Healthcare Center) Bina Sejahtera in Butuh Village indicated that the majority of elderly individuals with hypertension have unhealthy eating habits, such as consuming salty foods, fried foods, coconut milk, and sugary beverages, alongside low consumption of fruits and vegetables.

The pathophysiological impact of poor dietary choices significantly exacerbates vascular aging in the elderly. Specifically, excessive sodium intake induces extracellular fluid expansion and endothelial dysfunction by impairing nitric oxide (NO) bioavailability, thereby increasing peripheral arterial resistance (Rahmaniar et al., 2023). Furthermore, diets high in saturated fats and refined sugars accelerate atherosclerosis, arterial stiffness, and metabolic dysregulation. Conversely, adhering to a

dietary pattern rich in potassium, magnesium, and dietary fiber such as abundant vegetables, fruits, and legumes facilitates vasodilation and natriuresis, which have been clinically proven to effectively lower systolic and diastolic blood pressure (Mukti, 2018).

The elderly are a vulnerable group who often possess limited knowledge and access to accurate nutritional information. If dietary patterns are not properly managed, the risk of hypertension complications will increase, placing a significant burden on families and the broader healthcare system.

To address these challenges, community-level research, such as at the Posyandu, can provide contextual empirical data that is directly beneficial for health promotion and preventive programs for the elderly. Therefore, it is necessary to conduct research highlighting the relationship between dietary patterns and blood pressure in the elderly, particularly at primary healthcare levels like the Posyandu.

This study aimed to investigate the correlation between dietary patterns and the incidence of hypertension among the elderly. It was hypothesized that poorer dietary quality is significantly associated with an increased incidence and severity of hypertension within this population.

2. Research Methods

This study employed a correlational design utilizing a cross-sectional approach. The research was conducted at Posyandu Bina Sejahtera, Butuh Village, Purworejo Regency, from Mei to Juni 2025. The study population comprised all elderly individuals diagnosed with hypertension residing in the area. A total sampling technique was utilized, resulting in a sample size of 50 respondents; this method was chosen because the population size was relatively small and fully accessible, thereby minimizing sampling bias and ensuring data representativeness.

The inclusion criteria for this study were: (1) elderly individuals aged ≥60 years, (2) medically diagnosed with hypertension, (3) capable of communicating clearly, and (4) willing to participate in the study by signing the informed consent form. Conversely, the exclusion criteria included: (1) elderly individuals experiencing severe cognitive impairments (e.g., dementia) or hearing loss that hindered the interview process, and (2) those experiencing acute and severe hypertension complications requiring immediate hospitalization.

Data collection was systematically conducted through face-to-face structured interviews. Blood pressure was measured using a clinically calibrated digital sphygmomanometer (Omron). To ensure accuracy, measurements were taken after the respondents had rested for 10–15 minutes in a seated position. Dietary patterns were assessed using a Food Frequency Questionnaire (FFQ) comprising 40 items. To minimize recall bias and misinterpretation, the FFQ was administered directly by trained researchers who guided the elderly in recalling their food intake frequencies.

The respondents' dietary patterns were categorized into two ordinal groups: "Good" and "Poor," based on the median cut-off point of their total FFQ scores. The FFQ instrument had previously been tested for validity (r-value = -0.097 to 0.841, $p < 0.05$) and reliability (Cronbach's Alpha = 0.952) by Shiffa (2023), confirming its high suitability for this research context.

Data analysis was performed using IBM SPSS Statistics software (version 26.0). Univariate analysis was utilized to describe the frequency distribution of the demographic and primary variables. Bivariate analysis was conducted using the Spearman's Rank correlation test with a standard confidence level of 95% ($\alpha = 0.05$). The Spearman test was specifically chosen as the most appropriate non-parametric method because the analyzed variables consisted of ordinal data, namely Dietary Patterns (categorized as Good/Poor) and Incidence of Hypertension (categorized as Stage I/Stage II). This research has obtained official ethical approval from the Ethics Committee of Universitas 'Aisyiyah Yogyakarta (Ethical Clearance Number: No. 2191/KEP-UNISA/VII/2025).

3. Results and Discussion

3.1.Results

Table 1. Frequency Distribution of Elderly Characteristics

Characteristics	Frequency	Percentage (%)
Age		
Elderly (60-74 years)	42	84.0
Old (75-90 years)	8	16.0
Gender		
Male	26	52.0
Female	24	48.0
Education		
Basic (Elementary, Junior High)	35	70.0
Middle (Senior High)	15	30.0
Occupation		
Unemployed	34	68.0
Employed	16	32.0

Table 1 indicates that the majority of respondents were in the elderly age category (60-74 years), comprising 42 individuals (84%). In terms of gender, males were predominant with 26 individuals (52%). Elderly individuals with a basic education background (Elementary and Junior High School) constituted the majority with 35 individuals (70%). Regarding occupational status, unemployed elderly individuals were more prevalent, totaling 34 individuals (68%).

Table 2. Frequency Distribution Based on Elderly Dietary Patterns

Dietary Pattern	Frequency	Percentage (%)
Good	20	40.0
Poor	30	60.00

Table 2 demonstrates that the majority of the elderly had poor dietary patterns, accounting for 30 individuals (60%).

Table 3. Frequency Distribution of Food Consumption Among the Elderly

No	Food Item	>3x/day (Always) %	1x/day (Very often) %	3-6x/week (Often) %	1-2x/week (Sometimes) %	2x/month (Rarely) %	Never %
A. Sodium Sources							
1	Salted fish	0	8.0	36.0	24.0	16.0	16.0
2	Soy sauce	0	40.0	34.0	10.0	10.0	6.0
3	MSG	4.0	58.0	10.0	6.0	14.0	8.0
4	Anchovies	0	30.0	28.0	14.0	16.0	12.0
5	Sardines	0	8.0	18.0	24.0	18.0	32.0
6	Meatballs	0	28.0	6.0	46.0	18.0	2.0
7	Liver	0	0	8.0	34.0	24.0	34.0
8	Fermented soy (tauco)	2.0	16.0	0	0	0	82.0
9	Pickles	6.0	0	12.0	10.0	46.0	26.0
10	Chili paste (sambal)	42.0	32.0	8.0	8.0	4.0	6.0
11	Shrimp	0	0	32.0	26.0	16.0	26.0

No	Food Item	>3x/day (Always) %	1x/day (Very often) %	3-6x/week (Often) %	1-2x/week (Sometimes) %	2x/month (Rarely) %	Never %
12	Pizza	0	0	0	14.0	4.0	82.0
13	Pudding	0	10.0	18.0	42.0	16.0	14.0
B. Fat and Protein Sources							
14	Chicken meat	0	22.0	32.0	32.0	8.0	2.0
15	Fresh shrimp	0	0	30.0	32.0	14.0	24.0
16	Squid	0	6.0	8.0	24.0	14.0	48.0
17	Broiler eggs	0	14.0	44.0	26.0	14.0	2.0
18	Duck eggs	0	24.0	34.0	26.0	12.0	4.0
19	Butter	0	10.0	12.0	26.0	18.0	34.0
20	Packaged milk	24.0	0	26.0	34.0	12.0	4.0
21	Free range chicken eggs	0	12.0	28.0	34.0	12.0	14.0
22	Shellfish	0	0	4.0	14.0	26.0	56.0
23	Fried tempeh	18.0	50.0	0	26.0	4.0	2.0
24	Fried vegetable fritters	0	40.0	26.0	28.0	6.0	0
25	Rissole	4.0	40.0	18.0	22.0	12.0	4.0
26	Fried stuffed todu	12.0	32.0	34.0	14.0	6.0	2.0
27	Sosis	0	4.0	14.0	30.0	26.0	26.0
28	Nugget	0	6.0	20.0	38.0	10.0	26.0
29	Margarine	0	40.0	8.0	18.0	20.0	14.0
C. Carbohydrate Sources							
30	White bread	0	32.0	14.0	38.0	6.0	10.0
31	Chocolate bread	0	4.0	32.0	28.0	18.0	18.0
32	Biscuits	2.0	36.0	30.0	16.0	12.0	4.0
33	Rice vermicelli	8.0	6.0	6.0	50.0	18.0	12.0
34	Shrimp/fish crackers	8.0	28.0	34.0	18.0	10.0	2.0
35	Instant noodles	0	16.0	40.0	18.0	14.0	12.0
36	Chicken noodles	0	14.0	14.0	32.0	24.0	16.0
37	Snacks	0	14.0	20.0	22.0	34.0	10.0
38	French fries	0	26.0	12.0	14.0	36.0	12.0
39	Cassava chips	0	28.0	26.0	18.0	12.0	16.0

Table 3 illustrates that the foods most frequently consumed by the elderly at Posyandu Bina Sejahtera, Butuh Village, Purworejo Regency, were monosodium glutamate (MSG) with a frequency of once a day (very often) at 58%, followed by fried tempeh consumed once a day (50%), and chili paste (sambal) consumed more than three times a day (always) by 42%.

Table 4. Frequency Distribution Based on the Incidence of Hypertension in the Elderly

Incidence of Hypertension	Frequency	Percentage (%)
Stage I Hypertension	19	28.0
Stage II Hypertension	31	62.0

Table 4 reveals that the majority of hypertension cases among the elderly were categorized as Stage II Hypertension (defined as having a systolic blood pressure ≥ 160 mmHg and/or a diastolic blood

pressure ≥ 100 mmHg), affecting 31 individuals (62%). Meanwhile, the remaining 19 individuals (38.0%) were classified as having Stage I Hypertension (defined as a systolic blood pressure of 140–159 mmHg and/or a diastolic blood pressure of 90–99 mmHg).

Table 5 Spearman's Rank Test Results for the Correlation Between Dietary Patterns and the Incidence of Hypertension in the Elderly

Dietary Pattern	Stage I Hypertension		Stage II Hypertension		Total		Carrelation Coefficient	p-value
	f	%	f	%	f	%		
Good	14	28.0	6	12.0	20	40.0	0.538	0.000
Poor	5	10.0	25	50.0	30	60.0		

Table 5 indicates that the majority of elderly individuals with good dietary patterns predominantly experienced Stage I Hypertension (14 individuals, 28%). Conversely, elderly individuals with poor dietary patterns mostly suffered from Stage II Hypertension (25 individuals, 50%).

The statistical calculation using the Spearman's Rank test yielded a p-value of 0.000 (< 0.05), leading to the conclusion that there is a significant correlation between dietary patterns and the incidence of hypertension among the elderly. The correlation coefficient value of 0.538 indicates a moderate correlation with a positive direction. This implies that the better the dietary pattern of the elderly, the milder the incidence of hypertension tends to be (Stage I Hypertension), whereas poor dietary patterns are inclined to be associated with more severe hypertension (Stage II Hypertension).12

3.2.Discussion

The results of this study indicated that the majority of the elderly had poor dietary patterns, accounting for 30 individuals (60%). Previous studies similarly demonstrated that elderly individuals with hypertension often exhibit poor dietary habits by (Carsilah et al., 2024; Hamzah et al., 2021; Maqfirah et al., 2024). Dietary patterns refer to the methods or efforts to fulfill healthy nutritional needs, encompassing the regulation of food adequacy, types of food, and meal schedules aimed at maintaining health (Simamora et al., 2023). Unhealthy dietary patterns for individuals with hypertension include the consumption of foods high in sugar, sodium, and excessive fats (such as thick coconut milk and oils), and daily consumption of caffeinated beverages (Rahmaniar et al., 2023). Conversely, a healthy diet for hypertension patients, such as the DASH (Dietary Approaches to Stop Hypertension) diet, is rich in vegetables, fruits, and whole grains, and strictly limits foods high in saturated fats and sodium (Guo et al., 2021).

The dietary patterns of the elderly at Posyandu Bina Sejahtera revealed a persistent high consumption of foods posing a risk for elevating blood pressure, particularly high-sodium sources and ultra-processed condiments. For instance, MSG was consumed very frequently by 58% of respondents, chili paste (sambal) daily by 42%, and soy sauce by 40%. Sari (2024) highlighted that in rural communities, the habitual use of flavor enhancers like MSG and soy sauce acts as a primary predictor of uncontrolled hypertension. These condiments drastically alter the daily sodium-to-potassium ratio, triggering endothelial oxidative stress, reducing nitric oxide (NO) production, and increasing arterial stiffness, which consequently raises peripheral vascular resistance (Sulastriningsih & Prasestiyo, 2026; Wati & Hidayat, 2023; Youssef, 2022). Furthermore, foods such as salted fish (36%) and instant noodles (16%) were still frequently consumed. Rana (2022) emphasized that ultra-processed foods are laden with hidden sodium and preservatives that independently exacerbate systolic blood pressure spikes in the elderly.

Fried tempeh was also consumed very frequently by 50% of the elderly. While tempeh itself is a nutritious plant-based protein, the deep-frying process drastically escalates its saturated fat and caloric content. Kim (2024) confirmed that diets dominated by deep-fried foods and high fat content induce lipid peroxidation and systemic inflammation. This process promotes atherogenesis and structural remodeling of the vasculature, forcing the heart to increase its workload and subsequently elevating blood pressure (Zeng et al., 2023). The high incidence of Stage II Hypertension (62%) among the respondents reflects the cumulative damage of these poor dietary practices over time. Interestingly, the statistical analysis yielded a moderate correlation coefficient (r = 0.538). This specific correlation strength underscores that while diet directly dictates the severity of hypertension, individuals who maintain a relatively "Good" diet (higher in fiber, fewer fried foods) are significantly more likely to restrict their disease progression to Stage I. This aligns with Gomez-Marcos (2021), who demonstrated that adherence to diets low in sodium and high in plant-based nutrients directly halts arterial aging and attenuates hypertension severity.

Furthermore, the consumption of animal protein sources, such as broiler eggs (44%) and chicken (32%), remained suboptimal in this population. Li et al. (2023) and Tark et al. (2025) indicated that diversifying protein sources, particularly by integrating a balance of plant-based proteins (unfried) and lean animal proteins, can significantly reduce the risk of severe hypertension. The protective effect stems from the synergistic combination of essential micronutrients such as potassium and magnesium which naturally support endothelial vasodilation and natriuresis.

The dietary patterns observed in this study were also shaped by demographic characteristics. The majority of respondents were in the elderly category (60–74 years), unemployed (68%), and possessed only a basic education level (70%). Lower education and socioeconomic constraints often restrict access to accurate nutritional information and limit the ability to afford high-quality fresh produce, trapping the elderly in a cycle of relying on cheap, high-sodium, and ultra-processed foods (Adabella, 2023; Susanti et al., 2025). Moreover, elderly males in this study frequently exhibited unhealthier dietary patterns compared to females, often due to limited food preparation skills and a higher reliance on socially shared meals that are typically salty or fatty (Akbar et al., 2025; Carcedo-Argüelles et al., 2024; Fata et al., 2023).

Based on the cross-tabulation data, it was found that a small subset of elderly individuals with good dietary patterns still experienced Stage II Hypertension, and conversely, some with poor dietary patterns only experienced Stage I Hypertension. This variation perfectly contextualizes the moderate correlation coefficient (0.538) found in this study. It confirms that the incidence and severity of hypertension in the elderly are multifactorial. While dietary intake (specifically sodium and saturated fats) serves as a primary driver, the unexplained variance in blood pressure severity among this population suggests the presence of other significant contributing factors. These likely include unmeasured confounding variables in this study, such as physical activity levels, psychosocial stress, genetic predisposition, and the critical role of pharmacological adherence, which should be comprehensively investigated in future research.

4. Conclusion

The majority of the elderly exhibited poor dietary patterns, accounting for 30 individuals (60%). The incidence of hypertension among the elderly was predominantly Stage II Hypertension, affecting 31 individuals (62%). There was a statistically significant correlation between dietary patterns and the incidence of hypertension in the elderly (p = 0.000). The strength of this correlation was moderate (correlation coefficient = 0.538) with a positive direction. Future research is recommended to examine other contributing factors, such as physical activity levels, smoking habits, alcohol consumption, stress levels, and medication adherence.

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