SMOKING, PHYSICAL ACTIVITY, AND HYPERTENSION INCIDENCE AMONG OLDER ADULTS IN MALANG, INDONESIA

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ABSTRACT

Hypertension is a crucial health concern that requires attention, and it can be influenced by factors such as smoking and physical activity. According to a study conducted at Lawang Health Center, Malang, Indonesia, in 2020, 13.5% of the population in RW 05, Bedali Village, Malang, suffered from hypertension. It was one of the top three prevalent diseases in the village, especially among individuals aged over 69 years. The objective of this research was to examine the relationship between smoking, physical activity, and the occurrence of hypertension among older adults in RW 05, Bedali Village, Lawang, Malang. The study employed a case-control analytic observational method, involving 25 cases and 25 controls within the older adult age group (>45 years). The participants consisted of 50 individuals, including 23 men and 27 women. Among the respondents, 23 were smokers, while 27 were non-smokers. Additionally, 25 respondents engaged in light physical activity, whereas 25 respondents had moderate to vigorous physical activity levels. The analysis indicated a significant correlation between smoking, physical activity, and the prevalence of hypertension among older adults in RW 05, Bedali Village, Lawang, Malang, with a p-value of 0.005 for each factor.

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INTRODUCTION

Hypertension is one of the health problems that is still a major concern to be resolved. Globally, there are 1.4 million adults with hypertension, of which hypertension cases take the largest proportion in the type of non-communicable disease cases in the world [1]. *Riset Kesehatan Dasar Republik Indonesia* (2018) showed that the incidence of hypertension in the age group >15 years reached 34.1% with a distribution in the population aged 18 years of 34.1%, 31-44 years of age of 31.6%, 45-54 years of age of 45.3%, and 55-64 years of age of 55.2% [2]. *Badan Penyelenggara Jaminan Sosial*

(BPJS) stated that the cost of hypertension services has been increasing every year, reaching 3 trillion rupiahs in 2018 [3].

Previously, hypertension had been strongly associated with two risk factors, both non-modifiable, such as neurotransmitters, hormones, and genetics, and modifiable, such as smoking, physical activity, and sodium consumption [1]. The impact of hypertension can lead to high morbidity and mortality [4]. Complications such as heart disease, stroke, or other organ damage incidence could emerge as a result of late control of severe hypertension [1].

Cigarette use becomes the biggest threat to public health in the world, killing more than 8 million people each year [5]. Results from the Global Adult Tobacco Survey (GATS) in 2021 showed that 34.5% of the total Indonesian population aged >15 years were active smokers [6]. In a study conducted by Dismiantoni, et. al, 36 of 42 respondents (85.7%) with smoking habits had hypertension [7]. Smoking plays a role in the thickening and narrowing of the blood vessels, resulting in altered blood pressure regulation [8]. On the contrary, another study conducted by Susi and Aribowo with 102 respondents showed no significant relationship between smoking habits and the incidence of essential hypertension [9].

In addition to smoking, physical activity may also affect the incidence of hypertension. People with a sedentary lifestyle who have less physical activity pose a higher risk of suffering from hypertension [10]. A study conducted by Firdaus and Suryaningrat on 100 people with hypertension showed a significant correlation between physical activity and hypertension [11]. Decreased physical activity was found to have a direct relationship with weight gain and increased risk of hypertension [12]. Meanwhile, another study conducted by Garwahusada and Wirjatmadi on 96 employees of the Central Java Provincial Health Office showed no correlation was found between both variables [13].

Based on data from the *Unit Pelaksana Teknis* (UPT) of the Lawang Health Center, Malang Government Health Office in 2020, hypertension was included in the top 3 diseases in Bedali Village with hypertension patients between the age range of 5-14 years as many as 0 people, 15-44 years as many as 24 people, 45-69 years 36 people, and >69 years as many as 98 people. The highest prevalence of hypertension was in RW 05, according to data from public health officials in Bedali Village, and it tended to increase annually. The prevalence of hypertension among the 400 individuals in RW 05 was high, with a 13.5% incidence rate, higher than Indonesia's national hypertension incidence [2]. The distribution of people who smoked in RW 05 reached 281 people (70%). This data was a subject to further investigation, thus the authors decided to research the correlation between smoking and physical activity with the incidence of hypertension in RW 05, Bedali Village, Lawang, Malang, Indonesia.

MATERIALS AND METHODS

The Faculty of Medicine of Universitas Airlangga's ethical committee gave its clearance in an ethical clearance number of 51/EC/KEPK/FKUA/2023, dated 20 February 2023 before this observational analytical study with a case-control design was started. The study was conducted on the elderly age group (>45 years) who lived in RW 05, Bedali Village, Lawang, Malang. The population of this study consisted of 25 cases and 25 controls,

subjected to questionnaires consisting of questions regarding the respondent's identity, history of hypertension, smoking habits, and physical activity. Patients with blood pressure of >140/90 mmHg, a recorded history of hypertension, domiciled in RW 05, Bedali Village, Lawang District, Malang, Indonesia, were included in this study. Patients with medical conditions incompatible with having their blood pressure measured, unable to communicate fluently, experiencing emergencies, and having a previous history of kidney failure and diabetes mellitus were excluded. The correlation between the dependent and independent variables was tested using the IBM SPSS. Categorical data were processed in the form of frequency distribution tables to determine the frequency and percentage, whereas analytical tests were carried out to determine the correlation between modifiable factors and the incidence of hypertension in older adults. This study used Fisher's Exact Test because the data did not fulfill the requirements for the chi-square test. The variable for the multivariate model was a variable with a p-value <0.25 in univariate analysis.

RESULTS

A total of 25 cases and 25 controls were recruited from the residents of RW 05, Bedali Village, Lawang, Malang. The respondents were mostly female in total (54%), but the proportion of hypertension was higher in male respondents (68%). As many as 68% of the respondents who had hypertension were found to have smoking habits. In comparison, the control group consisted of more respondents who did not smoke (76%). Light activity and moderate to vigorous physical activity both had the same number of responses (50%). The case group (72%), which had hypertension, generally engaged in light physical activity, whereas the control group (72%), mostly engaged in moderate to vigorous activity.

Table 1. General Characteristics and Bivariate Analysis

Variables	Hypertension				TOtal		*p-value*
	Case	%	Control	%	n	Total	
Sex							
Male	17	68	6	24	23	46	0.005
Female	8	32	19	76	27	54	
Smoking							
Yes	17	68	6	24	23	46	0.005
No	8	32	19	76	27	54	
Physical Activity							
Light	18	72	7	28	25	50	0.005
Moderate-Vigorous	7	28	18	72	25	50	
Total	25	100	25	100			

Table 2. Multivariate Analysis

Variable	OR	95% CI	*p-value*
Sex	0.000	0.000	0.998
Physical Activity	0.000	0.000	0.998

Bivariate analysis was then performed on both smoking and physical activity variables towards the incidence of hypertension using Fisher's exact test. A significant correlation was found between smoking and hypertension with a p-value of 0.005. The same finding was obtained on the analysis between physical activity and hypertension with a p-value of 0.005. A multivariate analysis model was also performed on the variables of sex, smoking, and physical activity on the incidence of hypertension. The test results showed no significant association with a respective p-value of 0.998 (p>0.05).

DISCUSSION

This study found consistency with those of earlier research, which showed that more than 50% of hypertension patients smoked[14–16]. In contrast to this study, Jurgen, Jeini, and Sekplin's investigation on the prevalence of hypertension in the work environment of the Molompar Health Center in Belang, Minahasa in 2019 produced different findings; only 40% of the respondents smoked. This might have resulted from the different levels of stress in the region. Health centers in Belang, Minahasa promoted non-smoking behaviors by offering counseling and regular education on the risks of smoking.[17].

In terms of physical activity, there were results in this study similar to the findings in a study by Wedri et al, where 82.4% of the respondents with hypertension performed only light to moderate physical activity [18].

Our study found that, when assessed using multivariate analysis, there was no discernible relationship between smoking and physical activity and the risk of hypertension. This analysis showed male respondents were 0.090 times more at risk of developing hypertension compared to female respondents. Respondents who had light activity were 0.214 times more at risk of developing hypertension compared to those who had vigorous physical activity. Ali and Sumardiyono conducted a similar study on the increasing prevalence of hypertension with the escalating number of sedentary activities and smokers in each province in Indonesia, in which the multivariate analysis showed that both variables contributed to a 27x higher prevalence of hypertension[19].

However, when the bivariate analysis was conducted between each of both variables and the incidence of hypertension in this study, significant correlations were found (p smoking=0.005; physical activity=0.005). Smoking is highly related to hypertension allegedly due to altered blood pressure regulation with rapid effects on the autonomic nervous system and also accelerated arterial aging, which plays a role in chronic hypertension[20]. Andriani et al conducted a cohort study with 10,426 samples aged more than 15 years who had a smoking habit and followed them from 2000 to 2015 in which the results showed that there were notable changes in blood pressure in samples who smoked [21]. In addition to smoking, light-intensity physical activity (such as housework) is also closely related to hypertension. The less physical activity a person has, the more constrained the supply of blood and oxygen will be, resulting in increased blood pressure [22]. This condition may impose the arterial wall which causes elevated peripheral resistance and thus further increases blood pressure. Lack of physical activity can also lead to an increased risk of weight gain, which will

eventually affect blood pressure as well [23]. Nutrition, stress levels, obesity, and other non-modifiable factors such as genetics and age are also known to contribute to the incidence of hypertension, therefore further research needs to be carried out to determine the role of these factors [18,24,25]. The advantage of this study is that the results of this study can be used as additional knowledge about hypertension and its risk factors in RW 05 Bedali Village. The weakness of this study is that it requires bivariate analysis to determine the relationship between smoking and physical activity.

CONCLUSION

Smoking and physical activity simultaneously are not significantly correlated to the incidence of hypertension in RW 05, Bedali Village, Lawang, Malang. However, based on bivariate analysis, both smoking and physical activity had a significant influence on the incidence of hypertension.

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CONFLICT OF INTEREST

There are no conflicts of interest.

PATIENT CONSENT FOR PUBLICATION

All study participants provided informed written consent before study enrollment.

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AUTHOR CONTRIBUTION

The authors indicated in parentheses made substantial contributions to the following tasks of research: initial conceptualization (M.Z., A.R., F.M., I.Q, K.A., A.P.); design (I.Q.), collection of data (M.Z., A.R., F.M., I.Q, K.A.); analysis and interpretation of data (M.Z., S.S., F.M., I.Q., K.A.); writing and revision of paper (M.Z., A.R., S.S., F.M., I.Q., K.A., A.P.).

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