The Relationship Between Body Mass Index (BMI) and Age on Hypertension in Adults Aged 18-60 Years at the Sangurara Health Center in 2023

Dwi Bagas Andika[1], Wijoyo Halim[1*], Nur Faisah[1]

[1] Department of Medical Education, Faculty of Medicine, University of Alkhairaat, Palu, Jl. Diponegoro 94221, Central Sulawesi

[*]Authors Correspondence: wijoyoneuro@gmail.com

ARTICLE INFO	ABSTRACT
  	Hypertension Is a condition in which there is an increase in pulse rate, especially systolic blood pressure ≥ 140 mmHg and diastolic blood pressure ≥90 mmHg. hypertension has increased from 650 million people to 1.28 billion people over the past few years This type of research is quantitative research with a cross sectional approach using secondary data and primary data as a reference. The sampling technique was carried out using Random Sampling. Each data was described by univariate and bivariate analysis using the SPSS 26.0 program. Based on age, it was found that the sample with the most cases of hypertension was found in Early Adults, namely as many as 40 people (40%). In the Body Mass Index variable on the incidence of hypertension, the p value is 0.030 (p <0.05) using the Kruskal-Wallis test, meaning that there is a significant relationship between Body Mass Index and the incidence of hypertension. It was found that age has an insignificant relationship with the incidence of hypertension with a p value of 0.097 (p <0.05) using the Kruskal - Wallis test There is a significant relationship between BMI on the occurrence of hypertension in adult patients 18 - 60 at the Sangurara Palu Health Center and found the most cases of hypertension in patients with high BMI There is an insignificant relationship between age and the occurrence of hypertension in adult patients 18 - 60 at the Sangurara Palu Health Center and found the most cases of hypertension in patients with adult age.

INTRODUCTION

Hypertension is a condition in which there is an increase in pulse rate, particularly when the systolic blood pressure is ≥ 140 mmHg as well as diastolic blood pressure, due to problems in the arteries that cause a buildup of oxygen and nutrients carried by the blood, resulting in impaired delivery to body tissues that need them.[1] The main causes of hypertension are genetic factors, behavior, and lifestyle factors. Low awareness in the treatment of hypertension is a major contributor to the occurrence of stroke cases.[2]

Body Mass Index (BMI) is a simple tool used to assess the health status of adults, especially those related to underweight and overweight conditions. Today's lifestyle habits, such as unhealthy eating patterns high in fat and cholesterol, smoking, and consuming alcoholic beverages, are behaviors that can cause various infections, such as hypertension and diabetes mellitus. One of the factors causing hypertension is diet; in addition, hypertension can also be caused by body weight.[3]

According to data from the World Health Organization (WHO), the number of people of productive age between 30 and 79 years old with hypertension has increased from 650 million to 1.28 billion people over the past several years.[4] Based on the 2018 Basic Health Research (Riskesdas), the prevalence of hypertension measured among people aged 18 years and older was 34.1%, with the highest prevalence in South Kalimantan (44.1%), while the lowest was in Papua (22.2%).[5]

In 2020, the number of individuals aged ≥ 15 years with hypertension in the Central Sulawesi region was 384,072 (2.33%). The highest hypertension prevalence in 2020 was recorded in Donggala Regency, with a rate of 7.11%. Meanwhile, the area with the lowest hypertension rate was North Morowali Regency, with an estimated 20,917 individuals with hypertension.[6] In the working area of Sangurara Public Health Center (Puskesmas) in Palu, the population of hypertension patients reached 9,106 people in 2022.

MATERIAL AND METHOD

This research is an analytic quantitative study with a cross-sectional approach, using both primary and secondary data. The study was conducted in the working area of Sangurara Public Health Center (Puskesmas), located on Jl. Pomandu, Duyu Subdistrict, Tatanga District, Palu City, Central Sulawesi.

To avoid population bias, probability sampling was employed using random sampling techniques, which collected data randomly to represent a population. From December to January 2024, a total of 100 respondents who met the criteria were obtained.

The population in this study consisted of all patients who came and visited the health center and were diagnosed with hypertension, totaling 9,106 individuals. Data analysis was performed using univariate and bivariate analysis to determine the relationship between two or more variables, applying the Kruskal-Wallis test. The data collected were processed using the SPSS 26 software application.

RESULTS AND DISCUSSIONS

Table 1. Sample Characteristics Based on Body Mass Index and Hypertension Incidence

Body Mass Index	Hypertension								Total	
	Normal		Pre - Hypertension		Hypertension Level 1		Hypertension Level 2			
	n	%	n	%	n	%	n	%	n	%
Underweight	-	-	-	-	-	-	-	-	-	-
Normal	-	-	1	1,0	2	2,0	-	-	3	3,0
Overweight	1	1,0	9	9,0	1	1,0	-	-	11	11,0
Obes 1	2	2,0	44	44,0	28	28,0	3	3,0	77	77,0
Obes 2	-	-	1	1,0	7	7,0	1	1,0	9	9,0
Total	3	3,0	55	55,0	38	38,0	4	4,0	100	100

The largest number of hypertension cases was found among the Obesity Class 1 group, totaling 77 individuals (77%), consisting of 2 people (2%) with normal blood pressure, 44 people (44%) with pre-hypertension, 28 people (28%) with Hypertension Stage 1, and 3 people (3%) with Hypertension Stage 2.

Meanwhile, the smallest number of cases was found among the Normal weight group, with only 3 individuals (3%), consisting of 1 person (1%) with pre-hypertension and 2 people (2%) with Hypertension Stage 2.

In addition, no cases were found among individuals categorized as underweight. Among the Overweight group, 11 individuals (11.0%) were found to have hypertension, and in the Obesity Class 2 group, 9 individuals (9%) were found to have hypertension.

For the variable Body Mass Index in relation to the incidence of hypertension, a p-value of 0.030 (p < 0.05) was obtained using the Kruskal-Wallis test, indicating a significant relationship between Body Mass Index and the incidence of hypertension.

Table 2. Sample Characteristics Based on Age and Incidence of Hypertension

Body Mass Index	Hypertension								Total	
	Normal		Pre - Hypertension		Hypertension Level 1		Hypertension Level 2			
	n	%	n	%	n	%	n	%	n	%
Late Adolescence	2	2.0	13	13.0	8	8.0	-	-	23	23.0
Early Adulthood	1	1.0	26	26.0	11	11.0	2	2.0	40	40.0
Middle Adulthood	-	-	7	7.0	8	8.0	2	2.0	17	17.0
Early Elderly	-	-	8	8.0	5	5.0	-	-	13	13.0
Late Elderly	-	-	1	1.0	6	6.0	-	-	7	7.0
Total	3	3.0	55	55.0	38	38.0	4	4.0	100	100

DISCUSSION

Based on the research conducted, it was found that out of 100 respondents, the highest number of hypertension caseswas found among Early Adults, totaling 40 individuals (40%), consisting of 1 person (1%) with normal blood pressure, 26 people (26%) with pre-hypertension, 11 people (11%) with Hypertension Stage 1, and 2 people (2%) with Hypertension Stage 2.

Meanwhile, the lowest number of cases was found among the Late Elderly, with only 7 individuals (7%), consisting of 1 person (1%) with pre-hypertension and 6 people (6%) with Hypertension Stage 1.

In addition, there were 23 cases (23%) found among Late Adolescents. Among Middle Adults, 17 individuals (17%) were found to have hypertension, and among the Early Elderly, 13 individuals (13%) were found to have hypertension.

Based on statistical analysis using the Kruskal-Wallis method, it was found that age has no significant relationship with the incidence of hypertension, with a p-value of 0.097 (p < 0.05).

Based on Table 1, the highest number of hypertension cases was found among patients with a Body Mass Index (BMI) categorized as Obesity Class 1, totaling 77 patients (77%). This is because an increased BMI has a greater likelihood of being associated with metabolic syndrome, such as lipid metabolism disorders, which can lead to cardiovascular diseases, including hypertension. The prevalence of hypertension increases along with a higher BMI.[10]

According to a study by [reference][11], a p-value of 0.000 (p < 0.05) was obtained, indicating that there is a significant relationship between Body Mass Index (BMI) and hypertension.

Hypertension is caused by the accumulation of fat that narrows blood vessels, forcing the heart to work harder to pump blood flow. As a result, high blood pressure occurs as a consequence of increased cardiac output, higher blood volume circulating through the blood vessels, and ultimately leads to hypertension.[7]

Research by [reference][9] describes that even participants whose BMI was considered high but still fell within the "normal" category were found to have an increased risk of developing hypertension compared to individuals in the lowest quintile (<22.5 kg/m^2). Along with this finding, there was a positive trend in the development of hypertension when compared to BMI 14 years earlier. The study also noted that individuals with a BMI greater than 26.4 kg/m^2 had a 1.85 times higher risk of developing hypertension.

Hypertension, a non-communicable disease, is becoming more common each year and has become one of the leading causes of death in adulthood due to its complications.[8]

During adulthood, individuals experience increased responsibilities and a decline in physical capacity. This is because thickening of the arterial walls occurs due to the accumulation of collagen in the muscle layer, causing blood vessels to narrow further, leading to increased blood pressure and reduced efficiency of the cardiovascular system.[12]

Hypertension usually emerges during adulthood and tends to increase in individuals over the age of 40. In men over 31 years old, this disease often appears, while in women, it generally occurs after the age of 45. The rate of hypertension continues to rise with increasing age. As age advances, the normal functions of body organs undergo changes, and blood pressure increases along with age.

The fact is that age is a non-preventable factor because a person's age will naturally increase. However, age as a risk factor can be controlled by adopting a healthy lifestyle, one of which is through dietary changes. An unhealthy diet is a major cause of hypertension, and preventive measures are necessary to stop it.[12]

According to the World Health Organization (WHO), adulthood is considered the productive age, ranging from twenty to sixty years old. Compared to older adults, the prevalence of hypertension is generally higher in the adult population. Genetic factors and unhealthy lifestyles are the main causes of hypertension among young adults.

Certain bad habits have emerged as a consequence of this modern lifestyle, namely a lack of interest in physical activity. As a result, daily physical activity has begun to decline. Obesity is the result of an untrained heart, stiff blood vessels, poor blood circulation, and lack of activity.[14]

CONCLUSION AND RECOMMENDATION

The conclusion of this study is that there is a significant relationship between Body Mass Index (BMI) and the incidence of hypertension among adult patients aged 18–60 at Sangurara Public Health Center (Puskesmas) in Palu, with the highest number of hypertension cases found in patients with a high BMI.

There is no significant relationship between age and the incidence of hypertension among adult patients aged 18–60 at Sangurara Public Health Center in Palu, although the highest number of hypertension cases was found in adult age groups.

Suggestion: For future researchers, it is recommended to add more variables such as lifestyle, occupation, and daily activities to examine their relationship with the incidence of hypertension.

AUTHOR CONTRIBUTIONS

CONFLICTS OF INTEREST

REFERENCES

1. Hastuti AP. *HIPERTENSI*. Penerbit Lakeisha; 2020.

2. Suprayitno E, Huzaimah N. PENDAMPINGAN LANSIA DALAM PENCEGAHAN KOMPLIKASI HIPERTENSI. *SELAPARANG*. 2020;4(1):518. doi:10.31764/jpmb.v4i1.3001

3. Dien NG, Mulyadi, Kundre RM. HUBUNGAN INDEKS MASSA TUBUH (IMT) DENGAN TEKANAN DARAH PADA PENDERITA HIPERTENSI DI POLIKLINIK HIPERTENSI DAN NEFROLOGI BLU RSUP PROF. DR. R. D. KANDOU MANADO. Published online 2017.

4. WHO. More than 700 million people with untreated hypertension. Published 2021. Accessed July 20, 2023. https://www.who.int/news/item/25-08-2021-more-than-700-million-people-with-untreated-hypertension

5. KEMENKES RI. Kementerian Kesehatan Republik Indonesia. Published 2019. Accessed July 20, 2023. https://kemkes.go.id/article/view/190517 00002/hipertensi-penyakit-paling-banyak-diidap-masyarakat.html

6. DINAS KESEHATAN. PROFIL DINAS KESEHATAN 2021. Published online 2021.https://dinkes.sultengprov.go.id/wp-content/uploads/2022/05/profil-dinas-kesehatan-2021

7. Sihotang U. HUBUNGAN INDEKS MASSA TUBUH (IMT) DAN LINGKAR PINGGANG DENGAN STATUS HIPERTENSI PADA USIA 40-60 TAHUN DI KELURAHAN DATARAN TINGGI KOTA BINJAI. Published online 2023.

8. Rianty DA. PENGARUH EDUKASI KELOMPOK TERHADAP PENGETAHUAN PENGELOLAAN HIPERTENSI PADA KELOMPOK DEWASA HIPERTENSI DI UPT PUSKESMAS REJOSARI, KABUPATEN PRINGSEWU. *JIK*. 2023;12(1):30-38. doi:10.52657/jik.v12i1.1921

9. Khanna D, Peltzer C, Kahar P, Parmar MS. Body Mass Index (BMI): A Screening Tool Analysis. *Cureus*. Published online February 11, 2022. doi:10.7759/cureus.22119

10. Shidqi A, Fatmaningrum W. HUBUNGAN ANTARA STRES PSIKOLOGIS DAN IMT DENGAN HIPERTENSI. Published online 2022.

11. Yogeswara PA, Setyowati ER, Ruqayyah S, Wiatma DS. Pengaruh Indeks Massa Tubuh (IMT) dan Kadar Kolesterol dengan Hipertensi di Puskesmas Gerung Kabupaten Lombok Barat Nusa Tenggara Barat. *JN*. 2023;7(1):744-752. doi:10.31004/jn.v7i1.14199

12. Aniek Puspitosari, Ninik Nurhidayah. PENGARUH PROGRESSIVE MUSCLE RELAXATION TERHADAP TINGKAT HIPERTENSI PADA MIDDLE ADULTHOOD DI DESA KEMIRI KECAMATAN KEBAKKRAMAT KABUPATEN KARANGANYAR: THE EFFECT OF PROGRESSIVE MUSCLE RELAXATION ON HYPERTENSION LEVEL IN MIDDLE ADULTHOOD IN KEMIRI VILLAGE, KEBAKKRAMAT DISTRICT, KARANGANYAR REGENCY. *JIKKI*. 2022;2(2):1-5. doi:10.55606/jikki.v2i2.274

13. Jehani Y, Hepilita Y, Krowa YRR. FAKTOR - FAKTOR YANG BERHUBUNGAN DENGAN HIPERTENSI PADA USIA DEWASA MENENGAH DI WILAYAH KERJA PUSKESMAS WANGKO KECAMATAN RAHONG UTARA TAHUN 2022. 2022;7.

14. Cristanto M, Saptiningsih M, Indriarini MY. HUBUNGAN AKTIVITAS FISIK DENGAN PENCEGAHAN HIPERTENSI PADA USIA DEWASA MUDA: LITERATURE REVIEW. *JSK*. 2021;3(01):53-65. doi:10.32938/jsk.v3i01.937