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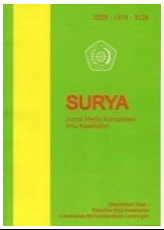

The Relationship between Fat Consumption Frequency and Body Mass Index on Hypertension in Ampel Village, Lawang

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ABSTRACT

Introduction: Hypertension is a non-communicable disease and a leading cause of mortality worldwide. One of modifiable risk factor is excess body mass as it is known to facilitate a series of metabolic disturbances. This study aims to determine whether there is an relationship between fat consumption frequency and body mass index with hypertension.
Methods: This cross-sectional study, conducted in Dusun Ampel Gading, Mulyoarjo Village, Lawang District, Malang Regency, minimal 44 respondents determined using a two-proportion comparison formula. Participants were selected through convenience sampling. Independent variables included the frequency of consuming foods containing fat and body mass index measured by Food Frequency Questionnaire, while the dependent variable was blood pressure. The Spearman Correlation test was used to analyze the relationship between these variables and hypertension.
Results: A total of 50 respondents were obtained. The respondents were predominantly female and adults. Most of them did not have a family with hypertension. Spearman correlation analysis revealed no significant relationship between fat consumption frequency and hypertension ($p > 0.05$) or between BMI and hypertension ($p > 0.05$).
Conclusion: Effective prevention requires addressing multiple modifiable risk factors beyond fat consumption frequency and BMI, as their interactions are complex. Comprehensive strategies targeting these factors simultaneously are essential.

Keywords: Fat Consumption Frequency, Body Mass Index, Hypertension, Public Health

INTRODUCTION

Hypertension is defined as condition which a measured blood pressure equal to or

above the normal threshold, with a systolic pressure of 140 mmHg and a diastolic pressure of 90 mmHg (Ministry of Health, 2021; Unger et al., 2020). Elevated blood pressure is closely linked to the world burden of cardiovascular disease and premature death. The majority of deaths from uncontrolled hypertension are caused by acute myocardial infarction, ischemic stroke, and hemorrhagic stroke (Mills et al., 2020). Untreated hypertension contributes to increased arterial stiffness, increased systolic blood pressure, and widened pulse pressure. It can reduce coronary perfusion while increasing myocardial oxygen demand. If these conditions persist, they can lead to myocardial hypertrophy and heart failure (Harrison et. al, 2021).

Hypertension is still prevalent from global level to local. Based on Mills et al., (2016) global studies of hypertension, 31.1% of adults is suffering from hypertension, with slightly higher prevalence in men (31.9%) than in woman (30.1). In Indonesia, the prevalence of hypertension in 2018 in the population over 18 years old was 34,1%, and had increased from 5 years ago with 25,8% (Ministry of Health, 2018). According to data from the Indonesian Ministry of Health in 2019, hypertension was ranked first as the most common disease in Malang City with a total of 35,641 cases.

Hypertension risk factors is generally classified as non-modifiable and modifiable categories. The non-modifiable includes family history of hypertension, age, and gender. Modifiable risk factors include smoking, overweight, high salt intake, alcohol consumption, caffeine intake, and physical inactivity (Purwono J., 2020). Another significant factor is excess body mass. A body mass index (BMI) above the normal range is known to facilitate a series of metabolic disturbances, as excess adipose tissue promotes gluconeogenesis. This shifts extracellular pressure to intracellular, activating the renin-angiotensin-aldosterone system (RAAS), which, in turn, affects blood pressure regulation (Leggio et al., 2017).

This study aims to analyze the potential relationship between fat consumption frequency and body mass index with hypertension. Understanding these two relationships is important, as those modifiable risk factors can be targeted through lifestyle interventions. Thus, the findings could at least provide evidence for improving public health by mitigating these factors.

METHOD

This study design is a cross-sectional study that observes relationship between cause and effect, both present or absent simultaneously at a specific point in time. This study did not involve any intervention, making it purely observational and analytical. The population selected was the residents of Dusun Ampel Gading, Mulyoarjo Village, Lawang District, Malang Regency. The minimal sample size is 44 respondents, calculated based on the comparison formula for two proportions, using data from a previous study (Harahap, 2020).

The sample was selected by convenience sampling method. The inclusion criteria is Ampel Gading Village locals above 18 years old whom agreed to informed consent. The exclusion criteria is the respondent had a cognitife impairment that led to difficulty in understanding and answering the questions. All respondents were over 18 years of age and were not experiencing cognitive impairments that would hinder valid questionnaire responses.

Variables in this study included the independent variables, the frequency of consuming foods containing fat and body mass index, and the dependent variable, which is blood pressure. Fat consumption patterns were measured using the Food Frequency Questionnaire (FFQ) completed by respondents, with responses categorized ordinally as never, rarely, sometimes, and often. Body mass index was calculated from

direct measurements of each respondent's weight and height and classified ordinally based on the Asia-Pacific category: underweight, normal, overweight, obesity class 1, and obesity class 2 (Mulyasari et. al, 2023).

Blood pressure was obtained directly using a digital sphygmomanometer for each respondent and categorized according to JNC VIII as normal, pre-hypertension, hypertension stage I, and hypertension stage II (James et. al, 2014). The relationship between these two variables and hypertension was then tested by statistical analysis using Spearman Correlation test in IBM SPSS Version 23.0. All data was first processed to address error, inconsistency, and missing values in the dataset thus minimizing bias.

Data collection was conducted on December 13, 2023. All data in this study were collected after obtaining informed consent from each respondent. This study has no ethical constraints as an ethics approval letter has been issued by the Health Research Ethics Committee of the Faculty of Medicine, Universitas Airlangga, with approval number 51/EC/KEPKA/FKUA/2023, valid from February 20, 2023 to February 20, 2024.

RESULTS

A total of 50 respondents were obtained. The respondents were predominantly female and adults. Most of them did not have a family with hypertension. Based on fat consumption frequency, the majority reported rarely or never consuming fats. Nutritional status, as measured by body mass index, varied considerably, with the majority classified as obese, either in obesity class 1 or obesity class 2. The majority of respondents had abnormal blood pressure, classified as either grade 1 or grade 2 hypertension. The detail is on Table 1.

Table 1. Respondents Characteristics

Characteristic	n	(%)
Gender		
Male	12	24%
Female	38	75%
Age		
Adult	20	40%
Pre-elderly	19	38%
Elderly	11	22%
Family History of Hypertension		
Negative	13	26%
Positive	37	74%
Total	**50**	**100%**

The data obtained were processed into Table 2 to compare the frequency of fat consumption with respondents' blood pressure. The majority of respondents with abnormal blood pressure reported fat consumption frequencies categorized as 'never' or 'rarely.' Most respondents with normal or pre-

Table 2. Relationship between Fat Consumption and Hypertension

Fat Consumption Frequency	Blood Pressure				p-value	R_s
	Normal	Pre-hypertension	Hypertension Grade I	Hypertension Grade I		
Never	2 40%	6 33,3%	6 42,9%	7 53,8%	0,112	0,228
Rarely	1 20%	7 38,9%	8 57,1%	5 38,4%		
Sometimes	2 40%	4 22,2%	0 0%	0 0%		
Often	0 0%	1 5,6%	0 0%	1 7,8%		
Total	5 100%	18 100%	14 100%	13 100%		

Table 3. Relationship between Body Mass Index and Hypertension

Body Mass Index	Blood Pressure				p-value	R_s
	Normal	Pre-hypertension	Hypertension Grade I	Hypertension Grade I		
Underweight	0 0%	0 0%	1 7,1%	0 0%	0,486	0,101
Normal	0 0%	5 27,8%	3 21,4%	2 15,4%		
Overweight	2 40%	2 11,1%	3 21,4%	1 7,8%		
Obesity Class I	1 20%	7 38,9%	3 21,4%	4 30,8%		
Obesity Class II	2 40%	4 22,2%	4 28,6%	6 46,2%		
Total	5 100%	18 100%	14 100%	13 100%		

hypertensive blood pressure also reported fat consumption frequencies in the 'never' or 'rarely' categories. Respondents with pre-hypertensive blood pressure showed a more varied frequency of fat consumption (including all four categories) compared to other blood pressure groups. The results of the Spearman correlation test analysis between fat consumption frequency and hypertension showed a p-value > 0.05, indicating no relationship between fat consumption frequency and hypertension.

The data obtained were also processed into Table 3 to compare BMI with respondents' blood pressure. There were no respondents with a normal BMI who had normal blood pressure. Most respondents with a BMI above the normal range also had blood pressure above the normal range. While the majority of respondents with hypertension, either stage I or stage II had a BMI classified as obese. The Spearman test analysis between body mass index (BMI) and hypertension showed a p-value > 0.05, indicating no relationship between BMI and hypertension.

DISCUSSION

Fat Consumption Frequency and Hypertension

This study aligns with findings by Komalasari et al. (2022), which showed no relationship between fat consumption and hypertension. In that study, the absence of an observed relationship was attributed to the use of a food recall method that did not ask respondents in detail about the amount of oil consumed in each food item. This limitation is similar to the current study, as no detailed data were obtained regarding the fat content of each food consumed or the portion size eaten by respondents.

Pathogenetically, hypertension is a multifactorial disease. Factors potentially associated with fat consumption frequency and hypertension, such as physical activity, were not examined in this study. Other hypertension risk factors, including alcohol consumption, smoking history, emotional stress, physical activity, and other medical conditions, may have acted as confounding variables in this study (Purwono J., 2020).

What this study found also align with those of Listiana (2017), who conducted research on 50 hypertensive patients at RSUD dr. M. Yunus Bengkulu and found no relationship between fat consumption and hypertension. In contrast, research by Wijaya et al. (2020) showed that there is a relationship between lipid containing food consumption patterns and hypertension (p-value = 0.000). Similar findings were found in a study conducted in Sidoarjo, Indonesia, which showed that there is a relationship between fat-rich food intake and blood pressure, both systolic and diastolic, thus increasing the risk of hypertension (Saputri et al., 2020).

Body Mass Index and Hypertension

Body mass index, especially in the obese category, can be associated with hypertension through various mechanisms, including the deregulation of white adipose tissue. This deregulation releases fatty acids and pro-inflammatory factors, which lead to endothelial dysfunction and impair vascular homeostasis. Endothelial dysfunction can cause arteriole spasms that contribute to increased blood pressure. Damaged endothelium also disrupts the renin-angiotensin-aldosterone system (RAAS) (Gonzales, 2017).

A study by Telaumbanua & Tobing (2022) yielded similar findings, showing no relationship between body mass index and hypertension among adults in Medan. Another study by Khalid et al. (2020) presented slightly different results by using a modified method to differentiate measurements by respondent gender. This study found that BMI and blood pressure had only a weak relationship in male respondents and no relationship in female respondents. In contrast, a study conducted in East Java Province by Herdiani (2019) found differing results from the current study, demonstrating an relationship between nutritional status and hypertension.

CONCLUSION

Preventive measures are essential to reduce the risk of complications from hypertension, which can lead to death. One approach to prevention is mitigating modifiable risk factors in individuals. Examples of such risk factors include fat consumption frequency and body mass index. This study shows the absence of a relationship between these two factors and hypertension. However, other studies presented both similar and contrasting findings, indicating a complex interaction among risk factors. This suggests that effective prevention strategies should address multiple risk factors simultaneously through a comprehensive approach.

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