



ORIGINAL ARTICLE

The association between lifestyle and hypertension among elderly: A cross-sectional study at the Merdeka Community Health Center, Karo Regency

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ABSTRACT

Background: Hypertension is a non-communicable disease with a continually rising prevalence, particularly within the elderly population. Lifestyle factors play a critical role in influencing the risk of developing hypertension. This study aimed to determine the relationship between lifestyle and the incidence of hypertension among the elderly at Merdeka Health Center in 2025.

Methods: This study employed a quantitative design with a descriptive correlational method and a cross-sectional approach. The study population consisted of all 125 elderly individuals who visited the Merdeka Health Center between January and December 2024. A sample of 55 respondents was selected using an accidental sampling technique. Data were collected through questionnaires and blood pressure measurements and were subsequently analyzed using the Spearman's rho correlation test with a significance level of $\alpha=0.05$.

Results: The findings indicated a significant relationship between physical activity ($p=0.046$; $r=-0.270$), dietary patterns ($p=0.029$; $r=0.295$), rest/sleep habits ($p=0.007$; $r=0.361$), pesticide exposure ($p=0.009$; $r=-0.351$), and family history of hypertension ($p=0.000$; $r=0.512$) with the incidence of hypertension in the elderly. However, no significant relationship was found between smoking history and the incidence of hypertension ($p=0.057$; $r=-0.258$).

Conclusion: Most of the investigated lifestyle components—specifically physical activity, dietary patterns, and rest habits—along with pesticide exposure and family history, have a significant association with the incidence of hypertension in the elderly. It is therefore recommended that elderly individuals adopt a healthy lifestyle for the prevention and control of hypertension.

Keywords: lifestyle, hypertension, elderly

Introduction

Non-communicable diseases (NCDs) represent a significant health challenge, characterized by escalating rates of morbidity and mortality. Mortality from NCDs is projected to continue rising globally, becoming the most common etiology of death by 2030. The global status report on Noncommunicable Diseases (NCDs) indicated that in 2016, NCDs were responsible for 71% of the 57 million deaths worldwide. The World Health Organization (WHO) has identified four main types of NCDs responsible for these deaths: cardiovascular diseases, cancer, chronic respiratory diseases, and diabetes. A primary risk factor for cardiovascular disease is elevated blood pressure, or hypertension.¹

Hypertension is widely recognized as a cardiovascular disease that can affect nearly all population groups worldwide. The number of individuals with hypertension is steadily increasing annually, contributing

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to the global burden of disease, with a prevalence that is nearly equal in both developing and developed nations.² Uncontrolled and prolonged high blood pressure can lead to severe complications, including damage to the kidneys (renal failure), heart (coronary heart disease), and brain (stroke), if not detected early and managed with appropriate treatment.³

Hypertension is a non-communicable disease that poses a global health problem and is a leading cause of morbidity and mortality worldwide. The WHO has termed hypertension the "silent killer" because it often presents without specific symptoms while having the potential to trigger serious complications such as coronary heart disease, stroke, and kidney failure. Globally, the WHO reports that approximately 1.28 billion people aged 30-79 years suffer from hypertension.⁴

In Indonesia, data from the Basic Health Research (Riskesdas) survey indicate a rising trend in the prevalence of hypertension over the years. The prevalence is significantly higher among the elderly compared to other age groups. A 2019 report from the Indonesian Ministry of Health revealed that the prevalence of hypertension in the 55-64 age group was 45.9%, increasing sharply to 63.8% in individuals over 75 years of age. These high figures underscore the vulnerability of the elderly to hypertension.⁵ In North Sumatra Province, the prevalence of hypertension is 18.61%, with the highest proportion recorded in North Padang Lawas Regency (89.55%) and the lowest in Humbang Hasundutan Regency (0.87%).⁶ A similar trend is observed in the service area of the Merdeka Primary Health Center in Karo Regency, where the number of hypertension cases has shown an increasing trend annually. This is evident from Health Office data on the ten leading causes of patient visits in Karo Regency, which reported 1,579 cases of hypertension in the Merdeka Primary Health Center's area in 2022.⁷

Although age is a non-modifiable risk factor, extensive research has demonstrated that modifiable risk factors, such as lifestyle, play a crucial role in the prevention and control of hypertension. Unhealthy lifestyles in the elderly often include physical inactivity, an unbalanced diet (high in salt and fat), smoking, and poor stress management.⁸ A decline in physical activity is common among older adults due to physical limitations or reduced motivation. However, insufficient physical activity can lead to obesity and elevate blood pressure.⁹ Furthermore, uncontrolled psychological stress can trigger the release of cortisol, a hormone that contributes to a sustained increase in blood pressure.¹⁰

Indonesia is entering an era of an aging population structure, with approximately 7.18% of its population aged 60 and over. In 2018, the elderly population was 20 million (9.51%) with a life expectancy of 67.4 years; this is projected to increase to 28.8 million (11.34%) by 2020 with a life expectancy of 71 years, and to 29 million by 2024. This demographic shift will impact various health issues, as the aging process involves cellular degeneration leading to decreased organ function, physical decline, and the emergence of various diseases, particularly degenerative ones. This will, in turn, create physical and psychological health challenges for the elderly.¹¹

This study selected the Merdeka Primary Health Center as its locus because it serves a significant outpatient population of older adults. By analyzing the relationship between lifestyle and the incidence of hypertension among the elderly at this center, the research aims to identify the most influential specific factors within this population. The findings are expected to provide a basis for developing more targeted and effective health promotion interventions tailored to the lifestyle characteristics of the elderly at the Merdeka Primary Health Center, with the ultimate goal of reducing the incidence and complications of hypertension.

Method

This study was designed as a quantitative investigation with a descriptive correlational approach to examine the relationship between independent and dependent variables. A cross-sectional design was employed, wherein all variables were measured concurrently at a single point in time. The research was conducted at the Merdeka Public Health Center (Puskesmas) in Merdeka District, Karo Regency, from February 2025 until its completion. This site was selected due to its sufficient volume of elderly patient visits and a documented increase in hypertension cases.

The study population consisted of all 125 elderly individuals who visited the health center between January and December 2024. From this population, a sample of 55 respondents was determined using Slovin's formula with a 90% confidence level. Participants were recruited using an accidental sampling technique, selecting individuals who presented at the health center and met the inclusion criteria: being 55–70 years of age, proficient in the Indonesian language, and willing to participate.

The data collection instrument was an adapted questionnaire divided into three sections: demographic data, a lifestyle questionnaire (assessing physical activity, dietary patterns, rest habits, and smoking history), and hypertension status as recorded in medical records. As the questionnaire's validity (mean correlation value of 0.636) and reliability (Cronbach's Alpha of 0.826) were previously established, the researchers did not conduct re-testing. The data collection procedure commenced with obtaining official permission, followed by explaining the research objectives to prospective participants and securing their agreement via an informed consent form. Upon collection, the data were processed through editing, coding, and tabulation.

Data analysis was performed in two stages. First, univariate analysis was used to describe the frequency distribution of each variable. Second, bivariate analysis was conducted using the Spearman Rho correlation test at a significance level (α) of 0.05 to determine the relationship between lifestyle variables and the incidence of hypertension. The entire research process adhered to strict ethical principles, including ensuring informed consent, maintaining respondent anonymity by not recording names, and guaranteeing the confidentiality of all obtained information.

Results

This study included 55 elderly participants from the Merdeka Community Health Center. The demographic analysis revealed that the majority of respondents were in the 55-60 age group (58.2%) and were predominantly female (63.6%). The most common level of educational attainment was high school (60%), and the most frequently reported occupation was housewife (45.5%). A slight majority of participants identified as Muslim (61.8%). A detailed summary of the respondents' demographic characteristics is presented in Table 1.

Table 1. Respondent demographic characteristics

Variable	n	%
Age		
55-60 years	32	58,2
61-65 years	13	23,6
>65 years	10	18,2
Gender		
Male	20	36,4
Female	35	63,6
Religion		
Islam	34	61,8
Christian	21	38,2
Education		
No Formal Schooling	3	5,5
Elementary School	4	7,3
Junior High School	8	14,5
Senior High School	33	60
Higher Education	7	12,7
Occupation		
Pensioner	7	12,7
Housewife	25	45,5
Entrepreneur	9	16,4
Other	14	25,5

A univariate analysis was conducted to describe the distribution of key study variables. The findings indicate a high prevalence of lifestyle-related risk factors among the participants. A majority reported insufficient physical activity (58.2%), poor dietary patterns (56.4%), and inadequate rest/sleep (60.0%). Furthermore, most participants had a history of smoking (63.6%), were at risk of pesticide exposure (67.3%), and reported a family history of hypertension (60.0%). Consistent with these risk factors, the prevalence of hypertension (defined as blood pressure $\geq 140/90$ mmHg) in the study sample was 58.2%. The complete frequency distribution for each variable is detailed in Table 2.

To assess the relationship between the independent variables and the incidence of hypertension, a bivariate analysis using Spearman's Rho correlation was performed. The results revealed statistically significant associations between the incidence of hypertension and physical activity ($p=0.046$), dietary pattern ($p=0.029$), rest/sleep habits ($p=0.007$), pesticide exposure ($p=0.009$), and family history ($p<0.001$). A family history of hypertension demonstrated the strongest correlation with the incidence of hypertension

($r=0.512$). Conversely, no statistically significant relationship was found between smoking history and the incidence of hypertension in this cohort ($p=0.057$). A summary of the bivariate analysis is provided in Table 3.

Table 2. Frequency distribution of study variables from univariate analysis

Variable	n	%
Physical Activity		
Insufficient	32	58,2
Sufficient	23	41,8
Dietary Pattern		
Poor	31	56,4
Good	24	43,6
Rest/Sleep Habits		
Insufficient	33	60,0
Sufficient	22	40,0
Smoking History		
Smoker	35	63,6
Non-smoker	20	36,4
Pesticide Exposure		
At Risk	37	67,3
Not at Risk	18	32,7
Family History		
Present	33	60,0
Absent	22	40,0
Hypertension		
Hypertensive ($\geq 140/90$ mmHg)	32	58,2
Normotensive ($< 120/80$ mmHg)	23	41,8

Table 3. Summary of bivariate analysis of associations with hypertension incidence

Variable	Correlation Coefficient (r)	p-value
Physical Activity	-0.270	0.046
Dietary Pattern	0.295	0.029
Rest/Sleep Habits	0.361	0.007
Smoking History	0.258	0.057
Pesticide Exposure	-0.351	0.009
Family History	0.512	<0.001

Discussion

Physical activity refers to body movements that result in energy expenditure and are essential for maintaining physical fitness, mental health, and overall quality of life. Any form of weekly physical activity, in addition to daily routine tasks, demonstrates a protective effect against cardiovascular mortality. Insufficient physical activity can lead to weight gain and increased risk of hypertension. A sedentary lifestyle tends to elevate heart rate frequency, requiring stronger myocardial contractions. The more frequently and intensely the heart contracts, the greater the pressure exerted on the arteries.¹² The findings of this study are consistent with Latifah's research¹³ which reported a correlation coefficient of 0.350 and a p-value < 0.05, indicating a significant relationship between physical activity and hypertension among older adults at Kebondalem Lor Public Health Center, Prambanan, Klaten Regency. This suggests that higher physical activity levels are associated with lower hypertension risk among the elderly. Similarly, Payana's study¹⁴ found a highly significant correlation ($p < 0.001$), demonstrating that regular physical activity among older adults in the Gianyar I Public Health Center area reduces the likelihood of developing hypertension. These findings highlight the need to encourage physical activity among older adults by revitalizing interest in exercise through elderly health center programs. However, these results differ from Wirakhmi and Purnawan's findings¹⁵ ($p = 0.142$), which showed no significant association between physical activity and hypertension among older adults at Kutasari Health Center. This discrepancy may be due to the light intensity of physical activity commonly practiced by participants, such as short walks, sweeping, or household chores. Such activities may not be sufficient to lower blood pressure, thus producing no clear difference between active and less active individuals. Occupational activity is another factor influencing blood pressure. Pulse rate rises during work and decreases during rest. Studies indicate that inactive individuals are 30 times more

likely to develop hypertension.¹⁶ In modern society, convenience has reduced engagement in physical activities. Light exercise can strengthen the heart, allowing it to pump more blood with less effort.¹⁷

Dietary habits refer to daily food and beverage consumption patterns, both in type and quantity, and constitute a central determinant of nutritional status.¹⁸ The quality and quantity of consumed foods influence individual and community health. To prevent chronic and noncommunicable diseases related to nutrition, adopting a balanced diet is essential. Adequate nutrition enhances health and longevity.¹⁹ This study aligns with Hamzah et al.²⁰ who found a significant correlation between dietary patterns and hypertension ($p = 0.014$) among residents in Molibagu, South Bolaang Mongondow Regency. Similarly, Carsilah et al.²¹ reported a highly significant relationship ($p = 0.000$) between dietary habits and hypertension among older adults at Sukawali Health Center, Tangerang. Conversely, Jannah's research²² revealed no significant relationship between diet and hypertension in Risa Village, possibly due to homogeneity in eating habits, such as frequent consumption of high-sodium foods or similar simple diets among participants. According to nutritional theory, eating on time and maintaining regular meals significantly benefit the body and should be habitualized. Breakfast is commonly neglected, yet skipping it may lead to overweight and elevated blood cholesterol compared to individuals who eat breakfast regularly. Irregular meal timing also poses health risks.²³

Sleep is a fundamental human need essential for physical and mental recovery. Adults typically require 6–8 hours of sleep daily. Sleep durations ≤ 6 hours are associated with adverse consequences, including reduced concentration, irritability, and fatigue.²⁴ In older adults, shorter sleep duration increases hypertension risk.²⁵ This study supports Amlan's findings²⁴ ($p = 0.035$), indicating a significant association between rest/sleep habits and hypertension among older adults in Tamalanrea Jaya, Makassar. Similarly, Florentia et al.²⁶ ($p = 0.001$) found that sleep quality correlates significantly with hypertension prevalence among older adults in Andalas Health Center, Padang. Poor sleep quality in older adults often results from age-related factors, restlessness, and frequent awakenings. However, research among Chinese nonagenarians and centenarians (aged 90–108 years) showed no relationship between sleep quality dimensions (including score, latency, and efficiency) and blood pressure or hypertension. This may be explained by late-age physiological effects that obscure sleep influence, survival bias among long-lived individuals, and potential inaccuracy of subjective measurement tools such as the PSQI in elderly populations.²⁷ Sleep disturbances manifest as inability to sleep through the night and frequent awakenings. Chronic sleep deprivation leads to stress, fatigue, irritability, and sustained elevation in blood pressure.²⁸ Although blood pressure may normalize once stress subsides, prolonged stress can cause persistent hypertension.²⁴

Smoking is a detrimental habit that compromises lung function because hemoglobin preferentially binds carbon monoxide over oxygen, reducing systemic oxygen delivery. Nicotine stimulates heart rate, leading to up to 20 additional beats per minute and raising blood pressure.¹⁷ Research by Efriandi²⁹ ($p = 0.643$) and Lestari et al.³⁰ ($p = 0.409$) found no significant relationship between smoking behaviors and hypertension among elderly populations in Jekan Raya and Cibogor, respectively. The lack of association may reflect cumulative exposure requirements, as many elderly participants had quit smoking years earlier. By contrast, Adriandy³¹ reported a significant relationship ($p = 0.003$) between smoking and hypertension incidence. Nicotine's systemic effects result from sympathetic nervous system activation, increased catecholamine release, accelerated circulation, and vascular constriction.³²

Pesticide exposure—common in agricultural settings—remains a critical health concern. Pesticides are chemical substances used to eliminate pests but are toxic and classified as persistent organic pollutants (POPs) with adverse effects on human health and the environment.³³ This study concurs with Yuyun et al.³⁴ ($p = 0.000$), showing a significant association between pesticide exposure and hypertension among farmers in Wakoko, Buton Regency, and with Cahyani's findings³⁵ ($p = 0.005$) indicating similar results among older adults. However, Ramadhani et al.³⁶ ($p = 0.788$) found no significant association between pesticide dosage and hypertension among farmers in Lampuyang, East Kotawaringin. The variation might be due to adjusted pesticide use based on pest levels, economic considerations, and tendency to reduce doses of expensive pesticides during low infestation periods. Pesticides can enter the body through inhalation or dermal absorption during agricultural activities. Dermal contact is the most frequent route and can lead to systemic absorption resulting in pesticide poisoning, which may manifest as hypertension.³⁷

Genetic predisposition is a nonmodifiable risk factor for hypertension, influenced by inherited gene mutations. Risk escalates with aging and is higher if one or both parents have a history of hypertension, with up to 60% risk when both parents are affected.^{38,39} This study supports findings by Habibah et al.⁴⁰ ($p = 0.049$) and Sidik⁴¹ ($p = 0.001$) showing a significant association between family history and hypertension in elderly

populations at Sukadiri Health Center, Tangerang. Contrarily, Salman et al.⁴² ($p = 0.312$) indicated no significant association at Cempaka Health Center, suggesting lifestyle and environmental factors may outweigh genetic predisposition.

Conclusion

In conclusion, this study demonstrates a definitive and statistically significant relationship between both knowledge and attitude regarding Occupational Safety and Health (OSH) and the occurrence of unsafe actions among lathe machine operators. Workers possessing higher levels of knowledge and more supportive attitudes consistently exhibited safer behaviors, whereas those with deficiencies in these areas were universally associated with high-risk actions. These findings strongly suggest that unsafe actions are not merely random events but are predictable outcomes linked to measurable internal factors. Therefore, to effectively mitigate workplace accidents, organizational strategies must extend beyond simple rule enforcement to include robust, targeted training programs that enhance worker knowledge and comprehensive initiatives aimed at cultivating a deeply ingrained culture of safety that positively shapes employee attitudes. Addressing both the cognitive and affective domains is essential for creating a sustainably safe work environment.

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