



Research Article

## Relationship between physical activity and hypertension in adults in the working area of Puskesmas Tampaksiring I

Dewa Ngakan Gede Sathyananda Wacika<sup>1</sup>, Pande Ayu Naya Kasih Permatananda<sup>2\*</sup>, I Putu Gede Eka Ariawan Suyasa<sup>3</sup>

1) Faculty of Medicine and Health Science, Warmadewa University, Denpasar, Indonesia

2) Department of Pharmacology, Faculty of Medicine and Health Science, Warmadewa University, Denpasar, Indonesia

3) Department of Cardiology, Faculty of Medicine and Health Science, University of Warmadewa/Tabanan Hospital, Indonesia

### ARTICLE INFO

*Submitted* : 07<sup>th</sup> June 2023  
*Accepted* : 04<sup>th</sup> September 2023  
*Published* : 25<sup>th</sup> January 2024

#### **Keywords:**

physical activity, hypertension, adulthood

#### **\*Correspondence:**

nayakasih@gmail.com

*This is an Open access article under the CC-BY license*



### ABSTRACT

Hypertension, often known as high blood pressure, is characterized by systolic blood pressure of at least 140 mmHg and/or diastolic blood pressure of at least 90 mmHg. Lack of regular physical activity is one of the risk factors for hypertension. This study aims to analyze the relationship between physical activity and the incidence of hypertension in adulthood. This study employs a cross-sectional design and analytical observational research methodology. The number of subjects in the study was 62 hypertension subjects and 62 non-hypertension subjects. Data was collected with the IPAQ-SF questionnaire to determine the level of physical activity. Data analysis was performed using the Chi-square statistical test. The results of the univariate analysis showed that most research subjects were aged 41-60 years (53.2%), female (66.9%), and 91.5% of subjects with hypertension were classified as having low physical activity. The bivariate analysis showed a strong correlation between physical activity and the incidence of hypertension, which yielded a value of  $p = 0.00$  ( $p < 0.05$ ). This study concluded that there is a relationship between physical activity and the incidence of hypertension in adulthood in the working area of the Tampaksiring I public health center.



# QANUN MEDIKA

## JURNAL KEDOKTERAN FKUM SURABAYA

<http://journal.um-surabaya.ac.id/index.php/qanunmedika>



### INTRODUCTION

Hypertension, commonly called high blood pressure, is a condition in which the blood vessel pressure is consistently elevated (WHO, 2022). In addition, hypertension is defined as having a systolic blood pressure of at least 140 and/or a diastolic blood pressure of at least 90 millimeters of mercury (Kemenkes RI, 2020). Hypertension can increase the risk of heart, brain, kidney, and other diseases (Kirtaniya et al., 2023; Santosa et al., 2022). According to data from WHO in 2021, more than one billion world population has hypertension, which is one of the leading causes of premature death in 1 in 4 men and 1 in 5 women (WHO, 2022).

According to the 2018 Riskesdas, there were 34.11% more people in Indonesia who had hypertension than those who were under 18 years old. Compared to the prevalence in 2013, which was 25.8%, this number has increased. Since Riskesdas 2007, hypertension has become more common nationally (Kemenkes RI, 2019b). In Bali Province, 29.97% of people under the age of 18 have hypertension (Kemenkes RI, 2019d). Some of the districts with the highest number of hypertension sufferers include Buleleng Regency, with 67,359 people; Gianyar Regency, with 13,113 people; Tabanan Regency, with 12,226 people; and Klungkung Regency, with 10,618 people (Dinkes Provinsi Bali, 2018). In Gianyar Regency, based on the pattern of the top 10 diseases in patients at the Public Health Center, hypertension ranks 6<sup>th</sup> with 4,474 cases. In contrast, in outpatients at RSU Gianyar Regency, hypertension has the second highest number of cases, with 3,201 cases (Dinkes Kabupaten Gianyar, 2018).

Physical activity is all body movement as a result of skeletal muscle work that causes an increase in energy and energy expenditure. Activities performed at home, school, the office,

travel, and other leisure activities all contain physical exercise. Based on intensity, physical exercise is categorized into low, moderate, and heavy levels (Kemenkes RI, 2017). People who are not active in physical activity tend to have a higher heart rate frequency, which will cause the heart muscle to work harder every time it contracts. The bigger and more often the heart muscle pumps blood, which will cause the pressure to be imposed on the arteries to be greater so that blood pressure will increase. The more often a person does physical activity, the lower the risk of hypertension (Lestari et al., 2020). Riskesdas data for 2018 shows that the number of Indonesian residents aged  $\geq 10$  years who do not engage in physical activity is as much as 33.5% (Kemenkes RI, 2019c).

The correlation between physical activity and the prevalence of adult hypertension is still a subject of much debate among researchers. This prompted researchers to carry out studies in the working environment of the Tampaksiring I Public Health Center in Gianyar Regency to establish this association.

### METHODS

This research is an analytical observational study with a cross-sectional design. The research was conducted in the working area of the Tampaksiring I Public Health Center, Tampaksiring District, Gianyar Regency. The instrument used to measure the level of physical activity is *the International Physical Activity Questionnaire Short-Form (IPAQ-SF)*, translated into Indonesian. This questionnaire consists of 7 short questions regarding the physical activity performed by the respondent during the last 7 days. The score is then multiplied by the duration of physical activity in minutes and days. Then the results obtained are summed to get the final score of the level of physical activity. We divided the physical activity level to 3 categories: low (3,3 MET),



**QANUN MEDIKA**  
**JURNAL KEDOKTERAN FKUM SURABAYA**  
<http://journal.um-surabaya.ac.id/index.php/qanunmedika>



Moderate (4,0 MET), and High (8,0 MET) (Pemayun et al., 2022). The population in this study were hypertensive adults aged 18-60 years in the working area of the Tampaksiring I Public Health Center. The sample was selected using the *consecutive sampling method* with inclusion and exclusion criteria.

The inclusion criteria included medical record data at the Tampaksiring I Public Health Center who were diagnosed with hypertension and not hypertension, had a contact number/address that could be traced in the medical record, were aged 18-60 years, and were willing to be a respondent. Meanwhile, the exclusion criteria were patients with BMI > 30. We estimated the sample needed in this study using a cross-sectional formula. The value of the proportion of

cases in the population based on data from the Tampaksiring I Community Health Center is 4.2%, and the error tolerance is 5%. Therefore, the number of research subjects to be used in the study were 62 hypertensive subjects and 62 non-hypertensive subjects.

The statistical test was the Chi-square test to see the relationship between the independent and dependent variables with a significance level of  $p = 0.05$ . If the  $p\text{-value} < 0.05$  means there is a relationship between the two variables, whereas if the  $p\text{-value} > 0.05$  means there is no relationship between the two variables. This research was approved by the Research Ethics Committee of Faculty of Medicine, Udayana University, through ethical approval No:2862/UN14.2.2.VII.14/LT/2022.

**RESULTS**

**Table 1.** Respondents' Characteristics (n=124)

Variable (n=124)	Hypertension		Total
	Hypertension (n=62)	Not hypertension (n=62)	
<b>Age</b>			
18-40 years	14 (24.1%)	44 (75.9%)	58 (46.8%)
41-60 years	48 (72.7%)	18 (27.3%)	66 (53.2%)
<b>Gender</b>			
Man	23 (56.1%)	18 (43.9%)	41 (33.1%)
Woman	39 (47.0%)	44 (53.0%)	83 (66.9%)
<b>Physical Activity</b>			
Low	43 (91.5%)	4 (8.5%)	47 (37.9%)
Moderate	14 (58.3%)	10 (41.7%)	24 (19.4%)
High	5 (9.4%)	48 (90.6%)	53 (42.7%)
<b>Total</b>	<b>62</b>	<b>62</b>	<b>124 (100%)</b>



**Table 2.** Relationship between Physical Activity and Hypertension in Research Respondents

Variable (n=124)	Hypertension		p-value
	Hypertension (n=62)	Not hypertension (n=62)	
<b>Physical activity</b>			
Low	43 (91.5%)	4 (8.5%)	
Currently	14 (58.3%)	10 (41.7%)	0.00*
Tall	5 (9.4%)	48 (90.6%)	

\*P value <0,05 means significant

We found 124 respondents who met inclusion and exclusion criteria, which we divided into two categories: hypertension and non-hypertension with the same frequency (62 respondents with hypertension and 62 respondents without hypertension). Based on Table 1, the group of respondents aged 41-60 had the highest frequency, 53.2% (n = 66). Of the 66 subjects, 48 were subjects with hypertension. In comparison, respondents aged 18-40 years amounted to 46.8% (n = 58). Respondents with female gender had the highest frequency of 66.9% (n = 83). When viewed from hypertension respondents as many as 39 out of 62 hypertension respondents were also female. At the same time, male respondents amounted to 33.1% (n = 41). Table 1 also presented the interpretation of physical activity using the IPAQ-SF questionnaire with the highest frequency in the high category of 42.7% (n = 53), which non-hypertensive respondents dominated. Then, the low category was 37.9% (n=47), which hypertension respondents dominated, and the moderate physical activity category was 19.4% (n=24). Respondents who experienced hypertension mostly did the low-category physical activity, namely 43 respondents (91.5%), while respondents who

did not experience hypertension did the most high-category physical activity, namely 48 respondents (90.6%). The results of the Chi-square statistical test obtained a value of p = 0.00 with a significance level of 0.05. The results showed that the p-value was less than the significance level (p <0.05), which meant a significant relationship exists between physical activity and the incidence of hypertension, as shown in Table 2.

## DISCUSSION

Most study participants—66 individuals, or 53.2%—were between the ages of 41 and 60. 48 of the 66 participants had high blood pressure. The results obtained are similar to the results of research conducted by Eni Nuraeni who obtained 110 respondents (52.4%) with hypertension aged 45-60 years (Nuraeni, 2019). Research by A. Hasan in 2018 also found similar results; namely, 18 respondents (60%) with hypertension were classified as adults. This is because, with age, there will be an increase in arterial pressure, aortic regurgitation, and degenerative processes (Hasan, 2018). As we age, the arterial walls in older people will experience thickening, resulting in a buildup of collagen in the muscle layer so that the blood vessels become stiff and narrow (Novitaningtyas, 2014).



# QANUN MEDIKA

## JURNAL KEDOKTERAN FKUM SURABAYA

<http://journal.um-surabaya.ac.id/index.php/qanunmedika>



The research results found that most of the research respondents, namely as many as 83 people (66.9%) were female. Based on the 62 respondents with hypertension, the majority of respondents with hypertension, namely 39 respondents (62.9%), were also female. This is in line with research conducted by Kusumawaty and colleagues in 2016. In this study, out of 92 hypertensive respondents, 54 respondents (58.7%) were female (Kusumawaty et al., 2016). Similar results were also found in Novitaningtyas' research in 2014, where 32 respondents (80%) were female. Women have a higher risk of suffering from hypertension after menopause, which is when they are around 45 years old. Women who are not yet menopausal have high levels of estrogen, which plays a role in increasing levels of *High-Density Lipoprotein* (HDL). Low HDL levels and high *Low-Density Lipoprotein* (LDL) levels will affect the occurrence of atherosclerosis and result in hypertension (Novitaningtyas, 2014).

Elisa Oktavia and colleagues' research from 2021 produced different findings. Of the 97 participants in the study participants, 60 were men (Oktavia et al., 2021). Men have a 2.3 times higher risk of having an increase in systolic blood pressure compared to women. However, after entering menopause, due to hormonal factors in women, the prevalence of hypertension in women increases and can be higher than in men (Kemenkes RI, 2019a).

This study showed that non-hypertensive respondents made up the bulk of the respondents with high physical activity levels, including 53 participants (42.7%). Of the 53 respondents who reported engaging in physical activity, 48 had normal blood pressure, whereas the remaining five had hypertension. Most hypertensive study participants were categorized as having low physical activity levels. Up to 43 of the 47 respondents who reported low levels of physical

exercise had hypertension. This is similar to the results obtained in a study by Harahap and colleagues in 2017, where 30 respondents (68.2%) with hypertension had mild physical activity, while the non-hypertension group had 26 respondents (59.1%) with medium and heavy physical activity (Harahap et al., 2017). The same results were obtained in a study conducted by Lestari et al. in 2020 that found that most of the respondents who experienced hypertension only did light physical activity, while the respondents who did not experience hypertension mainly were those who did strenuous physical activity (Lestari et al., 2020). Research conducted by Tirka and Sudhana in 2015 also found similar results in that more cases of hypertension were found in respondents who did less physical activity (47.7%) (Tirka & Sudhana, 2015).

Proper and regular physical activity, with the correct frequency and duration, can help lower blood pressure. Moderate physical activity helps strengthen the heart to pump more blood with less effort. The light work of the heart impacts reducing pressure on the arteries so that blood pressure drops. In people with strenuous activity, there is an increase in the circulation of oxygen into the blood, which is achieved through an increase in cardiac output. Regular physical activity will affect the physiological function of the heart, where the heart can pump more blood and oxygen, thereby reducing the frequency of the heart rate both when a person is resting or active (Putri et al., 2021). Lack of habit of doing physical activity can increase the risk of suffering from hypertension. People who are not physically active typically have higher heart rates, which makes the heart muscle work harder during each contraction. The more challenging and frequently the heart muscle pumps blood, the more pressure is placed on the arteries, which causes blood pressure to rise (Lestari et al., 2020).





# QANUN MEDIKA

## JURNAL KEDOKTERAN FKUM SURABAYA

<http://journal.um-surabaya.ac.id/index.php/qanunmedika>



This differs from the research results obtained by Sitorus (2019), which showed that hypertension sufferers had more moderate physical activity, namely 52.6%. Hypertension is not only influenced by a person's level of physical activity. This study also examined other factors that are related to lifestyle that can cause hypertension, namely an uncontrolled diet of salt, fiber, and fat that affected the occurrence of hypertension in the respondents (Sitorus, 2019).

The value of  $p = 0.00$  was determined using the results of a bivariate study with the Chi-square statistical test. This demonstrates a statistically significant association between physical activity and the prevalence of hypertension in people in the Tampaksiring I Public Health Center's operating area ( $p < 0.05$ ). In this study, the majority of hypertension patients engaged in low levels of physical activity, compared to high levels of activity among non-hypertensive responders. The results of this study are in line with research conducted by Lestari et al. in 2020, which stated that there is a significant relationship between physical activity and the incidence of hypertension in adulthood at the Kedu Temanggung Health Center with  $p$ -value  $< 0.05$  (Lestari et al., 2020). Similar findings were also found in research conducted by Harahap et al. and Rihiantoro and Widodo in 2017 that there was an effect of physical activity on the incidence of hypertension. Early adult males with light physical activity are more at risk of suffering from hypertension compared to those classified as having moderate and heavy physical activity (Harahap et al., 2017; Rihiantoro & Widodo, 2017)

The risk of developing hypertension can rise if physical activity is not a habit. People inactive in physical activity tend to have a higher heart rate. A higher heart rate means the heart muscle pumps blood more often,

causing more significant pressure to arteries and increasing blood pressure (Lestari et al., 2020). Doing proper and regular physical activity will help optimize the strength of the heart muscle so that the heart can pump blood better. This causes the heart to pump more blood and oxygen to reduce the heart rate (Permatananda et al., 2020; Putri et al., 2021). To get optimal results in physical activity, WHO recommends routine physical activity at least in the moderate category for 30 minutes per day for one week or in the high category for 20 minutes for five days a week (Lestari et al., 2020).

Other factors can cause a person to experience hypertension besides a lack of physical activity, one of which is still related to lifestyle, namely eating patterns and nutritional intake that are less controlled. The level of physical activity of respondents that has no relationship with the incidence of hypertension can be caused by other factors that influence it, such as intake of fat, salt, and fiber, which is less regular and controlled. This unhealthy lifestyle can also cause an increase in blood pressure rather than physical activity (Sitorus, 2019; Wiadnjana et al., 2020).

This study has several limitations to be declared. We used a questionnaire with short-answer questions to measure respondent's physical activity levels and only measured the level in the last seven days. Respondents' answers to questions on the questionnaire can sometimes be subjective so the assessment results can be inaccurate. Other limitations include limited respondents, and we didn't assess other variables that could cause hypertension.

## CONCLUSION

This study concluded that the majority of hypertension sufferers in the working area of the Tampaksiring I Public Health Center belonged to the age group of 41-60 years, were female,



# QANUN MEDIKA

## JURNAL KEDOKTERAN FKUM SURABAYA

<http://journal.um-surabaya.ac.id/index.php/qanunmedika>



and had a light level of physical activity. Another conclusion was that there was a significant relationship between physical activity and the incidence of hypertension in adulthood in the working area of the Tampaksiring I Public Health Center.

### REFERENCES

- Dinkes Kabupaten Gianyar. (2018). *Profil Kesehatan Kabupaten Gianyar 2017*.
- Dinkes Provinsi Bali. (2018). *Profil Kesehatan Provinsi Bali 2017*.
- Harahap, R. A., Rochadi, R. K., & Sarumpae, S. (2017). Pengaruh Aktivitas Fisik Terhadap Kejadian Hipertensi Pada Laki-Laki Dewasa Awal (18-40 Tahun) Di Wilayah Puskesmas Bromo Medan Tahun 2017. *Jurnal Muara Sains, Teknologi, Kedokteran Dan Ilmu Kesehatan*, 1(2), 68–73. <https://doi.org/10.24912/jmstkik.v1i2.951>
- Hasan, A. (2018). Korelasi Umur dan Jenis Kelamin dengan Penyakit Hipertensi di Emergency Unit Rumah Sakit Islam Khadijah Palembang 2017. *Indonesia Jurnal Perawat*, 3(1), 9–16.
- Hasanudin, Ardiyani, V. M., & Perwiraningtyas, P. (2018). Hubungan Aktivitas Fisik dengan Tekanan Darah pada Masyarakat Penderita Hipertensi di Wilayah Tlogosuryo Kelurahan Tlogomas Kecamatan Lowokwaru Kota Malang. *Nursing News*, 3(1).
- Kemenkes RI. (2017). *Panduan Pelaksanaan Gerakan Nusantara Tekan Angka Obesitas (GENTAS)*. Direktorat Pencegahan dan Pengendalian Penyakit.
- Kemenkes RI. (2019a). *Faktor Risiko Penyebab Hipertensi*.
- Kemenkes RI. (2019b). *Hipertensi Si Pembunuh Senyap*.
- Kemenkes RI. (2019c). *Laporan Nasional Riskesdas 2018*. Badan Penelitian dan Pengembangan Kesehatan.
- Kemenkes RI. (2019d). Laporan Provinsi Bali RISKESDAS 2018. In *Badan Penelitian dan Pengembangan Kesehatan*. LPB.
- Kemenkes RI. (2020). *Apa itu Hipertensi (Tekanan Darah Tinggi) ?*
- Kirtaniya, A. A. I. K., Lestari, A., Permatananda, P. A. N. K., & Aryastuti, A. A. S. A. (2023). Association of ELMO1 Genetic Polymorphism (rs741301) with the Progression of Diabetic Kidney Disease in Balinese Patients with Type 2 Diabetes Melitus. *Mol Cell Biomed Sci*, 7(1), 47–51. <https://doi.org/10.21705/mcbs.v7i1.297>
- Kusumawaty, J., Hidayat, N., & Ginanjar, E. (2016). Hubungan Jenis Kelamin dengan Intensitas Hipertensi pada Lansia di Wilayah Kerja Puskesmas Lakkok Kabupaten Ciamis. *Jurnal Mutiara Medika*, 16(2), 46–51.
- Lestari, P., Yudanari, Y. G., & Saparwati, M. (2020). Hubungan Aktivitas Fisik Dengan Kejadian Hipertensi Pada Usia Dewasa Di Puskesmas Kedu Kabupaten Temanggung. *Jurnal Kesehatan Primer*, 5(2), 89–98.
- Novitaningtyas, T. (2014). Hubungan Karakteristik (Umur, Jenis Kelamin, Tingkat Pendidikan) dan Aktivitas Fisik dengan Tekanan Darah Pada Lansia di Kelurahan Makamhaji Kecamatan Kartasura Kabupaten Sukoharjo. *Universitas Muhammadiyah Surakarta*.
- Nuraeni, E. (2019). Hubungan Usia dan Jenis Kelamin Berisiko dengan Kejadian Hipertensi di Klinik X Kota Tangerang. *Jurnal JKFT*, 4(1). <https://doi.org/http://dx.doi.org/10.31000/jkft.v4i1.1996>



# QANUN MEDIKA

## JURNAL KEDOKTERAN FKUM SURABAYA

<http://journal.um-surabaya.ac.id/index.php/qanunmedika>



- Oktavia, E., Rizal, A., & Hayati, R. (2021). *Hubungan Jenis Kelamin, Aktivitas Fisik dan Pola Makan dengan Kejadian Hipertensi pada Masyarakat di Wilayah Kerja Puskesmas Alalak Selatan Kota Banjarmasin Tahun 2021*. Universitas Islam Kalimantan.
- Pemayun, T. G. A. D., Budhitresna, A. A. G., & Permatananda, P. A. N. K. (2022). Gambaran Tingkat Aktivitas Fisik dan Kejadian Obesitas pada Civitas Akademika Universitas Warmadewa, Bali. *Jurnal Pendidikan Tambusai*, 6(2), 8526–8532.
- Permatananda, P. A. N. ., Aryastuti, A. A. S. A., & Cahyawati, P. N. (2020). Pelatihan Yoga pada Kelompok Lansia Komunitas Sadar Sehat dalam Rangka Menurunkan Kecemasan. *Buletin Udayana Mengabdi*, 19(3), 290–295.
- Putri, W. A., Waluya, N. A., Sasmita, A., & Setiawan, A. (2021). Studi Literature Gambaran Aktivitas Fisik Pasien dengan Hipertensi. *Jurnal Keperawatan Indonesia Florence Nightingale*, 1(1), 13–23.
- Rihiantoro, T., & Widodo, M. (2017). Hubungan Pola Makan dan Aktivitas Fisik dengan Kejadian Hipertensi di Kabupaten Tulang Bawang. *Jurnal Ilmiah Keperawatan Sai Betik*, 13(2), 159–167. <https://doi.org/10.26630/jkep.v13i2.924>
- Santosa, A., Permatananda, P. A. N. K., & Putra, I. P. Wi. E. (2022). Hubungan hipertensi dengan kejadian presbikusis di Poliklinik THT-KL RSUP Sanglah Denpasar. *Intisari Sains Medis*, 13(3), 718–721. <https://doi.org/10.15562/ism.v13i3.1451>
- Sitorus, J. (2019). Pengaruh Pola Makan Dan Aktivitas Fisik Terhadap Kejadian Hipertensi Pada Pasien Rawat Jalan Di RSU HKBP Balige. *Jurnal Ilmiah Kebidanan Imelda*, 5(1), 41.
- Tirka, P. S. W., & Sudhana, I. W. (2015). Prevalensi dan Gambaran Faktor Risiko Hipertensi Pada Usia Dewasa di Wilayah Kerja Puskesmas Tabanan II Periode Mei 2012. *E-Journal Medika Udayana*, 3(11).
- WHO. (2022). *Hypertension*. <https://www.who.int/news-room/fact-sheets/detail/hypertension>
- Wiadnjana, I. G. P., Yanti, M. R. R., & Permatananda, P. A. N. K. (2020). Nutritional Status of Reproductive Women Who Follow Vegetarian Diet in Badung Regency. *Proceedings of the 1st Seminar The Emerging of Novel Corona Virus, NCOV2020, 2020, November*. <https://doi.org/10.4108/eai.11-2-2020.2302019>