

The role of obesity in increasing the risk of hypertension in the elderly

Suprpto Suprpto^{1*}, Zhian Salah Jalal², Ali Syahid Bayau Naka³

¹Department of Nursing, Politeknik Sandi Karsa, South Sulawesi, Indonesia

²Adult Nursing Department, College of Nursing, University of Kirkuk, Kirkuk Governorate, Iraq

³Department of Health Administration, Permata Ilmu Maros Institute of Technology and Health, South Sulawesi, Indonesia

*Correspondence: Suprpto, Department of Nursing, Politeknik Sandi Karsa, South Sulawesi, Indonesia.

Email: atoenurse@gmail.com

Received: 10 September 2024 ● Revised: 12 November 2024 ● Accepted: 12 December 2024

ABSTRACT

Introduction: Obesity has been identified as one of the main risk factors contributing to the increase in hypertension cases, particularly among the elderly. This study aims to analyze the role of obesity in increasing the risk of hypertension in the elderly by examining the relationship between body mass index (BMI) and blood pressure.

Methods: This research uses a cross-sectional design, an analytical study that studies the causes of incidents or incidents. Data collection uses a questionnaire. The sample in this study was 64 elderly hypertensive patients in the working data analysis using the chi-square test.

Results: This study's results indicate a relationship between obesity ($p=0.000$) and the incidence of hypertension in the elderly working. The results showed that the elderly with obese status had a significantly higher risk of hypertension compared to the elderly with average weight.

Conclusions: These findings underscore the importance of preventing and treating obesity in the elderly to reduce the risk of hypertension and other health complications. This research is expected to contribute to formulating health policies and hypertension prevention programs among the elderly through a practical weight management approach.

Keywords: elderly, hypertension, obesity.



This is an open-access article distributed under the terms of the Creative Commons Attribution 4.0 International License (<https://creativecommons.org/licenses/by/4.0/>)

INTRODUCTION

Hypertension, or high blood pressure, is one of the most common chronic health problems in the elderly population and is a significant risk factor for various cardiovascular diseases, such as heart disease, stroke, and kidney failure (Culberson et al., [2023](#)). The prevalence of hypertension among the elderly is increasing with age, which is influenced by physiological changes in the body, lifestyle, and unhealthy diet. One of the main factors that play a role in increasing the risk of hypertension in the elderly is obesity. Obesity is when the body accumulates excess fat, measured using indicators such as Body Mass Index (BMI) and waist circumference (Tarantini et al., [2023](#)). This condition is known to have the potential to trigger various health problems, including hypertension, especially in the elderly group. There is a significant association between obesity and hypertension in the elderly population. Obesity leads to increased blood volume and vascular resistance, ultimately increasing blood pressure. In addition, obesity is also related to hormonal changes that affect the renin-angiotensin system, leading to a significant increase in blood pressure. Increased levels of body fat in the elderly result in increased production of leptin and resistin hormones, which trigger inflammation and lead to an increase in blood pressure. This impact is becoming more serious in the elderly because the function of the body's organs, including blood vessels, heart, and kidneys, decreases due to the natural aging process (Sehar et al., [2023](#)).

Obesity in older people is often overlooked or considered a normal part of the aging process, even though obesity can be prevented and controlled through lifestyle changes, including a healthy diet and adequate physical activity (Lapenna, [2023](#)). Older adults with obesity have a greater risk of developing hypertension compared to older adults who have an ideal or average weight. Therefore, weight control is important in reducing the risk of hypertension in the elderly. Reducing body fat can lower blood pressure and reduce the heart and circulatory system workload (Basu et al., [2023](#)). In Indonesia, the problem of obesity and hypertension in the elderly requires special attention because the number of elderly population is increasing from year to year. Based on data from Riskesdas, the prevalence of obesity and hypertension in Indonesia shows an increasing trend, indicating that the elderly group is becoming more vulnerable to health complications due to these conditions (Mian et al., [2024](#)). Appropriate health interventions, such as weight control programs and early detection of hypertension, can help reduce the incidence of hypertension and its accompanying complications (Pinheiro et al., [2024](#)).

Obesity is a growing health problem worldwide and has become one of the main risk factors for a variety of chronic diseases, including hypertension (Batitucci et al., [2024](#)). In Indonesia, the prevalence of obesity has shown a significant increase in recent decades, not only in the young population but also in the elderly group. Along with the aging process, the elderly face a decrease in metabolism and a tendency to gain weight, increasing the risk of various health problems, including hypertension (Wanionok et al., [2024](#)). Hypertension in the elderly is a serious concern because it can cause multiple health complications, such as heart disease, stroke, and impaired kidney function, which can ultimately reduce quality of life and increase mortality. Obesity in the elderly has a complex role in raising blood pressure. Physiologically, excess fat accumulation in the body, especially visceral fat, can lead to insulin resistance, chronic inflammation, and hormonal balance disturbances, all contributing to increased blood pressure. This condition results in heavier work on the heart and blood vessels, putting the elderly with obesity at a higher risk of developing hypertension than those with a healthy weight. In addition, obesity tends to be associated with a sedentary lifestyle and an unhealthy diet, factors that are also closely related to hypertension (Zhang et al., [2024](#)).

This study aims to analyze the role of obesity in increasing the risk of hypertension in the elderly, with the hope of providing a clearer picture of the relationship between obesity and hypertension. Through this understanding, it is hoped that there will be an increase in public awareness and related parties to pay attention to the health aspects of older people, especially regarding weight control. Thus, this research not only makes a theoretical contribution to the field

of health sciences but also plays a role in developing health policies that can be applied to improve the quality of life of older people.

MATERIALS AND METHODS

Research Design

This study uses an analytical survey design with a cross-sectional approach to assess the relationship between obesity and the risk of hypertension in the elderly. This design allows researchers to measure obesity and blood pressure variables at a specific time to identify patterns of relationships between the two variables in the elderly population.

Population and Sample

The target population in this study is the elderly aged 60 years and above. The research sample was selected using a purposive sampling technique, with inclusion criteria including Elderly aged 60 years and above, Willing to participate in the study and signing informed consent, not having acute health conditions or other chronic diseases that affect blood pressure or weight status. Exclusion criteria include Elderly who have chronic kidney disease, heart failure, or severe metabolic disorders and older adults who use medications that directly affect blood pressure, such as antihypertensive. Based on the calculation of the sample size using the Slovin formula with a margin of error of 5%, a sample of 200 respondents was obtained.

Data Collection

Data was collected through interviews, physical measurements, and medical recording methods. The data collected includes Body Mass Index (BMI): The weight and height of each respondent were measured using digital scales and height measuring devices. BMI is calculated using the body weight (kg) formula divided by height (m) squared. Respondents were categorized as obese if their BMI was $\geq 25 \text{ kg/m}^2$, based on World Health Organization (WHO) standards for Asian populations. Blood Pressure: Blood pressure measurement is done using a calibrated digital sphygmomanometer. Measurements were taken after the respondent rested for 5-10 minutes sitting. Respondents were categorized as hypertension if they had a systolic blood pressure of $\geq 140 \text{ mmHg}$ or diastolic $\geq 90 \text{ mmHg}$, according to the American College of Cardiology/American Heart Association (ACC/AHA) criteria. Demographic Variables and Health History: Additional data regarding age, gender, family history of diseases, smoking habits, and physical activity levels were collected through interviews to analyze additional factors that may influence the relationship between obesity and hypertension.

Research Instruments

The instruments used in this study include Digital scales and height measuring instruments for BMI measurement, a digital sphygmomanometer for blood pressure measurement, and a Structured questionnaire to obtain demographic data and health history. Each research instrument has undergone a validation process to ensure the accuracy and reliability of the measurements.

Research Procedure

The research procedure includes several stages as follows: Respondents have explained the purpose of the study and are asked to sign informed consent; BMI measurement is carried out to determine the respondent's obesity status; blood pressure measurement is carried out after the respondent rests to avoid bias due to stress or physical activity that has just been done. Demographic data and health history were collected through interviews. All research procedures are carried out in elderly health centers or where the respondents live for their convenience.

Data Analysis

The data was analyzed using SPSS statistical software version 25. The analyses used include Descriptive Analysis to provide an overview of respondents' characteristics, including age

distribution, gender, BMI status, and blood pressure, and Chi-Square Analysis to test the relationship between obesity and hypertension. This analysis assessed the significance of the relationship between the independent variable (obesity status) and the dependent variable (hypertension status). Logistic Regression Analysis to identify the influence of obesity on hypertension risk by adjusting the demographic variable as a confounding factor. This analysis helps determine the magnitude of the risk of hypertension in obese elderly compared to non-obese elderly.

Research Ethics

This research has received ethical approval from the University Research Ethics Committee with Number B-335/P19/KE/IX/2024. Each participant was explained the research objectives and procedures and the guarantee of confidentiality of their data. Participants are also free to resign at any time if they feel uncomfortable.

RESULTS

Table 1. Distribution of respondent frequency by age group in elderly, gender, education, occupation, obesity incidence of hypertension

Characteristic	Sum (n)	Percent (%)
Age		
≤ 65 year	47	73.4
66-70 year	14	21.9
> 71 year	3	4.7
Gender		
Female	33	51.6
Male	31	48.4
Education		
Elementary school	6	9.4
Junior high school	12	18.8
Senior high school	20	31.3
Bachelor's Degree	26	40.6
Work		
Retired Civil Servants/TNI/Polri	17	26.6
Housewives	24	37.5
Self-employed	18	28.1
Farmers/Workers	5	7.8
Physical Activity		
Low	20	31.3
Keep	15	23.4
Tall	29	45.3
Obesity		
Fat	39	60.9
Not fat	25	39.1
Incidence of Hypertension		
Hypertension	36	56.3
No Hypertension	28	43.8

Table 2. Bivariate test results for each independent variable

Independent Variable	Sig (p)	Included
physical activity	0,000	yes
obesity	0,000	yes
diet	0,029	yes
smoking habits	0,000	yes
work	0,020	yes

Table 3. Results of logistic regression test between hypertension incidence in the elderly

Variable	B	S.E.	Beta	t	Sig
physical activity	.102	.052	.178	1.988	.052
obesity	.751	.118	.738	6.338	.000
diet	.096	.089	.096	1.077	.286
smoking habits	-.121	.077	-.171	-1.570	.122
work	.043	.106	.037	.402	.689

Based on the table above shows that the most dominant respondents had high physical activity and experienced hypertension, namely 15 people (23.4%), and those who did not experience hypertension as many as 14 people (21.9%). For comparison, those who had moderate activity and experienced the incidence of hypertension were two people (3.1%) and non-hypertension as many as 13 people (20.3%) and respondents who had low physical activity and experienced hypertension, namely 19 people (29.7%) and one person who did not have hypertension (1.6%). The statistical test results were obtained with $p\text{-value} = 0.000 < \alpha \text{ value} (\alpha = 0.05)$. Based on the data obtained, the low activity in the elderly with hypertension was 19 people (29.7%) and one person without hypertension (1.6%), which means that the elderly with less physical activity have a greater potential to experience hypertension than the elderly with good physical activity. The incidence of hypertension in the elderly with the variables studied showed a relationship; The most related variable is obesity. Therefore, it is hoped that the elderly, especially those who are obese, will be given interventions to maintain their diet so that complications do not occur and can reduce the risk of hypertension.

DISCUSSION

Researchers found that obesity plays a significant role in increasing the risk of hypertension in the elderly. Older adults with obesity tend to have higher blood pressure than older adults with average weight. This condition is caused by an increased cardiac workload and narrowing of blood vessels due to fat accumulation, leading to increased blood pressure. Obesity has become one of the main risk factors that increase the prevalence of hypertension in the elderly group in different countries. Based on recent research, obesity affects blood pressure through various physiological and metabolic mechanisms that trigger an increased risk of hypertension. Older people with obesity face greater health challenges due to physiological changes associated with the aging process, including decreased vascular elasticity and changes in fat metabolism. In this context, several recent studies from reputable international journals have identified mechanisms that explain how obesity can affect blood pressure and strategies that can be applied to reduce the risk of hypertension in obese elderly (Khemka et al., [2023](#)).

Obesity, specifically visceral fat accumulation, is closely correlated with increased blood pressure. Visceral fat releases pro-inflammatory cytokines such as interleukin-6 (IL-6) and tumor-alpha necrosis factor (TNF- α), which trigger chronic systemic inflammation (Al-kuraishy et al., [2023](#)). This inflammation increases insulin resistance and impaired endothelial function, eventually narrowing blood vessels and increasing blood pressure. Older adults with obesity are more susceptible to this systemic inflammation due to the aging process that slows down the immune system's response, thereby increasing the risk of hypertension significantly. Obesity in older people can interfere with regulating the RAAS system (Eitmann et al., [2024](#)). Excess body fat produces angiotensinogen, which triggers the activation of angiotensin II, a vasoconstrictor hormone that causes an increase in blood pressure. In the elderly, the increase in RAAS activity due to obesity is more difficult to control due to a decrease in the elasticity of blood vessels, so they are more susceptible to hypertension. The study also suggests that proper weight management can help lower RAAS activity and reduce the risk of hypertension in the elderly (Poursalehi et al., [2023](#)).

Insulin resistance causes hyperinsulinemia, which stimulates the sympathetic nervous system and leads to vasoconstriction of blood vessels (Almeida et al., [2024](#)). In older people with

obesity, insulin resistance worsens due to decreased tissue sensitivity to insulin that occurs naturally in aging. This vasoconstriction increases blood pressure and the risk of hypertension (Dutta et al., [2023](#)). Therefore, interventions that can improve insulin sensitivity, such as physical exercise and dietary regulation, are recommended to lower the risk of hypertension in obese elderly. The activity of the sympathetic nervous system is increased in obese individuals, especially in older people (Turrini et al., [2023](#)). This increased sympathetic activity contributes to increased blood pressure through increased heart rate frequency and narrowing of blood vessels. Older people with obesity have a higher sympathetic response than younger age groups, which exacerbates the risk of hypertension. Increased sympathetic nervous activity can be controlled with a regular exercise program and relaxation techniques, which have been shown to help reduce blood pressure in obese elderly (Álvarez-Bueno et al., [2024](#)).

The importance of weight management programs as part of efforts to prevent hypertension in the elderly (Hu et al., [2024](#)). Effective weight management through dietary regulation and increased physical activity has been shown to lower blood pressure in obese older adults significantly. In addition, a diet low in salt, rich in fiber, and high in potassium can also help lower blood pressure (Syaharuddin et al., [2024](#)). The study also suggests community-based interventions involving health education, physical training, and periodic blood pressure monitoring to improve the effectiveness of weight loss and hypertension control in the elderly. Another prevention program consists of increasing physical activity adapted to the condition of older people (Suprpto et al., [2021](#)). Aerobic exercises such as walking, light cycling, and breathing exercises have positively impacted lowering blood pressure in obese elderly. A consistent physical activity program can help lower body fat levels, improve insulin sensitivity, and reduce inflammation, all of which contribute to a decrease in blood pressure (Suprpto et al., [2024](#)).

Clinical Implications

This research has important implications in the field of elderly health and hypertension, especially in the development of health policies and programs for the elderly. These findings suggest that obesity is not only an aesthetic problem but also has the potential to worsen the health conditions of the elderly, primarily related to hypertension. Therefore, health programs that focus on obesity prevention can significantly reduce the prevalence of hypertension and improve the quality of life of the elderly. Multidisciplinary interventions involving education, lifestyle modification, and medical support are expected to provide better outcomes in the treatment of hypertension in obese elderly.

CONCLUSIONS

Based on the discussion of recent research, it can be concluded that obesity in the elderly affects blood pressure through various mechanisms, including systemic inflammation, activation of the RAAS system, insulin resistance, and increased activity of the sympathetic nervous system. Older people with obesity face a higher risk of hypertension, which requires a comprehensive approach to prevent and treat the condition. Weight management programs, increased physical activity, and dietary interventions can help reduce the risk of hypertension in obese older adults, as well as contribute to improving their overall quality of life.

REFERENCES

- Al-kuraishy, H. M., Jabir, M. S., Albuhadily, A. K., Al-Gareeb, A. I., & Rafeeq, M. F. (2023). The link between metabolic syndrome and Alzheimer disease: A mutual relationship and long rigorous investigation. *Ageing Research Reviews*, 91, 102084. <https://doi.org/https://doi.org/10.1016/j.arr.2023.102084>
- Almeida, M. F., Farizatto, K. L. G., Almeida, R. S., & Bahr, B. A. (2024). Lifestyle strategies to promote proteostasis and reduce the risk of Alzheimer's disease and other proteinopathies. *Ageing Research Reviews*, 93, 102162.

- <https://doi.org/https://doi.org/10.1016/j.arr.2023.102162>
- Álvarez-Bueno, C., Medrano, M., Lucerón-Lucas-Torres, M., Otero-Luis, I., López-López, S., Lever-Megina, C. G., & Caverro-Redondo, I. (2024). Association between pulse wave velocity and white matter hyperintensities among older adults: A meta-analysis of cross-sectional and longitudinal studies. *Ageing Research Reviews*, 101, 102501. <https://doi.org/https://doi.org/10.1016/j.arr.2024.102501>
- Basu, T., Sehar, U., Malhotra, K., Culberson, J., Khan, H., Morton, H., Orlov, E., Brownell, M., & Reddy, P. H. (2023). Healthy brain aging and delayed dementia in Texas rural elderly. *Ageing Research Reviews*, 91, 102047. <https://doi.org/https://doi.org/10.1016/j.arr.2023.102047>
- Batitucci, G., Abud, G. F., Ortiz, G. U., Belisário, L. F., Travieso, S. G., de Lima Viliod, M. C., Venturini, A. C. R., & de Freitas, E. C. (2024). Sarcobesity: New paradigms for healthy aging related to taurine supplementation, gut microbiota and exercise. *Ageing Research Reviews*, 101, 102460. <https://doi.org/https://doi.org/10.1016/j.arr.2024.102460>
- Culberson, J. W., Kopel, J., Sehar, U., & Reddy, P. H. (2023). Urgent needs of caregiving in ageing populations with Alzheimer's disease and other chronic conditions: Support our loved ones. *Ageing Research Reviews*, 90, 102001. <https://doi.org/https://doi.org/10.1016/j.arr.2023.102001>
- Dutta, B. J., Rakshe, P. S., Maurya, N., Chib, S., & Singh, S. (2023). Unlocking the therapeutic potential of natural stilbene: Exploring pterostilbene as a powerful ally against aging and cognitive decline. *Ageing Research Reviews*, 92, 102125. <https://doi.org/https://doi.org/10.1016/j.arr.2023.102125>
- Eitmann, S., Matrai, P., Hegyi, P., Balasko, M., Eross, B., Dorogi, K., & Petervari, E. (2024). Obesity paradox in older sarcopenic adults — a delay in aging: A systematic review and meta-analysis. *Ageing Research Reviews*, 93, 102164. <https://doi.org/https://doi.org/10.1016/j.arr.2023.102164>
- Hu, Y., Wang, Z., He, H., Pan, L., Tu, J., & Shan, G. (2024). Prevalence and patterns of multimorbidity in China during 2002–2022: A systematic review and meta-analysis. *Ageing Research Reviews*, 93, 102165. <https://doi.org/https://doi.org/10.1016/j.arr.2023.102165>
- Khemka, S., Reddy, A., Garcia, R. I., Jacobs, M., Reddy, R. P., Roghani, A. K., Pattoor, V., Basu, T., Sehar, U., & Reddy, P. H. (2023). Role of diet and exercise in aging, Alzheimer's disease, and other chronic diseases. *Ageing Research Reviews*, 91, 102091. <https://doi.org/https://doi.org/10.1016/j.arr.2023.102091>
- Lapenna, D. (2023). Glutathione and glutathione-dependent enzymes: From biochemistry to gerontology and successful aging. *Ageing Research Reviews*, 92, 102066. <https://doi.org/https://doi.org/10.1016/j.arr.2023.102066>
- Mian, M., Tahiri, J., Eldin, R., Altabaa, M., Sehar, U., & Reddy, P. H. (2024). Overlooked cases of mild cognitive impairment: Implications to early Alzheimer's disease. *Ageing Research Reviews*, 98, 102335. <https://doi.org/https://doi.org/10.1016/j.arr.2024.102335>
- Pinheiro, F. I., Araújo-Filho, I., do Rego, A. C. M., de Azevedo, E. P., Cobucci, R. N., & Guzen, F. P. (2024). Hepatopancreatic metabolic disorders and their implications in the development of Alzheimer's disease and vascular dementia. *Ageing Research Reviews*, 96, 102250. <https://doi.org/https://doi.org/10.1016/j.arr.2024.102250>
- Poursalehi, D., Lotfi, K., & Saneei, P. (2023). Adherence to the Mediterranean diet and risk of frailty and pre-frailty in elderly adults: A systematic review and dose-response meta-analysis with GRADE assessment. *Ageing Research Reviews*, 87, 101903. <https://doi.org/https://doi.org/10.1016/j.arr.2023.101903>
- Sehar, U., Kopel, J., & Reddy, P. H. (2023). Alzheimer's disease and its related dementias in US Native Americans: A major public health concern. *Ageing Research Reviews*, 90, 102027.

- <https://doi.org/https://doi.org/10.1016/j.arr.2023.102027>
- Suprpto, Kamaruddin, M. I., Herlianty, & Nurhanifah, D. (2024). Building Nurse Competency Strategy at Public Health Center in Indonesia: A Descriptive Qualitative Approach. *The Malaysian Journal of Nursing*, 15(03), 62–70. <https://doi.org/https://doi.org/10.31674/mjn.2024.v15i03.008>
- Suprpto, S., Mulat, T. C., & Lalla, N. S. N. (2021). Nurse competence in implementing public health care. *International Journal of Public Health Science (IJPHS)*, 10(2), 428. <https://doi.org/https://doi.org/10.11591/ijphs.v10i2.20711>
- Syahrudin, S., Wijayanti, Y. T., Kana, M., Suprpto, S., & Napolion, K. (2024). Public health nurses' caring behaviour can increase homecare patients' satisfaction. *Jurnal Ilmiah Kesehatan Sandi Husada*, 13(2), 214–222. <https://doi.org/https://doi.org/10.35816/jiskh.v13i2.1207>
- Tarantini, S., Subramanian, M., Butcher, J. T., Yabluchanskiy, A., Li, X., Miller, R. A., & Balasubramanian, P. (2023). Revisiting adipose thermogenesis for delaying aging and age-related diseases: Opportunities and challenges. *Ageing Research Reviews*, 87, 101912. <https://doi.org/https://doi.org/10.1016/j.arr.2023.101912>
- Turrini, S., Wong, B., Eldaief, M., Press, D. Z., Sinclair, D. A., Koch, G., Avenanti, A., & Santarnecchi, E. (2023). The multifactorial nature of healthy brain ageing: Brain changes, functional decline and protective factors. *Ageing Research Reviews*, 88, 101939. <https://doi.org/https://doi.org/10.1016/j.arr.2023.101939>
- Wanionok, N. E., Morel, G. R., & Fernández, J. M. (2024). Osteoporosis and Alzheimer's disease (or Alzheimer's disease and Osteoporosis). *Ageing Research Reviews*, 99, 102408. <https://doi.org/https://doi.org/10.1016/j.arr.2024.102408>
- Zhang, Z., Wang, Y., Chen, X., Wu, C., Zhou, J., Chen, Y., Liu, X., & Tang, X. (2024). The aging heart in focus: The advanced understanding of heart failure with preserved ejection fraction. *Ageing Research Reviews*, 101, 102542. <https://doi.org/https://doi.org/10.1016/j.arr.2024.102542>

How to cite this article. Suprpto, S. and Salah Jalal, Z. (2024) “The role of obesity in increasing the risk of hypertension in the elderly ”, *Jurnal Edukasi Ilmiah Kesehatan*, 2(3), pp. 86–93. doi: 10.61099/junedik.v2i3.59.