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ORIGINAL ARTICLE

Association between dietary patterns and hypertension among older adults at the Medan Johor Community Health Center

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ABSTRACT

Hypertension is a leading global cause of mortality, with a high prevalence among the elderly. Dietary patterns constitute a modifiable risk factor. This study aimed to analyse the association between dietary patterns and the incidence of hypertension among the elderly. A quantitative study with a cross-sectional design was conducted at the Medan Johor Community Health Centre. A sample of 90 elderly individuals was selected via purposive sampling. Dietary data were collected using a Food Frequency Questionnaire (FFQ), and blood pressure was measured using a sphygmomanometer. Data analysis employed the Chi-Square test. A total of 72.2% of respondents had hypertension, and 65.6% had poor dietary patterns. Bivariate analysis indicated a significant association between dietary patterns and the incidence of hypertension (p-value = 0.022; OR = 0.268). Elderly individuals with poor dietary patterns had a 0.268 times higher risk of hypertension compared to those with good dietary patterns. A significant association exists between poor dietary patterns and the incidence of hypertension among the elderly at the Medan Johor Community Health Centre. Promotive and preventive efforts through balanced nutrition education are essential.

Keywords: hypertension, dietary patterns, elderly

Introduction

Hypertension, or high blood pressure, has long been recognised as a major global health challenge. It is often termed the "silent killer" as it frequently progresses without apparent symptoms, yet can lead to fatal complications such as coronary heart disease, stroke, renal failure, and premature death[1]. The World Health Organization (WHO) estimates that approximately 1.28 billion adults aged 30–79 years worldwide live with hypertension, nearly 46% of whom are unaware of their condition[1]. The burden of this disease is not equally distributed, with higher prevalence and lower rates of awareness and treatment in low- and middle-income countries, including Indonesia[1].

At the national level, hypertension remains a serious threat. According to the 2023 Indonesian Health Survey, the prevalence of hypertension among adults aged ≥18 years reached 34.1%[2]. This figure positions hypertension as the fourth highest risk factor for mortality in Indonesia, accounting for 10.2% of total deaths[2].

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The situation in North Sumatra Province, the location of this study, is also concerning, with an adult hypertension prevalence of 25.4%[2]. Among all age groups, the elderly (age ≥60 years) are the most vulnerable population. Physiological changes due to ageing, such as reduced vascular elasticity, increased arterial stiffness, and alterations in hormonal systems, inherently heighten susceptibility to elevated blood pressure[3]. In addition to non-modifiable factors like age and genetics, modifiable lifestyle factors play a crucial role in the pathogenesis of hypertension in the elderly.

Among various lifestyle factors, diet exerts a significant and direct influence on blood pressure regulation. An unbalanced diet, particularly one high in sodium (salt), saturated fats, and cholesterol, and low in fibre, potassium, calcium, and magnesium, is consistently associated with an increased risk of hypertension[4,5]. Excessive sodium consumption, commonly found in processed foods, fast food, and flavour enhancers, leads to fluid retention, increased blood volume, and vasoconstriction, ultimately raising blood pressure[6]. Conversely, adequate potassium intake helps relax blood vessel walls and excretes excess sodium through urine[7]. Therefore, an imbalance between sodium and potassium intake is a key driver of hypertension.

Local data from the Medan Johor Community Health Centre indicate a persistently concerning trend of hypertension cases among the elderly. Although the number of cases decreased from 2,306 in 2023 to 2,046 in 2024, the absolute figure remains high over the past three years (2,309 cases in 2022)[8]. This decline is not yet substantial enough to indicate long-term control success, making the identification of modifiable risk factors, such as diet, particularly important. Preliminary studies and field observations suggest a tendency for high salt and low fruit-and-vegetable consumption among the elderly in this region, which is strongly suspected to contribute to the high hypertension rates.

Based on this background, this study aimed to analyse the association between dietary patterns and the incidence of hypertension among the elderly in the working area of the Medan Johor Community Health Centre. This research is vital to provide local empirical evidence that can serve as a basis for planning more targeted and effective nutritional intervention and health promotion programmes at the community health centre level, to reduce hypertension prevalence and improve the quality of life for the elderly.

Method

This study employed a quantitative observational analytic design with a cross-sectional approach. The research was conducted in the working area of the Medan Johor Community Health Centre in March 2025. The study population comprised all registered elderly individuals (≥60 years) at the centre, totalling 923 persons. The minimum sample size was calculated using the Slovin formula with a 10% margin of error, yielding a sample of 90 respondents. The sampling technique was purposive sampling based on inclusion and exclusion criteria. Inclusion criteria encompassed elderly individuals aged ≥60 years, able to communicate effectively, and willing to participate by signing an informed consent form. Exclusion criteria included elderly persons with severe illness, significant cognitive impairment, or sensory disabilities hindering interview participation.

Data collection utilised a three-part questionnaire. The first section recorded respondent characteristics (age, sex, education, occupation, income). The second section consisted of a semi-quantitative Food Frequency Questionnaire (FFQ) to assess dietary patterns based on four components: diversity of food types, adequacy of sodium intake, adequacy of potassium intake, and sufficiency of meal frequency. Dietary patterns were categorised as good (total score ≥4) or poor (total score <4)[9]. The third section involved blood pressure measurement using a mercury sphygmomanometer and stethoscope. Measurements were taken twice with a 1–2 minute interval, and the average of the two readings was used. Hypertension was defined as systolic blood pressure ≥140 mmHg and/or diastolic blood pressure ≥90 mmHg[10].

Data were analysed computationally using the Statistical Package for the Social Sciences (SPSS). Univariate analysis described sample characteristics, while bivariate analysis employed the Chi-Square test with a significance level of $\alpha=0.05$ to examine the association between dietary patterns and hypertension.

Results

This study involved 90 elderly individuals who met the inclusion and exclusion criteria. The general characteristics of the respondents are presented in Table 1. The majority of respondents (68.9%) were in the young-old age group (60–70 years), followed by the 70–80 years group (30%). Most respondents were female (62.2%). Regarding education, the distribution was relatively varied, with the highest percentages

being Senior High School graduates (27.8%) and University graduates (27.8%); however, 12.2% had never attended school. Occupation-wise, respondents were predominantly homemakers (36.7%), followed by private employees (15.6%) and retired civil service/military personnel (14.4%). The majority of respondents (83.3%) had an income below the Regional Minimum Wage of Medan City.

Table 1. Frequency distribution of respondent characteristics (n=90)

Characteristic	n	%
Age		
60 – 70 Years	62	68.9
70 – 80 Years	27	30
>80 Years	1	1.1
Sex		
Male	34	37.8
Female	56	62.2
Education		
No Schooling	11	12.2
Primary School	14	15.6
Junior High School	14	15.6
Senior High School	25	27.8
Diploma	1	1.1
University	25	27.8
Occupation		
Unemployed	1	1.1
Homemaker	33	36.7
Self-Employed	11	12.2
Retired (Civil Service/Military)	13	14.4
Civil Servant/Employee	10	11.1
Farmer/Labourer	8	8.9
Private Employee	14	15.6
Income		
< Regional Minimum Wage	75	83.3
> Regional Minimum Wage	15	16.7

Blood pressure measurements indicated that the majority of respondents (72.2%) had hypertension. A total of 25 respondents (27.8%) were non-hypertensive, comprising 20 individuals in the prehypertensive category and 5 with normal blood pressure. Of the 65 hypertensive respondents, nearly half (43.3%) were in Stage 2 hypertension (systolic pressure ≥160 mmHg or diastolic ≥100 mmHg), and 28.9% had Stage 1 hypertension.

Table 2. Frequency distribution of dietary pattern components and hypertension incidence (n=90)

Variable	n	%
Dietary Pattern Components		
Food Type Diversity		
Diverse	90	100
Sodium Intake		
Adequate	46	51.1
Inadequate	44	48.9
Potassium Intake		
Adequate	33	36.7
Inadequate	57	63.3
Meal Frequency		
Sufficient (≥3 times/day)	88	97.8
Insufficient (<3 times/day)	2	2.2
Dietary Pattern Category (Overall)		
Good	31	34.4
Poor	59	65.6
Hypertension Incidence		
Non-Hypertensive (Normal + Prehypertensive)	25	27.8
Hypertensive (Stage 1 + Stage 2)	65	72.2
Detailed Category		
- Prehypertension	20	22.2
- Normal	5	5.6
- Hypertension Stage 1	26	28.9
- Hypertension Stage 2	39	43.3

Analysis of dietary pattern components revealed a varied picture (Table 2). Regarding food type diversity, all respondents (100%) consumed foods from at least three main food groups (carbohydrate sources, protein, vegetables, and fruit) daily, thus categorised as "Diverse". For meal frequency, almost all respondents (97.8%) ate at least three times daily (main meals and snacks) and were categorised as "Sufficient". However, analysis of micronutrient intake revealed serious concerns. Nearly half of the respondents (48.9%) had sodium intake deemed "Inadequate" against recommendations (outside the 80–100% range of the Recommended Dietary Allowance/RDA), typically indicating excess. More concerning, most respondents (63.3%) had potassium intake categorised as "Inadequate", usually meaning below recommendations. This imbalance between likely high sodium and low potassium intake constitutes a high-risk pattern. Overall, when combined into the dietary pattern category, 65.6% of the elderly had poor dietary patterns, while only 34.4% were assessed as having good patterns.

Table 3. Association between dietary patterns and hypertension incidence among the elderly (n=90)

Dietary Pattern	Hypertension Incidence			p-value	OR (95% CI)
	Yes	No	Total		
Good	27 (87.1%)	4 (12.9%)	31 (100%)	0.022	0.268 (0.083 – 0.870)
Poor	38 (64.4%)	21 (35.6%)	59 (100%)		
Total	65 (72.2%)	25 (27.8%)	90 (100%)		

Bivariate analysis to examine the association between dietary patterns (good vs. poor) and hypertension incidence (yes vs. no) is presented in Table 3. In the group with good dietary patterns (31 individuals), the proportion with hypertension was 87.1% (27 persons). Conversely, in the group with poor dietary patterns (59 individuals), the proportion with hypertension was lower in percentage terms, at 64.4% (38 persons). The Chi-Square test result showed this difference in proportion to be statistically significant with a p-value = 0.022 ($p < 0.05$). The Odds Ratio (OR) value of 0.268 (95% CI: 0.083 – 0.870) indicates that elderly individuals with poor dietary patterns had 0.268 times the odds of having hypertension compared to those with good dietary patterns. Another interpretation of this OR < 1 is that having a good dietary pattern is a protective factor; in other words, elderly individuals with good dietary patterns had a lower risk (approximately 3.7 times lower) of developing hypertension compared to those with poor patterns.

Discussion

This study reveals a very high prevalence of hypertension among the elderly at the Medan Johor Community Health Centre, at 72.2%. This finding aligns with research by Maqfirah et al., which reported an 84.3% hypertension prevalence among the elderly[11]. The high figure reflects hypertension as a primary health issue in the older age group, triggered by the natural ageing process that causes vascular stiffness[3]. Furthermore, the majority of respondents (65.6%) had poor dietary patterns, primarily due to inadequate sodium and potassium intake. This is consistent with research by Riwayanti et al., which found most elderly individuals had poor dietary patterns[12]. Low potassium and high sodium intake is a dietary pattern highly associated with increased blood pressure risk[7].

The main finding of this study demonstrates a statistically significant association between dietary patterns and hypertension incidence among the elderly (p=0.022). Elderly individuals with poor dietary patterns had a higher risk of hypertension. This finding is supported by studies from Hamzah et al. and Maqfirah et al., which also reported significant associations between the two variables[11,13]. The mechanism of this association can be explained through the theory of sodium consumption. Excessive sodium intake, often found in processed and salty foods, causes fluid retention and increased blood volume, thereby elevating pressure on arterial walls[6]. Conversely, potassium intake below recommendations reduces the body's ability to balance sodium's effects and dilate blood vessels[7].

Poor dietary patterns are also frequently linked to high consumption of saturated fats and cholesterol, which can accelerate atherosclerosis. The narrowing of blood vessels due to atherosclerosis forces the heart to pump more forcefully, ultimately increasing blood pressure[14]. In contrast, a good diet rich in fruits, vegetables, whole grains, and low in salt—such as the DASH diet—has proven effective in lowering blood pressure by providing potassium, magnesium, fibre, and antioxidants that support vascular health[5]. Therefore, interventions focusing on improving dietary patterns, particularly salt restriction and increased

consumption of vegetables and fruit, are key strategies in preventing and controlling hypertension in the elderly.

Conclusion

Based on the study results, it can be concluded that a significant association exists between dietary patterns and the incidence of hypertension among the elderly at the Medan Johor Community Health Centre in 2024. Elderly individuals with poor dietary patterns have a higher risk of hypertension. Most elderly individuals at the study location had hypertension and poor dietary patterns, particularly regarding sodium and potassium intake. It is recommended that the Medan Johor Community Health Centre intensify health education on balanced diets and low-salt diets specifically for the elderly, for instance through integrated health service posts for the elderly. Elderly individuals are advised to actively reduce consumption of high-salt foods, increase intake of vegetables and fruit, and have their blood pressure checked regularly. For future research, a longitudinal design is recommended to examine causal relationships and explore the influence of other variables such as physical activity and body mass index.

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