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Sodium, Potassium Intake, and Sleep Duration Linked to Hypertension in Adults 40-60 in East Jakarta

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Abstract
Hypertension is a non-communicable disease with an increasing prevalence in Indonesia, often referred to as a silent killer due to its asymptomatic nature until serious complications like stroke or kidney failure occur. This study aims to analyze the relationship between sodium intake, potassium intake, and sleep duration with hypertension among middle-aged individuals (40-60 years) in Kramat Jati Subdistrict, East Jakarta. A cross-sectional design was used, involving 97 purposively selected respondents. Data on sodium and potassium intake were collected using a 24-hour food recall method, sleep duration through structured interviews, and hypertension status through blood pressure measurements. Data were analyzed using Chi-Square and Fisher's Exact Test. The results showed no significant relationship between sodium intake and hypertension (p = 0.218), although 75% of respondents consumed excessive sodium. Conversely, potassium intake had a significant relationship with hypertension (p = 0.047), with 71% of respondents with sufficient potassium intake being non-hypertensive. Sleep duration also showed a significant association with hypertension (p = 0.032), as respondents with less than six hours of sleep had higher blood pressure. This study concludes the importance of maintaining dietary balance by increasing potassium intake, reducing sodium, and ensuring adequate sleep duration to prevent hypertension. Public education on healthy lifestyles is recommended to lower hypertension risk in urban middle-aged populations.

Keywords: Hypertension, Potassium intake, Sleep Duration, Sodium Intake

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1. BACKGROUND

Hypertension is one of the most significant public health issues worldwide, impacting individuals' quality of life and productivity. This disease is classified as a chronic condition, characterized by a recurrent and sustained increase in systolic blood pressure ≥140 mmHg or diastolic blood pressure ≥90 mmHg (Kusyani et al., 2024). Hypertension is often referred to as the "silent killer" because many individuals are unaware of its presence until serious

complications such as stroke, heart disease, or kidney failure occur (Hendra et al., 2021). (Hendra et al., 2021).

Data from the World Health Organization (WHO) in 2023 indicates that more than 1.28 billion adults worldwide suffer from hypertension, with the majority of these individuals residing in developing countries and having low awareness of their condition. Additionally, around 46% of those with hypertension are unaware they have high blood pressure (WHO, 2023).

In Indonesia, hypertension is also a leading cause of morbidity and mortality. According to a report by the Ministry of Health (2018), the national prevalence of hypertension reaches 34.1%, with the highest prevalence occurring in the 45–64 age group. In the DKI Jakarta area, the number of recorded hypertension cases in 2022 exceeded 866,000, with approximately 39% of these cases originating from East Jakarta (Dinkes-DKI, 2022) Penelitian. A study by Larasati, (2022) in Kramat Jati District revealed that the prevalence of hypertension was 22%, with nearly 30,000 individuals receiving treatment. Despite various intervention efforts by the government through healthy eating education programs, promotion of physical activity, and access to healthcare services, the prevalence of hypertension remains high, indicating the need for a more comprehensive and specific approach tailored to the local community conditions (Irwanto et al., 2023).

The risk factors for hypertension are divided into two categories: non-modifiable factors such as age, gender, and genetics, and modifiable factors such as diet, physical activity, and sleep duration (Rita & Ramayulis, 2019). Among the modifiable factors, sodium intake, potassium intake, and sleep duration are of particular concern due to their significant roles in regulating blood pressure (Chantakeeree et al., 2022). Excessive sodium consumption can increase blood volume through fluid retention, leading to elevated blood pressure. Conversely, potassium helps lower blood pressure by counteracting sodium effects and promoting sodium excretion through urine (Rachmasari & Mardiana, 2022). Inadequate sleep duration, particularly less than 6 hours per night, is also associated with increased blood pressure due to heightened sympathetic nervous system activity and higher salt retention (Rita & Ramayulis, 2019). Previous studies have shown that high sodium intake, low potassium intake, and short sleep duration are significantly associated with the

incidence of hypertension (Fitri et al., 2018; Li et al., 2019).

Middle age (40–60 years) is a vulnerable age group for hypertension because individuals at this stage are transitioning from productive to older age, where the risk of degenerative diseases such as hypertension increases (Ahadiyanto, 2021). This group is also crucial in hypertension prevention efforts as they still have opportunities to make effective lifestyle modifications. Preliminary research in Kramat Jati Sub-district, East Jakarta, identified that the prevalence of hypertension in this age group is quite high, influenced by high salt intake, low potassium intake, lack of physical activity, and limited access to healthy lifestyle facilities such as parks or sports fields (Larasati, 2022). The low socio-economic conditions also contribute to the high prevalence of hypertension in this area.

Based on these facts, this study aims to analyze the relationship between sodium intake, potassium intake, and sleep duration with the incidence of hypertension among individuals aged 40-60 years in Kramat Jati Sub-district, East Jakarta. It is hoped that the findings of this study will make a significant contribution to hypertension prevention and control efforts, especially through evidence-based policies and community education interventions to improve the overall quality of life and public health.

2. METHODS

This study employs a quantitative observational design with a cross-sectional approach to analyze the relationship between sodium intake, potassium intake, and sleep duration with the incidence of hypertension among individuals aged 40–60 years in Kramat Jati Sub-district, East Jakarta. The research was conducted from late August to mid-September 2024. This design allows for simultaneous data collection to evaluate the relationships between variables.

The study population consists of individuals aged 40–60 years residing in Kramat Jati Sub-district. The sample was selected using a cluster sampling technique in three randomly chosen RWs (RW 1, RW 2, and RW 4). Respondents were selected using the snowball sampling method with inclusion criteria of individuals aged 40–60 years, while exclusion criteria included individuals with severe disease complications or those who withdrew from the study.

Data were collected through blood pressure measurements using a

sphygmomanometer by trained nurses, interviews regarding sodium and potassium intake using a Semi Quantitative Food Frequency Questionnaire (SQ-FFQ), and sleep duration through questionnaires. Sodium and potassium intake were calculated as total daily consumption using Nutri Survey software (Al-faida, 2023). Data processing included examination, coding, entry, and cleaning before analysis. Univariate analysis was used to describe the frequency distribution of variables, while bivariate analysis employed the Chi-Square test or Fisher's Exact Test to evaluate relationships between variables (Swarjana, 2023). This approach ensures valid and reliable results regarding hypertension risk factors in the study population.

The study variables include both dependent and independent variables. The dependent variable is the incidence of hypertension, defined as a recurrent and sustained increase in systolic blood pressure of 140 mmHg or more, or diastolic blood pressure of 90 mmHg or more. The independent variables are sodium intake, potassium intake, and sleep duration. Sodium intake is measured as the total daily consumption of sodium, categorized based on dietary guidelines. Potassium intake is similarly measured as the total daily consumption of potassium, again categorized according to dietary guidelines. Sleep duration is the total number of hours of sleep per night, categorized as either adequate (six hours or more) or inadequate (less than six hours). Ethical approval for this study was obtained from the relevant Institutional Review Board, ensuring that all procedures adhere to ethical standards for research involving human participants.

3. RESULTS

This study was conducted in Kramat Jati Sub-district, located in East Jakarta, covering an area of approximately 2.65 km². According to geographical data, this sub-district is situated at an elevation of 5-45 meters above sea level with relatively flat terrain. The area borders Cawang Sub-district to the north, Batu Ampar Sub-district to the south, Dukuh Sub-district to the east, and Cililitan Sub-district to the west. Kramat Jati Sub-district has 14 neighborhood units (RW) and 150 community units (RT) with a population of more than 40,000 people. One of the main economic centers in this area is the Kramat Jati Main Market, which is a primary provider of food and household necessities.

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This study involved 97 respondents aged between 40 and 60 years. The demographic characteristics of the respondents include age, gender, education level, occupation, and history of hypertension. The detailed demographic characteristics showed in Table 1.

Tabel 1. Distribution of Respondent Characteristics

Variable	Category	Σ	%
Age	40-47 years	39	40
	48-54 years	29	30
	55-60 years	29	30
Gender	Female	83	86
	Male	14	14
Education	Junior High School	2	2
	Senior High School	88	91
	Bachelor's Degree	7	7
Occupation	Housewife	63	65
	Entrepreneur	29	30
	Other	5	5
Hypertension History	Yes	55	57
	No	42	43

The table above indicates that the majority of respondents fall within the age range of 40-47 years, accounting for 40%. Respondents aged 48-54 years and 55-60 years each make up 30%. The majority of respondents are female, comprising 86%, while males account for only 14%. In terms of educational level, most respondents are high school graduates (91%), followed by undergraduates (7%) and junior high school graduates (2%). This indicates that the majority of respondents have a senior high school level of education.

The majority of respondents are housewives (65%), followed by entrepreneurs (30%), and others (5%), indicating a dominance of domestic work among the respondents. Regarding the history of hypertension, 57% of respondents have a history of hypertension, while the remaining 43% do not. This data provides a general overview of the demographic characteristics of the respondents, which will be used for further analysis to understand health patterns and determinants within this population.

This study includes variables such as the incidence of hypertension, potassium intake, sodium intake, and sleep duration. The frequency distribution of each variable is shown in table 2.

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Tabel 1. Frequency Distribution of Research Variables (N=97)

Variable	Category	Σ	%
Hypertension Incidence	No Hypertension	41	42
	Hypertension	56	58
Potassium Intake	Insufficient	39	40
	Sufficient	58	60
Sodium Intake	Sufficient	24	25
	Excessive	73	75
Sleep Duration	Abnormal	59	61
	Normal	38	39

Based on the findings, the majority of respondents experienced hypertension, with 56 individuals (58%) affected, while 41 individuals (42%) did not have hypertension. Regarding potassium intake, 60% of respondents (58 individuals) had adequate intake, whereas 40% of respondents (39 individuals) had inadequate intake. Meanwhile, in terms of sodium intake, the majority of respondents, 75% (73 individuals), consumed excessive sodium, while only 25% (24 individuals) had adequate sodium intake.

Concerning sleep duration, 61% of respondents (59 individuals) had abnormal sleep duration, whereas 39% of respondents (38 individuals) had normal sleep duration. These findings indicate that the majority of respondents have excessive sodium consumption and abnormal sleep duration, which may contribute to the high prevalence of hypertension in this population.

Bivariate analysis was conducted using the Chi-Square test and Fisher's Exact Test to examine the relationships between variables. Fisher's Exact Test was utilized when the Chi-Square test requirements were not met. In this study, the relationship between sodium intake and hypertension was analyzed using Fisher's Exact Test due to the presence of cells with small frequencies. Decisions were based on the p-value; if $p > 0.05$, there was no correlation.

The results of the analysis of the relationship between sodium intake and the incidence of hypertension are presented in the following table 3.

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Tabel 3. The Relationship Between Sodium Intake, Potassium Intake, Sleep Duration and Hypertension Incidence

		Hypertension		No Hypertension		Total		P Value
		f	%	f	%	f	%	
Sodium Intake	Excessive	40	54.80%	33	45.20%	73	100%	0.218
	Sufficient	16	66.70%	8	33.30%	24	100%	
	Total	56	57.70%	41	42.30%	97	100%	
Potassium Intake	Insufficient	27	69.20%	12	30.80%	39	100%	0.047
	Sufficient	29	50%	29	50%	58	100%	
	Total	56	57.70%	41	42.30%	97	100%	
Sleep Duration	Abnormal	55	93.20%	4	6.80%	59	100%	0.000
	Normal	1	2.60%	37	97.40%	38	100%	
	Total	56	57.70%	41	42.30%	97	100%	

The test of the relationship between sodium intake and the incidence of hypertension showed a p-value of 0.218, which is greater than 0.05, indicating no significant relationship between sodium intake and the incidence of hypertension among respondents. The majority of respondents with higher sodium intake, 40 respondents (54.8%), tended to experience hypertension. However, statistically, this relationship is not significant. This result was interpreted using Fisher's Exact Test due to the presence of cells with small frequencies, namely, 8 respondents with adequate sodium intake who did not experience hypertension.

The test of the relationship between potassium intake and the incidence of hypertension showed a p-value of 0.047, which is less than 0.05, indicating a significant relationship between potassium intake and the incidence of hypertension. Respondents with low potassium intake, 27 respondents (69.2%), were more likely to experience hypertension compared to respondents with adequate potassium intake, 29 respondents (50%).

The relationship between sleep duration and the incidence of hypertension showed a p-value of 0.000, which is less than 0.05. This indicates a highly significant relationship between sleep duration and the incidence of hypertension. The majority of respondents with abnormal sleep duration, 55 respondents (93.2%), experienced hypertension. Conversely, 37 respondents (97.4%) with normal sleep duration were more likely not to experience hypertension.

From the analysis results, sodium intake does not have a significant relationship with the incidence of hypertension, whereas potassium intake and sleep duration show significant relationships with the incidence of

hypertension. These findings underscore the importance of improving potassium intake and maintaining normal sleep duration as preventive measures against hypertension.

4. DISCUSSION

The study results show a significant relationship between potassium intake and the incidence of hypertension (p = 0.047), where respondents with adequate potassium intake were less likely to experience hypertension compared to those with insufficient potassium intake. This finding aligns with Purnamasari et al. (2022), which explains that potassium can lower blood pressure through natriuretic effects and vascular relaxation. The ideal sodium-potassium ratio is crucial in reducing the risk of hypertension, as emphasized by O'Donnell et al. (2021). Community education to increase the consumption of potassium-rich foods, such as tempeh, green beans, and fruits, should be promoted as part of hypertension prevention strategies.

Sodium intake in this study did not show a significant relationship with the incidence of hypertension (p = 0.218), although 75% of respondents had sodium intake exceeding WHO recommendations (<2,000 mg/day). This may be due to individual variations in sodium sensitivity and the influence of the sodium-potassium ratio. O'Donnell et al. (2021) highlight that the sodium-potassium ratio is a stronger indicator for hypertension than sodium consumption alone. Diet-based interventions to reduce sodium intake, such as decreasing the consumption of instant noodles and processed foods, should be integrated with increased potassium intake to improve the sodium-potassium ratio and reduce the risk of hypertension.

Sleep duration also has a significant relationship with the incidence of hypertension (p < 0.000), with 93.2% of respondents with less than 6 hours of sleep experiencing hypertension. Lack of sleep increases cortisol stress hormone and sympathetic nervous system activity, contributing to elevated blood pressure (Ifadah et al., 2024). Socio-economic and environmental conditions, such as long working hours or night shifts and dense and noisy environments, also affect the sleep quality of the community in Kramat Jati Sub-district. Interventions such as education on the importance of sufficient sleep, time management, and relaxation techniques are necessary to reduce the risk of hypertension.

Age and gender factors also influence the incidence of hypertension. The majority of respondents are in the 40-60 age group,

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which has a higher risk due to decreased vascular elasticity and degenerative processes (Luthfiyah et al., 2023). Female respondents are more prone to hypertension, especially after menopause, due to the reduction of estrogen levels that have protective effects on blood vessels (Khasanah, 2022). Additionally, low educational levels (91% are only high school graduates) can limit understanding of hypertension and healthy lifestyles. Being a housewife also contributes to psychosocial stress that increases the risk of hypertension (Setiyorini et al., 2021).

This study emphasizes the importance of a holistic approach to reducing the risk of hypertension in the community. Community-based education programs should prioritize promoting a potassium-rich diet, reducing sodium intake, and increasing awareness of the importance of sufficient sleep. The government also needs to support the management of an environment conducive to quality sleep, such as reducing noise in residential areas. An integrative approach involving education, dietary interventions, and stress management can significantly reduce the prevalence of hypertension and improve cardiovascular health in the community.

5. CONCLUSION

This study concludes that potassium intake and sleep duration have significant relationships with the incidence of hypertension in the 40–60 age group in Kramat Jati Sub-district, East Jakarta, while sodium intake does not show a significant relationship. A high potassium diet and sufficient sleep duration can help reduce the risk of hypertension through mechanisms of blood pressure regulation and physiological stress reduction. Additionally, age, gender, and educational level also contribute to the high prevalence of hypertension in this population.

Further research is recommended to explore the influence of other lifestyle factors, such as physical activity and stress levels, on hypertension to obtain a more comprehensive picture. Intervention studies involving community-based education programs on healthy eating patterns, stress management, and sleep management are also needed to directly evaluate their impact on reducing hypertension risk.

AUTHOR CONTRIBUTIONS

The primary author was responsible for the planning, data collection, analysis, and writing article.

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CONFLICT OF INTEREST

The authors declare that there are no conflicts of interest in this research. All research activities were carried out without any external influence that could affect the objectivity of the results

DATA AVAILABILITY STATEMENT

The data supporting the findings of this research are available from the corresponding author upon reasonable request.

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