AL-IQRA MEDICAL JOURNAL : JURNAL BERKALA ILMIAH KEDOKTERAN
e-ISSN : 2549-225X. Vol. 08 No. 1, April 2025, Hal. 48-58

THE EFFECT OF BODY MASS INDEX (BMI) ON HYPERTENSION IN PRODUCTIVE AGE AT SYEKH YUSUF HOSPITAL, GOWA REGENCY IN 2021

Muhammad Risqullah Ammar[1], Miftahulfahra Maulani Indri[1], Rolly Riksanto Bahtiar[1]

[1]Faculty of Medicine and Health Sciences, Universitas Muhammadiyah Makassar, Indonesia
Correspondence Author : risqullah.ammar@med.unismuh.ac.id

Abstract

Background: Hypertension is characterized by blood pressure readings showing a systolic pressure >140 mmHg or diastolic pressure >90 mmHg, measured according to the JNC VII guidelines. One of the predisposing factors for hypertension is weight gain, especially in individuals with obesity. **Objective**: This study aims to determine the effect of Body Mass Index (BMI) on the incidence of hypertension among individuals of productive age at Syekh Yusuf Hospital, Gowa Regency in 2021. **Method**: This analytical observational study used a cross-sectional approach and used secondary medical records data. **Results**: Data from 57 patients were analyzed, comprising 22 males (38.6%) and 35 females (61.4%). The distribution of patients by age was 14 people (24.6%) aged 35–45 years, 20 people (35.1%) aged 46–55 years, and 23 people (40.4%) aged 56–65 years. The highest number of hypertension grade I and II cases was found in BMI Obesity I category (34.8% and 65.2% respectively). Statistical analysis using the Spearman method revealed a p-value of 0.564 ($p > 0.05$) and a correlation coefficient (r) of 0.583. **Conclusion**: BMI did not show a statistically significant relationship with the incidence of hypertension in this study, but the correlation strength was categorized as strong.

Keywords : Effect, Body Mass Index, Hypertension, Productive Age, Syekh Yusuf Hospital

Abstrak

Latar Belakang: Hipertensi ditandai dengan hasil pengukuran tekanan darah yang menunjukkan tekanan sistolik >140 mmHg atau diastolik >90 mmHg, sesuai dengan pedoman JNC VII. Salah satu faktor predisposisi terjadinya hipertensi adalah peningkatan berat badan, khususnya pada individu dengan obesitas. Tujuan: Penelitian ini untuk mengetahui pengaruh Indeks Massa Tubuh (IMT) terhadap kejadian hipertensi pada usia produktif di RSUD Syekh Yusuf Kabupaten Gowa tahun 2021. Metode: Penelitian ini merupakan studi observasional analitik dengan pendekatan potong lintang (cross-sectional) menggunakan data sekunder berupa rekam medis. Hasil: Dari 57 pasien yang dianalisis, ditemukan sebanyak 22 orang (38,6%) laki-laki dan 35 orang (61,4%) perempuan. Sebanyak 14 orang (24,6%) berada dalam rentang usia 35–45 tahun, 20 orang (35,1%) usia 46–55 tahun, dan 23 orang (40,4%) usia 56–65 tahun. Kasus hipertensi derajat I dan II paling banyak ditemukan pada kategori IMT obesitas I (34,8% dan 65,2%). Hasil analisis menggunakan uji Spearman menunjukkan nilai p sebesar 0,564 (p > 0,05) dan nilai korelasi r sebesar 0,583. Simpulan: Tidak terdapat hubungan yang signifikan secara statistik antara IMT dan tekanan darah pasien hipertensi, namun memiliki kekuatan korelasi yang kuat.

Kata kunci **:** ***Pengaruh, Indeks Massa Tubuh, Hipertensi, Usia Produktif, RSUD Syekh Yusuf***

INTRODUCTION

Non-communicable diseases are still a scourge of current health problems in Indonesia. This is due to an unhealthy lifestyle in each individual. According to the 2018 Basic Health Research (Riskesdas) shows that 95.5% of Indonesian people consume less vegetables and fruit. Then 33.5% of people lack physical activity, 29.3% of people of productive age smoke every day, 31% have central obesity and 21.8% have obesity in adults. This has led to an increase in the number of non-communicable diseases (PTM) in Indonesia, one of which is hypertension.

Hypertension is a health problem worldwide and is a non-communicable disease that cannot be transmitted from person to person. However, hypertension is one of the main causes of premature death in the world which is nicknamed "the silent killer" because sufferers sometimes do not know they have hypertension before having their blood pressure checked so that it can have impacts and complications that can cause sudden death for sufferers.

Hypertension is a threat to public health because of its potential to cause complications such as stroke, coronary heart disease, and kidney failure. Hypertension is characterized by the results of blood pressure measurements showing a systolic pressure of >140 mmHg or a diastolic pressure of >90 mmHg. Blood pressure measurements were carried out according to the Joint National Committee (JNC) VII guideline criteria.

World Health Organization (WHO) estimates that currently the global prevalence of hypertension is 22% of the

total world population. Of these sufferers, only less than one-fifth make efforts to control their blood pressure. The proportion of hypertension also increased with increasing age group. This pattern occurred in Riskesdas in 2018. Physiologically, the higher a person's age, the greater the risk of developing hypertension.

The 2018 Riskesdas results show the prevalence rate of hypertension in residents > 18 years based on national measurements of 34.11%. This prevalence is higher than the prevalence in 2013 of 25.8%. WHO data for 2015 shows that around 1.13 billion people in the world have hypertension, meaning that 1 out of 3 people in the world is diagnosed with hypertension. The number of people with hypertension continues to increase every year, it is estimated that by 2025 there will be 1.5 billion people affected by hypertension, and it is estimated that every year 9.4 million people die from hypertension and its complications. The estimated number of cases of hypertension in Indonesia is 63,309,620 people, while the death rate in Indonesia due to hypertension amounted to 427,218 deaths. Hypertension occurs in the age group 31-44 years (31.6%), age 45-54 years (45.3%), age 55-64 years (55.2%). In terms os medication adherence, most hypertensive patients regularly take medication, namely 54.4%. Meanwhile, residents who did not take medication regularly and did not take medication at all were 32.27% and 13.33%, respectively. Of all hypertension sufferers who did not take medication regularly, the majority reasoned that they felt they were healthy, as many as 59.8%. In fact, there is a difference between hypertension sufferers based on measurements of 34.11% and hypertension sufferers based on a diagnosis of 8.36%. This indicates that at least 25% of the population has high blood pressure but has not been diagnosed or not aware that they have hypertension so they don't get treatment.

American Heart Association (AHA) states that to control hypertension it is necessary to make lifestyle changes and control risk factors such as a balanced diet, not consuming alcohol, stress management, quitting smoking, regular exercise, and maintaining a healthy body weight. If the lifestyle that is carried out is lacking in physical activity, this is referred to as a sedentary lifestyle that spends little energy, consumption of instant food containing chemicals, smoking behavior, alcohol consumption, and low consumption of fruits and vegetables are factors that can trigger obsession associated with hypertension. This has a major impact on the productive age according to the Big Indonesian Dictionary (KBBI) that productive age is the age group when a person is still able to work and produce something.

Obesity is a major factor affecting hypertension which can be seen from the Body Mass Index (BMI). Approximately 46% of patients with BMI 27 are hypertensive. The Framingham Study has found a 15% increase in body weight can lead to an 18% increase in systolic blood pressure. Compared with normal weight people, overweight people who are 20% overweight have an eight times greater risk of hypertension. BMI is a simple tool to monitor the nutritional status of adults, especially with regard to underweight and overweight. The use of BMI only applies to adults aged over 18 years and cannot be applied to infants, children and pregnant women.

According to The Central Statistics Agency (BPS) reported that in 2019, the

productive age population still dominated. The percentage of men and women in productive age (15-64 years) is around 67.6%. Meanwhile, the non-productive age population is only around 26-27%. Indonesia will become a country experiencing a demographic bonus in 2045, when the composition of the productive age population (15–64 years) is greater than the non-productive age population. The demographic bonus can be a threat, but it can also be an opportunity that will become a strength for Indonesia's resources if it can be utilized properly, especially if health is a matter of concern.

Based on the background description, namely the prevalence of hypertension is increasing, especially at productive age, the authors want to conduct a study to determine the effect of BMI on the incidence of hypertension at productive age at the Syekh Yusuf Hospital, Gowa Regency in 2021.

METHODS

This research is an analytic observational study with a cross-sectional approach to study the correlation between risk factors by means of an approach or data collection at one time. Sampling technique (1) Population ; The population in this study were hypertensive inpatients in the Syekh Yusuf Gowa Hospital area in 2021. (2) Sample The sampling technique was to use purposive sampling of hypertensive inpatients in the area of RSUD Sheikh Yusuf Gowa in 2021. (a) Inclusion Criteria ; (1) Patients hospitalized with hypertension at RSUD Sheikh Yusuf Gowa in 2021. (2) Patients with productive age between 15 - 64 years old who seek treatment at RSUD Syekh Yusuf Gowa in 2021.(3) Patients who have complete medical record data at RSUD Syekh Yusuf Gowa in 2021 that can be evaluated, including: Patient identity in the form of name, age, gender, and patient anthropometric results in the form of weight and height. (b) Exclusion Criteria ; (1) Unreadable medical record data. (2) Infants, children and pregnant women (if known through medical records).

RESULTS

This research was conducted on hypertensive patients at Syekh Yusuf Gowa Hospital from January to December 2021. This research was conducted by taking secondary data from the medical records of hypertensive patients according to the inclusion criteria. The sampling technique used is purposive sampling, which is a deliberate sampling method because there are certain considerations under the required sample requirements. The number of hypertension sufferers who were treated at Syekh Yusuf Gowa Hospital from January to December 2021 which will be used as samples in this study was found to be 57 people. Samples were taken from the medical record data section of Syekh Yusuf Gowa Hospital which were collected and processed based on gender, age, BMI, and blood pressure.

1. Univariate Analysis

Univariate analysis was used to describe the characteristics of the independent and dependent variables. The entire data obtained, processed and presented in the form of a frequency distribution table.

2. Frequency Distribution of Hypertension Patients Based on Gender Groups at Syekh Yusuf Gowa Hospital in January - December 2021

Based on data collected from a total of 57 patients, it was found that there were 22 males (38.6%) and 35 females (61.4%).

3. Frequency Distribution of Hypertension Patients by Age Group at Syekh Yusuf Gowa Hospital in January - December 2021

Based on data collected from a total of 57 patients, it was found that the number of patients with an age range of 35 - 45 years was 14 people (24.6%), the age range 46 - 55 years was 20 people (35.1%) and the age range was 56 - 65 years 23 people (40.4%).

4. Frequency Distribution of Hypertension Patients Based on BMI Interpretation at Syekh Yusuf Gowa Hospital in January - December 2021

Based on data collected from a total of 57 patients, it was found that the number of patients with underweight BMI was 2 people (3.5%), normal weight BMI was 13 people (22.8%), overweight BMI was 11 people (19.3 %), BMI obesity I amounted to 23 people (40.4 %), and BMI obesity II amounted to 8 people (14.0 %).

5. Frequency Distribution of Hypertension Patients Based on Interpretation of Hypertension Degrees at Syekh Yusuf Gowa Hospital in January - December 2021

Based on data collected from a total of 57 patients, it was found that the number of patients with grade I hypertension was 22 people (38.6%) and the number of patients with grade II hypertension was 35 people (61.4%).

Bivariate analysis was used to see the effect between the independent and variable dependent variable using the Spearman correlation test analysis because the two groups of data were obtained using an ordinal scale (interpretation) so that a correlation test with the Spearman method is needed to connect the two.

Samples with grade 1 hypertension totaled 22 people (38.6%), of which 1 person had less weight BMI (50.0%), 6 people had normal weight BMI (46.2%), 4 people had heavy BMI overweight (36.4%), 8 people had obesity BMI I (34.8%), and 3 people had obesity BMI II (37.5%). Meanwhile, the sample with grade 2 hypertension was 35 people (61.4%), of which 1 person had BMI underweight (50.0%), 7 people had BMI normal weight (53.8%), 7 people had BMI overweight (63.6%), 15 people had obesity BMI I (65.2%), and 5 people had obesity BMI II (62.5%).

DISCUSSION

Based on the processing of medical records of hypertensive patients in Syekh Yusuf Gowa Hospital from January to December 2021, It was found that the number of male hypertensive patients was less than that of female hypertensive patients.

Based on the results of these studies, *American Heart Association* (AHA) said that the prevalence of hypertension in women is higher than men, especially in menopausal and postmenopausal conditions, which are aged 50 to 79 years at

the start. This happens because at this age, women tend to experience an increased risk of high blood pressure (hypertension) due to reduced estrogen levels during menopause which results in reduced levels of High-Density Lipoprotein (HDL), which will affect the occurrence of atherosclerosis and result in blood pressure. due to high levels of Low-Density Lipoprotein (LDL).

In addition, women who gain weight after menopause are associated with increased blood pressure and an increased incidence of type II diabetes. Obesity is also accompanied by increased sympathetic activity, especially in the kidneys, which causes increased renin release which can lead to hypertension. Therefore, while blood pressure is increased in the majority of postmenopausal women, postmenopausal women who are obese have a greater predisposition to hypertension than postmenopausal women who are thinner.

In the results of the study of hypertensive patients, it was found that the number of patients with an increasingly older age range, the patient's blood pressure also increased. It can be seen that in the average age range of hypertensive patients in Syekh Yusuf Gowa Hospital from January to December 2021more at the age above or equal to 50 years, which means the results of this study show that patients who suffer from hypertension are dominated by ages over 50 years who come to the Syekh Yusuf Gowa Hospital from January to December 2021to get treatment. Increasing age greatly affects the process of hypertension. Age more than 40 years has a risk of suffering from hypertension with a prevalence rate of incidence of hypertension is around 40% with a mortality rate of around 50% at the age of over 60 years.

According to the theory it is said that over the age of 45 years the blood vessel walls will experience thickening due to the accumulation of collagen in the muscle layer. So that the blood vessels will narrow and become stiff. The global prevalence of hypertension is therefore increasing due to an aging population and an increasing prevalence of obesity, and is expected to affect one third of the world's population by 2025.

Based on data collected from 57 patients, it was found that the number of hypertensive patients with BMI above normal values was higher than hypertensive patients with normal BMI or less. The distribution of hypertensive patients with BMI and degree of hypertension shows that patients with BMI are obese I and suffer from grade II hypertension predominate in this study.

If you look at the data that has been obtained from the results of the research above, in hypertensive patients from January to December 2021 at Syekh Yusuf Gowa Hospital with the results of the analysis test using the Spearman method, the results show a *p*-value of 0.564 where $p > 0.05$, which means there is no significant relationship between body mass index and hypertension in hypertensive patients at Syekh Yusuf Gowa Hospital from January to December 2021.

This study is in accordance with the results of other studies conducted at the Lubuk Minturun Padang Health Center by Imelda, et al 2020 with statistical test results using chi-square, obtained a p-value of 0.980 ($p > 0.05$) meaning that there is no

significant relationship between obesity and the incidence of hypertension in the elderly. A similar study was conducted by Grelvan in 2017 with a p-value of 0.597 ($p > 0.05$), which means that there is no significant relationship between body mass index and hypertension in hypertensive patients at Hasanuddin University Teaching Hospital from March to August 2017.

This is also in line with research conducted by Lina in 2016, which obtained a *p*-value of 0.272 ($p>0.05$) meaning that there is no significant relationship between obesity and the incidence of hypertension, so it can be concluded that there is no significant relationship between obesity with the incidence of hypertension in the elderly. In addition, the results obtained in this study were strengthened by previous research conducted in Samosir Village in 2013 by Arifin, et al using the chi-square method and found that the *p*-value was 0.160 where $p> 0.05$, which means that there is no significant relationship between nutritional status and the incidence of hypertension.

However, the results are different from other studies conducted at the Jagir Health Center in Surabaya in 2019 by Yuniar using the chi-square test, it was found that the p value was 0.018 with a *p*-value <0.05, this study showed that there was a significant relationship between obesity and hypertension in the sense that the greater the body mass index, the higher the risk of developing hypertension, so it can be concluded that the risk factor associated with the incidence of hypertension in people of productive age (15-64 years) is obesity.

This difference in results is caused by multicausa, from the large and heterogeneous number of productive age samples of 103 people who live in the working area of the Jagir Health Center and are obese (58.3%), while consuming potassium (38.0%) which is also a risk factor hypertension ($p = 0.004$), so that this can support a significant relationship between obesity and the incidence of hypertension.

In the current study on hypertensive patients at Syekh Yusuf Hospital in January - December 2021, the results obtained were a *p*-value of 0.564 where $p > 0.05$ which means there is no a significant relationship between body mass index and hypertension, this is due to the possibility of an increase in the sympathetic system and the renin-angiotensin system. This is in line with the results of the cross-tabulation between obesity and stress events, which is known that stress events are more common in patients who are not obese. This means that not all obese patients will experience hypertension. In some cases, an increase in sympathetic nerve activity that regulates nerve and hormone function can cause an increase in heart rate, narrowing of the arteries and increased water and sodium retention, causing these patients to experience hypertension.

In addition, according to the Ministry of Health of the Republic of Indonesia in 2020, it is known that the average case of hypertension has decreased blood pressure by reducing salt intake. So even though a person has a thin or normal BMI, if the consumption of sodium is excessive then a person has a risk of hypertension. It has been suggested that a 10% increase in relative normal body weight results in a 7 mm Hg increase in blood pressure.

Although there is no significant relationship between the two variables, this study obtained an *r*-value of 0.583 which means that the *r*-value, if converted to the De Vaus Version correlation coefficient, has a strong relationship between body mass index and hypertension in hypertensive patients at Syekh Yusuf Gowa Hospital. from January to December 2021. In addition, the correlation coefficient in the results above has a positive value, which is 0.583 so the relationship between the two variables is unidirectional, thus it can be interpreted that the body mass index is increasing in hypertensive patients aged ≥ 40 years at Sheikh Hospital Yusuf Gowa in January to December 2021 then The patient's blood pressure will also increase.

The increase in BMI is followed by an increase in blood pressure. This means that the higher a person's BMI, the higher the chance of developing hypertension. Individuals who are obese have a 2.51 times greater risk of experiencing hypertension than individuals in the normal category. When a person is obese or in other words has excess body weight, that person will need more blood to supply oxygen and food to the body's tissues, so that the volume of blood circulating through the blood vessels increases, cardiac output also increases, and finally, blood pressure goes up increase. So that overall the risk factors for obesity have a relationship with the incidence of hypertension and have an increased risk from normal to overweight and obesity.

Therefore, we must make every effort to maintain our health, especially ideal body weight, to avoid various diseases whose risk factors are overweight or obesity.

CONCLUSION

After conducting research on the effect of body mass index on hypertension at Syekh Yusuf Gowa Hospital from January to December 2021 it was concluded that there was no significant effect between body mass index and hypertension in hypertensive patients at Syekh Yusuf Gowa Hospital from January to December 2021, but had the correlation coefficient is positive, so that the relationship between the two variables is unidirectional which indicates that there is a strong correlation between BMI and the incidence of hypertension.

REFERENCES

1. Riset Kesehatan Dasar (Riskesdas) (2018). Badan Penelitian dan Pengembangan Kesehatan Kementerian RI tahun 2018.

2. Gosal, D., Firmansyah, Y. and Su, E. (2020). Pengaruh Indeks Massa Tubuh terhadap Klasifikasi Tekanan Darah pada Penduduk Usia Produktif di Kota Medan. *Jurnal Kedokteran Meditek*, *26*(3), pp.103-110.

3. Arum, Y.T.G. (2019). Hipertensi pada penduduk usia produktif (15-64 tahun). *HIGEIA (Journal of Public Health Research and Development)*, *3*(3), pp.345-356.

4. Herdiani, N. (2019). Hubungan IMT dengan hipertensi pada lansia di Kelurahan Gayungan Surabaya. *Medical Technology and Public Health Journal*, *3*(2), pp.183-

189.

5. Badan Pusat Statistik. Statistik Indonesia 2019. Jakarta: BPS; 2019.

6. Bernabe-Ortiz, A., Carrillo-Larco, R.M. and Miranda, J.J. (2021). Association between body mass index and blood pressure levels across socio-demographic groups and geographical settings: analysis of pooled data in Peru. *PeerJ*, *9*, p.e11307.

7. Kementerian Kesehatan Republik Indonesia. (2018). *Epidemi Obesitas*. Available at: http://p2ptm.kemkes.go.id/uploads/N2VaaXIxZGZwWFpEL1VlRFdQQ3ZRZz09/2018/02/FactSheet_Obesitas_Kit_Informasi_Obesitas.pdf (Accessed: July 27th, 2022).

8. Utami, D. (2017). Faktor-faktor yang mempengaruhi indeks massa tubuh pada remaja usia 15-18 tahun di SMAN 14 Tangerang. *Jurnal Ilmu Kedokteran Dan Kesehatan*, *4*(3).

9. Krismawati, L.D.E., Andayani, N.L.N. and Wahyuni, N. (2019). Hubungan antara aktivitas fisik dengan indeks massa tubuh (IMT) pada remaja usia 16-18 tahun di SMA Negeri 2 Denpasar. *Majalah Ilmiah Fisioterapi Indonesia*, *7*(1), pp.29-32.

10. Adrian, S.J. (2019). Hipertensi esensial: diagnosis dan tatalaksana terbaru pada dewasa. *Cermin Dunia Kedokteran*, *46*(3), pp.172-178.

11. Unger, T., Borghi, C., Charchar, F., Khan, N.A., Poulter, N.R., Prabhakaran, D., Ramirez, A., Schlaich, M., Stergiou, G.S., Tomaszewski, M. and Wainford, R.D. (2020). 2020 International Society of Hypertension global hypertension practice guidelines. *Hypertension*, *75*(6), pp.1334-1357.

12. Setiati, S. (2014). *Buku Ajar Ilmu Penyakit Dalam.* Ngawi: Interna Publishing.

13. Salam, A. (2010). *Faktor risiko kejadian obesitas pada remaja*. Hasanuddin University.

14. Giles, T.D., Materson, B.J., Cohn, J.N. and Kostis, J.B. (2009). Definition and classification of hypertension: an update. *The journal of clinical hypertension*, *11*(11), pp.611-614.

15. Miller, C.R., Wactawski-Wende, J., Manson, J.E., Haring, B., Hovey, K.M., Laddu, D., Shadyab, A.H., Wild, R.A., Bea, J.W., Tinker, L.F. and Martin, L.W. (2020). Walking volume and speed are inversely associated with incidence of treated hypertension in postmenopausal women. *Hypertension*, *76*(5), pp.1435-1443.

16. Brahmbhatt, Y., Gupta, M. and Hamrahian, S. (2019). Hypertension in premenopausal and postmenopausal

women. *Current hypertension reports*, *21*, pp.1-10.

17. Estefania, O., Hena, P., Stella, K., Steri, F., Alan, G., Nidhi, M. and Kim, W. (2020). Hypertension in older adults: Assessment, management, and challenges. *Clinical Cardiology Wiley*.

18. Nakagawa, P., Gomez, J., Grobe, J.L. and Sigmund, C.D. (2020). The renin-angiotensin system in the central nervous system and its role in blood pressure regulation. *Current hypertension reports*, *22*, pp.1-10.

19. Kementerian Kesehatan Republik Indonesia. (2018). *Batasi Asupan Natrium Bagi Pengidap Hipertensi*. Available at: https://p2ptm.kemkes.go.id/infographic-p2ptm/hipertensi-penyakit-jantung-dan-pembuluh-darah/page/46/batasi-asupan-natrium-bagi-pengidap-hipertensi (Accessed: July 29th, 2022).

20. I Imelda, I., Sjaaf, F. and PAF, T.P. (2020). Faktor-faktor yang berhubungan dengan kejadian hipertensi pada lansia di puskesmas air dingin lubuk minturun. *Health and Medical Journal*, *2*(2), pp.68-77.

21. Lim, O.W. and Yong, C.C. (2019). The risk factors for undiagnosed and known hypertension among Malaysians. *The Malaysian journal of medical sciences: MJMS*, *26*(5), p.98.