

Dietary Adherence and Physical Activity: Unraveling the Threads Impacting Blood Pressure in Hypertensive Patients

Dwi Isnarti Amin¹, Asep Sujana Wahyuri¹, Roma Irawan¹, Wilda Welis¹, Farida Gusni², Dally Rahman^{3*}, Adri Budiwanto¹, Yovhandra Ockta¹

^{1,2,3,4,7,8} Faculty of Sports Sciences, Universitas Negeri Padang, Padang, Indonesia

² Politeknik Kesehatan Jambi, Jambi, Indonesia

³ Faculty of Nursing, Universitas Andalas, Padang, Indonesia

Received: October 15, 2023

Revised: December 5, 2023

Accepted: December 25, 2023

Published: December 31, 2023

Corresponding Author:

Dally Rahman

dallyrahman@nrs.unand.ac.id

DOI: [10.29303/jppipa.v9iSpecialIssue.7388](https://doi.org/10.29303/jppipa.v9iSpecialIssue.7388)

© 2023 The Authors. This open access article is distributed under a (CC-BY License)



Abstract: This study investigates the relationship between dietary adherence, physical activity, and blood pressure among hypertensive patients in the Simpang Pandan Health Center, East Tanjung Jabung Regency. The research, employing quantitative descriptive analysis and a cross-sectional methodology, included 127 hypertensive patients. The results revealed a significant correlation between dietary adherence and blood pressure (p -value=0.000). Of the respondents, 47.2% did not adhere to the recommended diet, while 52.8% showed adherence. Moreover, physical activity demonstrated a substantial association with blood pressure (p -value=0.000). The majority (63.8%) engaged in light physical activity, while 36.2% had heavy physical activity. The study also explored demographic characteristics, noting that 46.5% of respondents were male, and 53.5% were female. The age distribution indicated 39.4% were adults, and 60.6% were elderly. In conclusion, both dietary adherence and physical activity significantly influence blood pressure among hypertensive patients. The findings underscore the importance of maintaining a hypertensive diet, including reduced salt and fatty foods, along with regular physical activity to promote overall health and normalize blood pressure. This research contributes to understanding lifestyle factors impacting hypertensive patients in the Simpang Pandan Health Center, providing insights for healthcare interventions and emphasizing the holistic approach needed for effective hypertension management

Keywords: Diet Adherence; Hypertension; Physical Activity

Introduction

One of the many non-communicable diseases that are often found in basic health services such as Puskesmas is hypertension (Akik et al., 2022; Haruna et al., 2021; Sudin et al., 2023). An increase of more than 160 mmHg for systolic pressure and/or higher than 95 mmHg for diastolic pressure is called hypertension (Lizano-Díez et al., 2022; Rodriguez-Zuñiga et al., 2021). Persistent hypertension is another term for a condition of blood pressure check results that show numbers above 140/90 mmHg (Bello et al., 2021; Sartika Dasopang et al., 2021). When a person's blood pressure increases beyond the recommended limit (140/90

mmHg), it is called hypertension. This condition can result in illness or even death. About 22% of the world's population suffers from hypertension, with an incidence of 36% in Southeast Asia. In Indonesia, hypertension accounted for 23.7% of all deaths in 2016 with a total of 1.7 million deaths (Tatisina et al., 2020; Wasilah et al., 2022). Meanwhile, in Jambi province itself in 2021, the 10 largest diseases were recorded, hypertension was ranked first with 31.70% of the 10 largest diseases in Jambi province (Darwis et al., 2022).

One of the main risk factors for stroke, heart disease, kidney disease, congestive heart failure, and eye problems is hypertension (Fuchs & Whelton, 2020; Zaki et al., 2020). These problems may be more likely to occur

How to Cite:

Amin, D. I., Wahyuri, A. S., Irawan, R., Welis, W., Gusni, F., Rahman, D., ... Ockta, Y. (2023). Dietary Adherence and Physical Activity: Unraveling the Threads Impacting Blood Pressure in Hypertensive Patients. *Jurnal Penelitian Pendidikan IPA*, 9(SpecialIssue), 1363-1371. <https://doi.org/10.29303/jppipa.v9iSpecialIssue.7388>

in people with high blood pressure. Untreated hypertension can impact every organ system, resulting in a decrease in life expectancy by 10 to 20 years (Lizano-Díez et al., 2022). Hypertensive patients who experience problems in many important organs due to uncontrolled conditions will die faster (Renu et al., 2020; Akik et al., 2022).

The goal of a hypertensive diet is to help lower blood pressure and maintain it. It is highly recommended for people with hypertension to change their diet by excluding or consuming fewer foods that can increase blood pressure and cholesterol (Nepali et al., 2022). Adherence to a diet can lower the risk of cardiovascular disease and avoid or delay the onset of hypertension. It has been proven that following a diet that requires reducing alcohol and salt intake, eating more fruits and vegetables, losing and maintaining weight, exercising regularly, and quitting smoking can lower blood pressure (Hashemi-Arend et al., 2022; Nepali et al., 2022; Umemoto et al., 2022). In addition to dietary adherence, physical exercise is part of the elements that affect blood pressure. Physical activity is any body movement that uses energy and is performed by skeletal muscles (Ramsey et al., 2021). People who engage in continuous, regular physical activity that truly energetic people usually avoid hypertension and have lower systolic blood pressure (Ferretto et al., 2020). Vasoconstrictor and cardioaccelerator areas in the vasomotor center become more active in response to increased blood pressure controlled by the brainstem reticular activation system. Blood pressure will increase due to this condition (Huang et al., 2021; Shariful Islam et al., 2023).

An initial survey conducted by researchers at the Simpang Pandan Health Center on March 23 by interviewing 10 hypertensive patients who came for treatment to the Simpang Pandan Geragai Health Center, Tanjung Jabung Timur Regency, obtained data on 7 out of 10 hypertensive patients who like to eat seafood almost every day, then coconut milk foods and also often consume salted fish. Some of them know that too often eating salted fish and seafood can cause hypertension, but they still eat the food because salted fish is a durable raw material. Of the 10 patients, 6 people said they could not do activities because after going to sea at night, in the morning they slept and were also limited in doing activities due to the aging process, such as cleaning the house, leaving the house, and exercising. The blood pressure of the 6 patients was included in the hypertension category I. Then 2 out of 4 people who were still active had blood pressure that was included in the prehypertension category, while the other two people had blood pressure that was included in the hypertension I category.

Research conducted by Wulandari et al., (2023) states that in hypertensive individuals, the degree of dietary adherence correlates with blood pressure. Kemudian Friska et al., (2024) showed that people with hypertension at the Puskesmas Perwira Bekasi Utara found a significant relationship between dietary compliance with blood pressure. Furthermore, the results of research conducted by Sihotang & Elon (2020) which states there is a relationship between physical activity and systole blood pressure. But so far no studies have looked simultaneously at the relationship between diet adherence and physical activity with a person's blood pressure. Based on the above phenomenon, researchers feel the need to conduct research on the relationship between diet compliance and physical activity with blood pressure of hypertensive patients.

Method

To get a clear picture of the phenomena that occur, this study uses quantitative descriptive analysis. The description of activities is carried out methodically, focusing on factual information rather than conclusions (Sugiyono, 2012), using a cross-sectional methodology. The study, estimation, and explanation of relationships are based on current research and theory. The sample should cover the entire range of possible values (Triyono, 2015). The estuary of this study is to determine the effect of blood pressure of hypertensive patients on dietary compliance and physical activity in the operational area of the Simpang Pandan Health Center, East Tanjung Jabung Regency in 2023. In this study blood pressure (Y) was the dependent variable, while dietary adherence and physical activity (X) were independent factors. All hypertensive patients who received therapy at the Simpang Pandan Health Center were used as a study population with a total population in the last 1 month of December 2022 of 170 people. Then the samples in this study were patients who came for treatment to the Simpang Pandan Health Center Work area. The determination of the sample in this study was by *accidental sampling technique* so as to obtain 127 respondents. The inclusion criteria selected in the study were Hypertensive Patients of productive age and Hypertensive Patients undergoing treatment in the working area of the Simpang Pandan Health Center.

Data were collected for independent variables (dietary compliance and physical activity) using questionnaires and interviews, while data for bound variables (blood pressure) were also collected with tension meters. The collected data is then processed in several stages, namely *editing, coding, processing, cleaning*. The data was also analyzed using two ways, namely univariate to see frequency. Meanwhile, bivariate analysis to see the relationship between diet compliance

and physical activity with the incidence of hypertension in the Simpang Pandan health center work area.

Result and Discussion

Characteristic

a. Gender

The following table displays the findings of the distribution of hypertension patients at Simpang Pandan Health Center by gender:

Table 1. Distribution of Respondents by Gender

Gender	Sum	(%)
Man	59	46.5
Woman	68	53.5
Total	127	100

It can be seen from table above that out of 127 respondents, 46.5% were men and 53.5% were women.

b. Age

The results of distribution based on the age of hypertensive patients at Simpang Pandan Health Center, can be seen in Table 2.

Table 2. Distribution of Responses by Age

Age	Sum	(%)
Adolescent	-	0
Adult	50	39.4
Seniors	77	60.6
Total	127	100

It can be seen from the analysis of table above, out of 83 respondents, 39.4% were adults and 60.6% were elderly.

Data Analysis of Research Results

a. Results of univariate analysis

The frequency distribution of each variable from all independent and dependent variables can be seen using univariate analysis.

1. Incidence of Hypertension

The results of the distribution of Hypertensive Events in Hypertensive patients at Simpang Pandan Health Center, can be seen in Table 3.

Table 3. Distribution Based on Blood Pressure

Blood pressure	Sum	(%)
Normal Blood Pressure < 140/80 mmHg	54	42.5
Hypertension > 140/90 mmHg	73	57.5
Total	127	100

Based on Table 3, it can be known from 127 respondents, 54 people, 42.5% of respondents with

normal blood pressure, and 73 people, 57.5% of respondents have hypertension.

2. Dietary Adherence

The results of the distribution of dietary adherence in hypertensive patients at the Simpang Pandan Health Center, can be seen in Table 4:

Table 4. Distribution Based on dietary adherence

Dietary Adherence	Sum	(%)
Disobedient	60	47.2
Obedient	67	52.8
Total	127	100

Based on table above, it can be seen that from 127 respondents, 60 people (47.2%) did not adhere to the diet, and 67 people (52.8%) adhered to the diet.

3. Physical Activity

The results of the distribution of physical activity in hypertensive patients at the Simpang Pandan Health Center, can be seen in Table 5.

Table 5. Distribution Based on Physical Activity

Physical Activity	Blood pressure		p-value
	Normal (%)	HTN (%)	
Light	15.9	84.1	0.000
Heavy	91.1	8.9	
Total	42.5	57.5	

Based on the table above, it can be seen from 127 respondents 81 people (63.8%) have light physical activity, and 46 people (36.2%) have heavy physical activity.

b. Results of Bivariate Analysis

The results of the analysis of the relationship between the variables of dietary compliance and physical activity with the incidence of hypertension will be described below:

1. Relationship of Diet Adherence with Blood Pressure

Table 6. Relationship of Diet Adherence with Blood Pressure

Dietary Adherence	Blood pressure		p-value
	Normal (%)	HTN (%)	
Disobedient	21.4	78.6	0,000
Obedient	59.2	41.8	
Total	42.5	57.5	

Based on the Table above, 71 participants reported adherence, 42 (59.2%) reported normal blood pressure, and 29 (41.8%) reported hypertension. Twelve respondents (21.4%) had normal blood pressure, 44 respondents (78.6%) had hypertension, and 56

respondents (non-compliant) were non-compliant. A substantial correlation between dietary adherence and blood pressure can be inferred from the findings of statistical trials, which result in a p-value of 0.000. The relationship between blood pressure and physical exercise.

2. Relationship of Diet Adherence to Physical Activity

Table 7. Relationship of Physical Activity with Blood Pressure

Physical Activity	Sum	(%)
Light	81	63.8
Heavy	46	36.2
Total	127	100

Table above shows that 69 (84.1%) respondents had hypertension, 13 (15.9%) respondents had normal blood pressure, and 82 respondents engaged in moderate physical activity. While normal blood pressure as many as 41 people (42.5%) and hypertension as many as 45 people (8.9%). A substantial correlation between physical activity and blood pressure can be inferred from the findings of statistical tests, which result in a p-value of 0.000.

A p-value of 0.000 indicates the results of the study, the results of the study showed a significant correlation between blood pressure and dietary adherence. Research Triwibowo et al., (2016) In agreement with the results of this study revealed that it was seen in hypertensive patients at the Internal Medicine Poly of RSUD Prof.Dr.Soekandar Mojokerto that Banar adherence to the hypertension diet had an impact on blood pressure. The findings of the study showed a relationship between the blood pressure of hypertensive patients and dietary adherence was (pv = 0.000). This is also supported by research Nurazizah & Kurniawati, (2022) that there is a significant correlation between the diet of hypertensive patients with blood pressure in the working area of the Simpang Pandan Health Center with a p - value of 0.00.

A person who adheres to recommended health practices is known as obedience, as is the patient's behavior in response to medical orders (Sacks et al., 1995). The extent to which a patient adheres to guidelines or directions given in recommended forms of therapy, including those relating to food, exercise, medications, or scheduling an appointment with a physician, is called adherence (Muharani Syaftriani et al., 2023). Compliance is the extent to which one follow recommended guidelines and behaviors (Friska et al., 2024; Wulandari et al., 2023). There are two existing compliances: full compliance (total compliance), i.e. hypertensive patients strictly follow a diet, and non-

compliance, i.e. patients do not follow a diet to prevent hypertension (Wentzel, 2020).

If you want to lower blood pressure naturally, diet is a better option than medication, which can have a number of negative effects (Shariful Islam et al., 2023). It is important to take into account dietary factors, or dietary adherence, when treating hypertensive patients. To avoid further complications, people with hypertension should follow a hypertensive diet (Chan et al., 2020; Ozaki et al., 2020; Vaismoradi et al., 2020). People with hypertension must continue to run their daily hypertensive diet either when experiencing pain or other symptoms. The goal is to keep the blood pressure of hypertensive patients stable in order to avoid hypertension and its effects (Fogli-Cawley et al., 2007).

People with hypertension are expected to follow a consistent eating schedule every day so that their blood pressure remains stable and prevents complications of the disease (Purwandari & Nugroho, 2018). The goal is to keep the blood pressure of hypertensive patients stable in order to avoid hypertension and its effects. Dietary adherence according to the advice of Saragih et al., (2022); Nepali et al., (2022)(Sacks et al., 1995) Include:

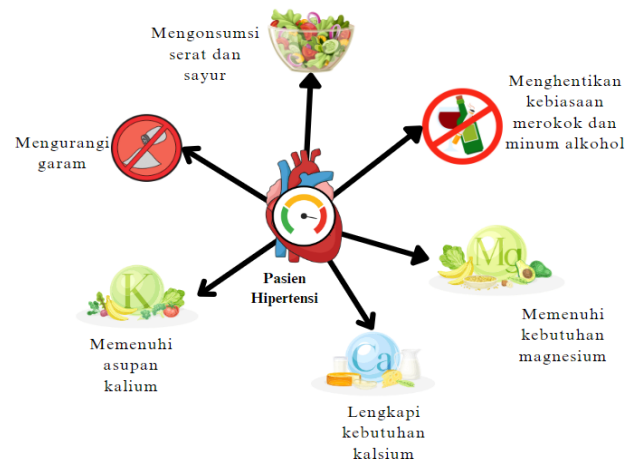


Figure 1. dietary recommendations for people with hypertension

The basic principle of the diet of hypertensive patients is that the diet should ideally be varied and the composition is tailored to the needs of the patient (Nepali et al., 2022; Triwibowo et al., 2016). If left untreated, hypertension can be dangerous and increase the risk of heart disease, kidney failure, and stroke (Purba et al., 2023). Adherence to the diet of high blood pressure patients is a priority to reduce their status to normal. Every person with hypertension is expected to maintain a regular diet every day so that blood pressure remains stable and avoid complications of the disease (Fogli-Cawley et al., 2007). Adopting a regular diet, including eating less fatty and salty foods, increasing fiber-rich foods, and doing physical activity, can help

normalize hypertension (Permatasari et al., 2021). With a p -value of 0.000, statistical test results show a significant relationship between blood pressure and physical activity. This is in line with research conducted by Simanjuntak & Hasibuan, (2022) which shows a correlation between physical activity and systolic and diastolic blood pressure; The more physically active a person is, the lower his blood pressure will be. Other research conducted by Yulistina et al., (2017) which shows a correlation between physical activity and systolic and diastolic blood pressure; The more physically active a person is, the lower his blood pressure will be. Other research conducted by (Mulyasari & Srimiati, 2020).

Individuals who move infrequently usually experience an increased heart rate, which means that each contraction of their heart muscle requires more effort (Kinnunen et al., 2020). Harder heart pressure triggers an increase in peripheral resistance, leading to increased blood pressure and increased pressure on the arteries. (Abdurakhman et al., 2022). Inactivity can also increase the chances of weight gain beyond the limit, which also carries risks. Doing physical activity can lower blood pressure through a decrease in peripheral resistance. Changes in sympathetic nervous system activity and vascular response after physical activity lead to a decrease in peripheral resistance. First, peripheral blood vessels experience a decrease in sympathetic nervous system activity, thereby lowering blood pressure neurohumorously. Second, after physical activity, the vascular response plays an important role in lowering blood pressure (Chen et al., 2020; Nagata et al., 2021). Exercise increases nitric oxide (NO) production and alters the reaction of vasoconstrictors to vasodilators, thus minimizing vasoconstriction in blood vessels (Kazeminia et al., 2020).

Doing regular exercise helps reduce blood pressure. The goal of physical activity is to burn glucose to produce adenosine triphosphate (ATP) which the body's cells can use as energy (Barone Gibbs et al., 2021). The pineal gland will release more melatonin and serotonin when you exercise (Herrod et al., 2021). The pituitary receives stimuli from the hypothalamus necessary for the production of endorphins and beta endorphins. Because of their calming and cheerful effects, beta endorphine and enkephalin can reduce stress and anxiety (Abdurakhman et al., 2022; Ariyanto et al., 2020; Wellman et al., 2020). Being overweight can put additional stress on the heart's ability to do its job as a blood pump throughout the body, increasing cardiac output and peripheral stress and ultimately leading to hypertension (Mulyati et al., 2018).

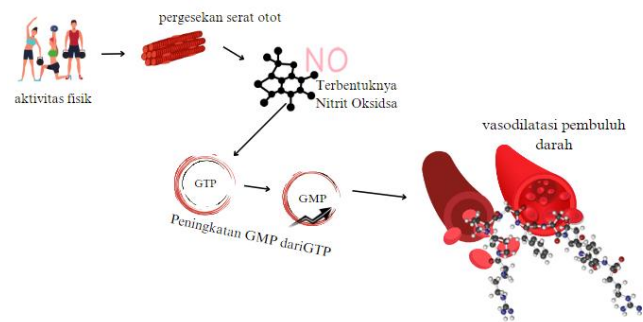


Figure 2. The process of physical activity affects blood pressure

Shear stress, which occurs when muscle fibers rub against each other during exercise, causes increased wave-like blood flow. This triggers the production of nitric oxide (NO), also known as endothelium-derived relaxin factor (EDRF), which dilates blood vessels. The mediator of vascular smooth muscle relaxation is nitric oxide (NO) (Wentzel, 2020; Sousa Junior et al., 2020). Because NO stimulates Guanylate Cyclase (sGC) solute, which increases the cyclic synthesis of guanosine monophosphate (GMP) from guanosine triphosphate (GTP), normalizes blood pressure when NO is released. Smooth muscle in blood vessels will relax due to an increase in cyclic GMP. Blood vessel resistance will decrease due to relaxed smooth muscles, causing an increase in the diameter of the blood vessels. This decrease in blood flow also results in a decrease in blood pressure (Wellman et al., 2020; Wentzel, 2020; Ferretto et al., 2020)

Conclusion

As a conclusion of research and discussion conducted by researchers on how the relationship between diet adherence and physical activity with blood pressure of hypertensive patients at the Simpang Pandan Health Center, East Tanjung Jabung Regency, it can be concluded that dietary compliance has a very important role in reducing one's blood pressure, especially hypertensive patients. Likewise, physical activity showed a positive influence on the blood pressure of hypertensive patients in this study. The p -value results of $0.000 < 0.05$ of these two variables provide statistical evidence that dietary compliance and physical activity together have a positive impact on the blood pressure of hypertensive patients at the Simpang Pandan Health Center. This alignment is believed not only to have an impact on improving blood pressure but will have an impact on a better life and increasing one's physical fitness of course. Being more selective in the selection of what is consumed makes us healthier, especially if accompanied by enough physical activity so that the food consumed can be absorbed nutrients

properly and processed by the body as fuel, not just accumulate as fat which will lead to the onset of various diseases. The quality of blood pressure will be better if hypertensive patients are willing to follow a diet obediently and increase physical activity so that hypertensive patients are aware that these two aspects are indeed very necessary to achieve the goal of improving one's health for general aspects and normalizing blood pressure as a special aspect.

Acknowledgements

In the course of this research, I would like to express my highest appreciation to my beloved family who always provide endless support, love, and encouragement. Thank you to the leading lecturers at the Faculty of Sports Science who have provided extraordinary guidance, knowledge, and inspiration. Also, do not forget to thank my comrades in arms in the Master of Sports Education Study Program who have always been a source of inspiration and motivation.

Author Contributions

The authors provide equal contributions to this work.

Funding

This research has not received financial funding from other parties.

Conflicts of Interest

The authors declare no conflict of interest.

References

- Abdurakhman, R. N., Hidayat, A., Taswindi, D., & Romadoni, A. (2022). Effect of hypertension exercise on blood pressure in the elderly. *World Journal of Advanced Research and Reviews*, 13(3), 491–495. <https://doi.org/10.30574/wjarr.2022.13.3.0269>
- Akik, C., Asfahani, F., Elghossain, T., Mesmar, S., Rabkin, M., El Sadr, W., Fouad, F. M., & Ghattas, H. (2022). Healthcare system responses to non-communicable diseases' needs of Syrian refugees: The cases of Jordan and Lebanon. *Journal of Migration and Health*, 6(September), 100136. <https://doi.org/10.1016/j.jmh.2022.100136>
- Ariyanto, H., Andika Abdul Malik, Widiyanti, W., & Oktavia, W. (2020). Prevalence and Correlation of Knowledge Levels with the Physical Activity of Hypertension Patients. *Genius Journal*, 1(2), 45–49. <https://doi.org/10.56359/gj.v1i2.9>
- Barone Gibbs, B., Hivert, M. F., Jerome, G. J., Kraus, W. E., Rosenkranz, S. K., Schorr, E. N., Spartano, N. L., & Lobelo, F. (2021). Physical Activity as a Critical Component of First-Line Treatment for Elevated Blood Pressure or Cholesterol: Who, What, and How?: A Scientific Statement From the American Heart Association. *Hypertension*, 78(2), E26–E37. <https://doi.org/10.1161/HYP.000000000000196>
- Bello, N. A., Zhou, H., Cheetham, T. C., Miller, E., Getahun, D. T., Fassett, M. J., & Reynolds, K. (2021). Prevalence of Hypertension among Pregnant Women When Using the 2017 American College of Cardiology/American Heart Association Blood Pressure Guidelines and Association with Maternal and Fetal Outcomes. *JAMA Network Open*, 4(3), 1–12. <https://doi.org/10.1001/jamanetworkopen.2021.3808>
- Chan, A. H. Y., Horne, R., Hankins, M., & Chisari, C. (2020). The Medication Adherence Report Scale: A measurement tool for eliciting patients' reports of nonadherence. *British Journal of Clinical Pharmacology*, 86(7), 1281–1288. <https://doi.org/10.1111/bcp.14193>
- Chen, M. L., Hu, J., McCoy, T. P., Letvak, S., & Ivanov, L. (2020). Associations of lifestyle intervention effect with blood pressure and physical activity among community-dwelling older Americans with hypertension in Southern California. *International Journal of Environmental Research and Public Health*, 17(16), 1–9. <https://doi.org/10.3390/ijerph17165673>
- Darwis, R., Rosmita, A., Fery, K., Amalia, D., Nini, N., Heriyantomi, Edy, S., & Try, P. A. (2022). Provinsi Jambi Tahun 2021 Provinsi Jambi. In *Profil Kesehatan Provinsi Jambi Tahun 2021* (Issue 08).
- Ferretto, L. R., Bellei, E. A., Biduski, D., Bin, L. C. P., Moro, M. M., Cervi, C. R., & De Marchi, A. C. B. (2020). A Physical Activity Recommender System for Patients with Arterial Hypertension. *IEEE Access*, 8, 61656–61664. <https://doi.org/10.1109/ACCESS.2020.2983564>
- Fogli-Cawley, J. J., Dwyer, J. T., Saltzman, E., McCullough, M. L., Troy, L. M., Meigs, J. B., & Jacques, P. F. (2007). The 2005 Dietary Guidelines for Americans and risk of the metabolic syndrome. *American Journal of Clinical Nutrition*, 86(4), 1193–1201. <https://doi.org/10.1093/ajcn/86.4.1193>
- Friska, N., Anggreini, N., Susanita, N., Pardede, L., Tinggi, S., Kesehatan, I., Keluarga, M., Tinggi, S., Kesehatan, I., Keluarga, M., Tinggi, S., Kesehatan, I., & Keluarga, M. (2024). *Hubungan Kepatuhan Diet Dengan Tekanan Darah*. 07(02), 2–5.
- Fuchs, F. D., & Whelton, P. K. (2020). High Blood Pressure and Cardiovascular Disease. *Hypertension*, 75(2), 285–292. <https://doi.org/10.1161/HYPERTENSIONAHA.119.14240>
- Haruna, T., Somba, M., Siril, H., Mahiti, G., August, F., Minja, A., Urassa, D., Tarimo, E., & Mugusi, F. (2021). Factors hindering integration of care for noncommunicable diseases within HIV care

- services in Dar es Salaam, Tanzania: The perspectives of health workers and people living with HIV. *PLoS ONE*, 16(8 August), 1-16. <https://doi.org/10.1371/journal.pone.0254436>
- Hashemi-Arend, A., Vasquez, K. S., Guishard, D., Naji, M., Ronning, A., George-Alexander, G., Vasquez, D., Sylvester, C., Pagano, W., Khalida, C., Coffran, C., Ezeonu, T., Fofana, K., Bielopolski, D., Vaughan, R., Qureshi, A., Tobin, J. N., & Kost, R. G. (2022). Implementing DASH-Aligned Meals and Self-Measured Blood Pressure to Reduce Hypertension at Senior Centers: A RE-AIM Analysis. *Nutrients*, 14(22). <https://doi.org/10.3390/nu14224890>
- Herrod, P. J. J., Lund, J. N., & Phillips, B. E. (2021). Time-efficient physical activity interventions to reduce blood pressure in older adults: a randomised controlled trial. *Age and Ageing*, 50(3), 980-984. <https://doi.org/10.1093/ageing/afaa211>
- Huang, B., Xiao, T., Grekousis, G., Zhao, H., He, J., Dong, G., & Liu, Y. (2021). Greenness-air pollution-physical activity-hypertension association among middle-aged and older adults: Evidence from urban and rural China. *Environmental Research*, 195(January), 110836. <https://doi.org/10.1016/j.envres.2021.110836>
- Kazemina, M., Daneshkhah, A., Jalali, R., Vaisi-Raygani, A., Salari, N., & Mohammadi, M. (2020). The Effect of Exercise on the Older Adult's Blood Pressure Suffering Hypertension: Systematic Review and Meta-Analysis on Clinical Trial Studies. *International Journal of Hypertension*, 2020. <https://doi.org/10.1155/2020/2786120>
- Kinnunen, H., Rantanen, A., Kentt, T., & Koskim ki, H. (2020). Feasible assessment of recovery and cardiovascular health: Accuracy of nocturnal HR and HRV assessed via ring PPG in comparison to medical grade ECG. *Physiological Measurement*, 41(4). <https://doi.org/10.1088/1361-6579/ab840a>
- Lizano-Díez, I., Poteet, S., Burniol-Garcia, A., & Cerezales, M. (2022). The burden of perioperative hypertension/ hypotension: A systematic review. In *PLoS ONE* (Vol. 17, Issue 2 February). <https://doi.org/10.1371/journal.pone.0263737>
- Muharani Syaftriani, A., Ardilla Siregar, M., & Baiduri Siregar, R. (2023). The Relationship Between Self-Motivation and Diet Compliance In Hypertension Patients at Mitra Medika General Hospital In Medan. *Journal Keperawatan Degeneratif*, 01(1), 1-11.
- Mulyasari, E. W., & Srimati, M. (2020). Asupan Zat Gizi Makro, Aktivitas Fisik dan Tingkat Stress dengan Kejadian Hipertensi pada Dewasa (18-60 Tahun) Macro Nutrition Intake, Physical Activity and Level of Stress with Event of Hypertension for Adults (18-60 Years). *Jurnal Ilmiah Kesehatan (JIKA)*, 2(2), 83-92.
- Nagata, J. M., Vittinghoff, E., Pettee Gabriel, K., Garber, A. K., Moran, A. E., Sidney, S., Rana, J. S., Reis, J. P., & Bibbins-Domingo, K. (2021). Physical Activity and Hypertension From Young Adulthood to Middle Age. *American Journal of Preventive Medicine*, 60(6), 757-765. <https://doi.org/10.1016/j.amepre.2020.12.018>
- Nepali, P., Suresh, S., Pikale, G., Jhaveri, S., Avanthika, C., Bansal, M., Islam, R., & Chanpura, A. (2022). Hypertension and the Role of Dietary Fiber. *Current Problems in Cardiology*, 47(7), 101203. <https://doi.org/10.1016/j.cpcardiol.2022.101203>
- Nurazizah, E. P., & Kurniawati, T. (2022). The Relationship between Hypertension Diet Adherence and Blood Pressure in Hypertensive Patients in Surajaya. *Inprosidng University Research Colloquium 2023 Jan 4*, 441-447.
- Ozaki, A. F., Choi, A. S., Le, Q. T., Ko, D. T., Han, J. K., Park, S. S., & Jackevicius, C. A. (2020). Real-World Adherence and Persistence to Direct Oral Anticoagulants in Patients With Atrial Fibrillation: A Systematic Review and Meta-Analysis. *Circulation: Cardiovascular Quality and Outcomes*, 13(3), E005969. <https://doi.org/10.1161/CIRCOUTCOMES.119.005969>
- Permatasari, K. S., Mursudarinah, M., & Prajayanti, E. D. (2021). Pengaruh Konsumsi Pisang Ambon terhadap Perubahan Tekanan darah pada Lansia dengan Hipertensi. *Nursing Sciences Journal*, 5(1), 1. <https://doi.org/10.30737/nsj.v5i1.1580>
- Purba, E., Lolowang, N. L., Enggune, M., & Sompotan, R. (2023). Pengetahuan Lansia Tentang Pentingnya Diet Hipertensi. *Aksara: Jurnal Ilmu Pendidikan Nonformal*, 9(1), 313-320.
- Purwandari, K. P., & Nugroho, Y. W. (2018). Hubungan Tingkat Kepatuhan Diet terhadap Tekanan Darah pada Penderita Hipertensi di Desa Nambangan. *University Research Colloquium*, 482-486.
- Ramsey, K. A., Rojer, A. G. M., D'Andrea, L., Otten, R. H. J., Heymans, M. W., Trappenburg, M. C., Verlaan, S., Whittaker, A. C., Meskers, C. G. M., & Maier, A. B. (2021). The association of objectively measured physical activity and sedentary behavior with skeletal muscle strength and muscle power in older adults: A systematic review and meta-analysis. *Ageing Research Reviews*, 67(September 2020). <https://doi.org/10.1016/j.arr.2021.101266>
- Renu, K., Prasanna, P. L., & Valsala Gopalakrishnan, A. (2020). Coronaviruses pathogenesis, comorbidities and multi-organ damage - A review. *Life Sciences*, 255(May), 117839. <https://doi.org/10.1016/j.lfs.2020.117839>
- Rodriguez-Zuñiga, J., Garcia-Hernandez Jorge, A., Lopez-Vilchis Lizeth, L., Ruiz-Mondragon, A., &

- Sanchez-Martinez Fatima, A. (2021). Unjustified Referral of Adult Patients with Hypertensive Crisis from a First Level of Care to the Emergency Department. *International Archives of Cardiovascular Diseases*, 5(1), 1–10. <https://doi.org/10.23937/2643-3966/1710034>
- Sacks, F. M., Obarzanek, E., Windhauser, M. M., Svetkey, L. P., Vollmer, W. M., McCullough, M., Karanja, N., Lin, P. H., Steele, P., Proschan, M. A., Evans, M. A., Appel, L. J., Bray, G. A., Vogt, T. M., Moore, T. J., & DASH Investigators. (1995). Rationale and design of the Dietary Approaches to Stop Hypertension trial (DASH). A multicenter controlled-feeding study of dietary patterns to lower blood pressure. *Annals of Epidemiology*, 5(2), 108–118. [https://doi.org/10.1016/1047-2797\(94\)00055-X](https://doi.org/10.1016/1047-2797(94)00055-X)
- Saragih, M., Aryanti, D., & Yuliza, E. I. (2022). *Asuhan Gizi dan Keperawatan pada Hipertensi*.
- Sartika Dasopang, E., Febrika Zebua, N., Nadia, S., Ginting, E., Natalia Siahaan, D., Saputri, M., Julianti Tambunan, I., Fujiko, M., Rahmi Ningrum, S., Anggraini, D., Hasanah, F., & Juniar, A. (2021). Pengenalan dan Pencegahan Hipertensi Serta Pengecekan Tekanan Darah. *Mejuajua: Jurnal Pengabdian Pada Masyarakat*, 1(2), 1–4. <https://doi.org/10.52622/mejuajujabdimas.v1i2.11>
- Shariful Islam, M., Fardousi, A., Sizar, M. I., Rabbani, M. G., Islam, R., & Saif-Ur-Rahman, K. M. (2023). Effect of leisure-time physical activity on blood pressure in people with hypertension: a systematic review and meta-analysis. *Scientific Reports*, 13(1), 1–11. <https://doi.org/10.1038/s41598-023-37149-2>
- Sihotang, M., & Elon, Y. (2020). Hubungan Aktivitas Fisik Dengan Tekanan Darah Pada Orang Dewasa. *Chmk Nursing Scientific Journal*, 4(April), 199–204.
- Simanjuntak, E. Y., & Hasibuan, S. (2022). Tekanan Darah Pada Pasien Hipertensi Pada Masa Pandemi Covid-19. *Jurnal Ilmu Kesehatan Mandira Cendikia*, 1(1), 40–48.
- Sousa Junior, A. E., Macêdo, G. A. D., Schwade, D., Sócrates, J., Alves, J. W., Farias-Junior, L. F., Freire, Y. A., Lemos, T. M. A. M., Browne, R. A. V., & Costa, E. C. (2020). Physical activity counseling for adults with hypertension: A randomized controlled pilot trial. *International Journal of Environmental Research and Public Health*, 17(17), 1–15. <https://doi.org/10.3390/ijerph17176076>
- Sudin, M. S., Kartini, & Haris, H. (2023). Faktor Yang Berhubungan Dengan Kejadian Hipertensi Pada Lansia di Wilayah Kerja Puskesmas Pratiwi Kota Makasar. *Jurnal Promotif Preventif*, 6(1), 37–47.
- Sugiyono. (2012). *Metode Penelitian Pendidikan Pendekatan Kuantitatif, Kualitatif, dan R&D*. Alfabeta.
- Tatisina, C. M., Hariawan, H., & Naufal, A. A. (2020). Mental-Emotional Disorder among Post-Earthquake Responders in Ambon Maluku. *Jurnal Ners*, 15(1 Special Issue), 91–95. <https://doi.org/10.20473/jn.v15i1Sp.18970>
- Trijono, R. (2015). *Metodologi Penelitian Kuantitatif*. Papas Sinar Sinanti.
- Triwibowo, H., Frilasari, H., & Dewi, I. R. (2016). Hubungan Kepatuhan Diet Hipertensi Dengan Tekanan Darah Pada Pasien Hipertensi Di Poli Penyakit Dalam RSUD Prof . Dr . SOEKANDAR MOJOKERTO. *Jurnal Keperawatan*, 5(1), 1–6.
- Umemoto, S., Onaka, U., Kawano, R., Kawamura, A., Motoi, S., Honda, N., Kanazashi, H., & Mitarai, M. (2022). Effects of a Japanese Cuisine-Based Antihypertensive Diet and Fish Oil on Blood Pressure and Its Variability in Participants with Untreated Normal High Blood Pressure or Stage I Hypertension: A Feasibility Randomized Controlled Study. *Journal of Atherosclerosis and Thrombosis*, 29(2), 152–173. <https://doi.org/10.5551/jat.57802>
- Vaismoradi, M., Tella, S., Logan, P. A., Khakurel, J., & Vizcaya-Moreno, F. (2020). Nurses' adherence to patient safety principles: A systematic review. *International Journal of Environmental Research and Public Health*, 17(6), 1–15. <https://doi.org/10.3390/ijerph17062028>
- Wasilah, T., Dewi, R., & Sutrisno, D. (2022). Evaluasi Kerasionalan Penggunaan Obat Antihipertensi Pada Pasien Hipertensi Rawat Inap RSUD H. Hanafie Muara Bungo. *Indonesian Journal of Pharmaceutical Education*, 2(1), 21–31. <https://doi.org/10.37311/ijpe.v2i1.13788>
- Wellman, R. J., Sylvestre, M. P., Abi Nader, P., Chiolero, A., Mesidor, M., Dugas, E. N., Tougri, G., & O'Loughlin, J. (2020). Intensity and frequency of physical activity and high blood pressure in adolescents: A longitudinal study. *Journal of Clinical Hypertension*, 22(2), 283–290. <https://doi.org/10.1111/jch.13806>
- Wentzel, A. (2020). *Public Health at the School of Public Health. December*.
- Wulandari, A., Kurdanti, W., & Setiyobroto, I. (2023). Pemberian pesan Dietary Approaches to Stop Hypertensions-like diet melalui whatsapp untuk memperbaiki kepatuhan diet dan tekanan darah pasien hipertensi. *Jurnal Gizi Klinik Indonesia*, 19(3), 104. <https://doi.org/10.22146/ijcn.57687>
- Yulistina, F., Deliana, M., & Rustiana, R. (2017). Korelasi asupan makanan, stress, dan aktivitas fisik dengan hipertensi pada usia menopause. *Unnes Journal of Public Health*, 6(1).
- Zaki, N., Alashwal, H., & Ibrahim, S. (2020). Association of hypertension, diabetes, stroke, cancer, kidney

disease, and high-cholesterol with COVID-19 disease severity and fatality: A systematic review. *Diabetes and Metabolic Syndrome: Clinical Research and Reviews*, 14(5), 1133–1142. <https://doi.org/10.1016/j.dsx.2020.07.005>