

**CORRELATION OF PHYSICAL ACTIVITY WITH TOTAL CHOLESTEROL  
RATIO TO HIGH-DENSITY LIPOPROTEIN IN HYPERTENSION ELDERLY AT  
PUSKESMAS GEDANGAN SIDOARJO**

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**ABSTRACT**

**Background:** The elderly have a higher risk of developing hypertension. The elderly will experience a decrease in physical activity due to a decrease in stamina and body strength due to aging. This situation can increase the risk of non-communicable diseases such as coronary heart disease (CHD) and affect blood cholesterol levels in the body.

**Objective:** This study aimed to understand the correlation of physical activity intensity with the ratio of total cholesterol to HDL in hypertension elderly at Puskesmas Gedangan Sidoarjo.

**Methods:** This study is an analytic study with the research subjects elderly with hypertension at the Puskesmas Gedangan Sidoarjo with a cross-sectional study design. Using Spearman's correlative test with the Statistical Product and Service Solution (SPSS) program, data analysis was carried out.

**Results:** There is a negative correlation between physical activity and the ratio of total cholesterol to HDL in the elderly with hypertension with  $p = 0.004$  ( $<0.05$ ) and the correlation value ( $\tau$ ) =  $-0.424$ , which indicates a sufficient correlation value. Of 45 respondents, 11 people (24.4%) had low physical activity intensity, 21 people (46.7%) had moderate physical activity intensity, 13 people had (28.9%) heavy physical activity intensity, 29 people (64.4%) had a total cholesterol/HDL ratio  $\leq 5$ , and 16 people (35.6%) had a total cholesterol/HDL ratio  $>5$ .

**Conclusion:** There is a negative correlation between physical activity intensity and the ratio of total cholesterol to HDL in the elderly with hypertension at Puskesmas Gedangan Sidoarjo, which means the higher the intensity of physical activity carried out by the hypertensive elderly, the lower the total cholesterol/HDL ratio.

**Keywords:** Elderly, hypertension, physical activity intensity, total cholesterol/HDL ratio

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## BACKGROUND

The Elderly is someone who reaches the age of 60 years and over.<sup>1</sup> The total population of Indonesia in 2020 is 270.20 million people, with the percentage of the elderly population reaching 9.78% or around 27 million, and in 2025 it is projected to increase to 33 million.<sup>2</sup> The elderly have health problems caused by reduced cells in the body so that the function and immunity of the body are reduced. This condition causes an increase in risk factors for some diseases in the elderly.<sup>3</sup>

Hypertension is one of the most common cardiovascular diseases in the elderly and is the world's number one cause of death.<sup>3</sup> In the 65-74 year age group, the prevalence of hypertension was around 57.6% in 2013 and increased to 63.2% in 2018. According to Riskesdas 2018, East Java ranks in the top 5 with a prevalence of 36.32%.<sup>4</sup>

Coronary heart disease (CHD) is a heart dysfunction caused by reduced blood flow due to blockage or narrowing of coronary blood vessels.<sup>5</sup> The most common cause of this narrowing is atherosclerosis. The prevalence of heart disease in Indonesia is 1.5%, and coronary heart disease is the second highest cause of death after stroke, accounting for 12.9% of all causes of death.<sup>6</sup> The prevalence of coronary heart

disease in East Java is 1.7% of the population.<sup>4</sup>

Blood cholesterol is a fatty compound produced by various cells in the body, and about a quarter of blood cholesterol levels are produced by liver cells.<sup>7</sup> Cholesterol levels in the body are influenced by lifestyles, such as physical activity, food intake, smoking habits, etc.<sup>8</sup> The higher the physical activity, the more ATP is needed, which will decrease total cholesterol and LDL cholesterol and an increase in HDL cholesterol.<sup>9</sup> Physical activity is one of the protective factors against non-communicable diseases such as heart disease, stroke, diabetes, and cancer. The elderly will experience a decrease in physical activity.<sup>10</sup> The intensity of physical activity can affect the ratio of total cholesterol to HDL.

This condition encourages researchers to conduct a study entitled "Correlation Of Physical Activity With Total Cholesterol Ratio To High Density Lipoprotein In Elderly Hypertension At Puskesmas Gedangan Sidoarjo." This study aimed to understand the correlation between the intensity of physical activity and the ratio of total cholesterol to HDL in the elderly with hypertension at Puskesmas Gedangan Sidoarjo.

## METHODS

### Tools

This study uses secondary data from patient medical records to obtain data on the patient's age and blood pressure and uses a Global Physical Activity Questionnaire (GPAQ) questionnaire to measure the intensity of physical activity.

### Data Collections

This research is an analytic study with a cross-sectional study design. The sampling technique used one of the non-probability sampling methods, purposive sampling. The research sample was selected based on predetermined inclusion and exclusion criteria. The minimum sample size for this study was 35 people, which was obtained from the results of calculations using the ordinal-nominal correlative analytic sample size formula. There are several inclusion criteria in this study, including elderly people aged 60-74 years, having hypertension and/or taking anti-hypertensive drugs, reading and writing, communicating well, and being willing to fill out questionnaires and perform laboratory tests. The exclusion criteria for this study included the elderly who were immobilized, had a history of coronary heart disease, smoked, or consumed cholesterol-lowering drugs or herbal ingredients.

### Data Analysis

This study aimed to understand a correlation between the dependent and independent variables of the ordinal-nominal scale, so this study used Spearman's correlative statistical test. Data analysis was carried out using the Statistical Product and Service Solution (SPSS) program.

## RESULTS

The study was carried out at Puskesmas Gedangan Sidoarjo within two weeks, from 31 July to 14 August 2021. The sample of this study was 45 elderly patients with hypertension at Puskesmas Gedangan Sidoarjo. Based on the data from the research that has been done, the following data were obtained:

**Table 1 Characteristics of Respondents**

Variable	n = 45
<b>Gender n (%)</b>	
Hypertensive elderly male	15 (33,3)
Hypertensive elderly woman	30 (66,7)
<b>Profession n (%)</b>	
Farm workers	13 (28,9)
Retired	10 (22,2)
Trader	3 (6,7)
Pedicab driver	2 (4,4)
Unemployment	17 (37,8)
<b>Physical activity intensity n (%)</b>	
Mild	11 (24,4)
Moderate	21 (46,7)
Heavy	13 (28,9)
<b>Total cholesterol to HDL ratio n (%)</b>	
≤5	29 (64,4)
>5	16 (35,6)

From Table 1, it is known that most respondents are female, as many as 30 people. Of 45 respondents, there were five types of work, with the highest number being unemployed. Based on the results of filling out the questionnaire, it was found that most of the respondents had moderate-intensity physical activity. The blood cholesterol examination results found that most respondents had a low total cholesterol/HDL ratio ( $\leq 5$ ).

**Table 2 Results of Analysis of the Correlation Of Physical Activity with Total Cholesterol Ratio to HDL In Hypertensive Elderly at Puskesmas Gedangan Sidoarjo.**

Physical activity intensity in hypertensi on elderly	Total cholesterol/HDL ratio		Total	P-value	Coefficient value
	$\leq 5$	$> 5$			
Mild	3	8	11		
Moderate	15	6	21	0,004	-0,424
Heavy	11	2	13		
Total	29	16	45		

Table 2 shows that most respondents had moderate-intensity physical activity and a low total cholesterol/HDL ratio, as many as 21 and 29 respondents. The results of data analysis using Spearman's correlative test obtained a p-value of 0.004, which indicates a significant relationship between the intensity of physical activity and the total cholesterol/HDL ratio, and a

coefficient value of -0.424 which indicates the correlation is negative with sufficient correlation strength. Based on these results, the correlation between the intensity of physical activity and the total cholesterol/HDL ratio in the elderly with hypertension got significant results.

## DISCUSSION

The aging process causes several physiological changes in the body, one of which is a change in the elasticity of the blood vessels so that the blood vessels become stiff and the lumen narrows.<sup>11</sup> Elderly is one of the risk factors for hypertension.<sup>12</sup> The elderly who have hypertension tend to experience physical changes and decreased stamina, causing a decrease in physical activity.<sup>10</sup>

Regular physical activity with moderate intensity can positively impact the body's metabolism and heart health.<sup>13</sup> This situation occurs because physical activity can convert food into ATP so that the formation and transportation of cholesterol will decrease, causing a decrease in total cholesterol levels in the body. Physical activity has an impact on decreasing the lipoprotein lipase enzyme activity, resulting in a decrease in the conversion of cholesterol derived from food into adenosine triphosphate (ATP) as the body's energy source.<sup>9</sup> These impacts total cholesterol and HDL levels in the body.

Total cholesterol levels divided by HDL cholesterol will produce the ratio of total cholesterol to HDL (total cholesterol / HDL). This ratio can be used to predict the risk of CHD in a person. The normal value for the total cholesterol/HDL ratio is 5, with 3.5 being considered very good. A ratio value of  $\leq 5$  indicates a low CHD risk, and a ratio value  $> 5$  indicates a high CHD risk.<sup>14</sup>

In this study, to obtain data on the intensity of physical activity, researchers used the Global Physical Activity Questionnaire (GPAQ), which contains 16 question points related to daily physical activity. The results of this questionnaire are divided into 3 types, mild, moderate, and severe intensity. As many as 21 of 45 respondents in this study had moderate physical activity. This is closely related to the type of work the respondents do; most of the respondents are still actively working, so they do physical activity every day.

Researchers examined total cholesterol and HDL cholesterol levels from respondents' blood samples. The value of the total cholesterol/HDL ratio was obtained by comparing the levels of total cholesterol and HDL cholesterol. Based on the results of the study, it was found that 29 respondents had a ratio value of 5, which indicates a low risk of CHD. This happens because physical activity

regularly can reduce total cholesterol levels and increase HDL cholesterol levels resulting in a low ratio value which means that a person's risk for developing CHD is low.

The research data was analyzed using the Spearman correlation test with the SPSS program; there was a significant relationship between the intensity of physical activity and the ratio of total cholesterol to HDL in the elderly with hypertension,  $p\text{-value} = 0.004$  and correlation coefficient =  $-0.424$ , which showed a negative correlation with sufficient strength.

#### **LIMITATIONS OF THE RESEARCH**

This study did not use a control group. It only looked for correlations between age, hypertension, and physical activity with the ratio of total cholesterol to HDL, without discussing other factors that affect the ratio of total cholesterol to HDL. The accuracy of the information obtained only relied on the respondent's memory.

#### **CONCLUSION**

Based on the results of the study conducted on elderly hypertension at Puskesmas Gedangan Sidoarjo, from 45 respondents, it was found that the majority had moderate physical activity intensity, the value of the ratio of total cholesterol to HDL showed a low risk of CHD, and there

was a negative correlation between physical activity and the ratio of total cholesterol to high-density lipoprotein, which means the heavier intensity of physical activity carried out by the hypertensive elderly, the lower the total cholesterol/HDL ratio.

## REFERENCES

1. Kholifah SN. Keperawatan Gerontik. Kementrian Kesehatan Republik Indonesia; 2016.
2. Perhimpunan Dokter Spesialis Kardiovaskular Indonesia. Pedoman Tatalaksana Hipertensi Pada Penyakit Kardiovaskular. 2015; Available from: [http://www.inaheart.org/upload/image/Pedoman\\_TataLaksana\\_hipertensi\\_pada\\_penyakit\\_Kardiovaskular\\_2015.pdf](http://www.inaheart.org/upload/image/Pedoman_TataLaksana_hipertensi_pada_penyakit_Kardiovaskular_2015.pdf)
3. Kemenkes RI. Hipertensi Si Pembunuh Senyap. Kementrian Kesehatan RI [Internet]. 2019;1–5. Available from: <https://pusdatin.kemkes.go.id/resources/download/pusdatin/infodatin/infodatin-hipertensi-si-pembunuh-senyap.pdf>
4. Kesehatan Badan Penelitian dan Pengembangan Kesehatan Puslitbang Humaniora dan Manajemen Kesehatan KR. Hasil Utama Riskesdas 2018 Provinsi Widyarani VC, Dinata M, Sarvasti D. Jawa Timur. 2018;1–82.
5. Perhimpunan Dokter Spesialis Kardiovaskular Indonesia. Pedoman Tatalaksana Sindrom Koroner Akut Edisi Ketiga. Centra Communications; 2015. p 15.
6. Kemenkes.RI. Hari Jantung Sedunia Tahun 2019 : Jantung Sehat, SDM Unggul [Internet]. 2019. Available from: <http://p2ptm.kemkes.go.id/kegiatan-p2ptm/pusat-/hari-jantung-sedunia-hjs-tahun-2019-jantung-sehat-sdm-unggul>
7. Helmanu K, Ulfa N. Stop! Gejala Penyakit Jantung Koroner, Kolesterol Tinggi, Diabetes Melitus, Hipertensi. Yogyakarta: Istana Media; 2015.
8. American Heart Association. Take Action . Live Healthy! 2018;cholesterol guide.
9. Rodwell V, Bender D, Botham K, Kennelly P, Weil A. Harper's Illustrated Biochemistry. 30th ed. EGC; 2017.
10. Langhammer B, Bergland A, Rydwick E. The Importance Of Physical Activity Exercise Among Older People. Biomed Res Int. 2018;2018:3–6.
11. Imelda I, Sjaaf F, Puspita T. Faktor-Faktor yang Berhubungan dengan Kejadian Hipertensi pada Lansia di

- Puskesmas Air Dingin Lubuk Minturun. *Heal Med J*. 2020;2(2):68–77.
12. Sartik S, Tjekyan RS, Zulkarnain M. Risk Factors and the Incidence of Hipertension in Palembang. *J Ilmu Kesehat Masy*. 2017;8(3):180–91.
  13. Nurhayati. Aktivitas Fisik dan Kadar kolesterol Total dengan Kejadian Jantung Koroner di RSUD Undata Provinsi Sulawesi Tengah. *Info Kesehat*. 2018;8(2):24–30.
  14. University Of Rochester Medical Center. Lipid Panel with Total Cholesterol: HDL Ratio [Internet]. 2021. Available from: [https://www.urmc.rochester.edu/encyclopedia/content.aspx?ContentTypeID=167&ContentID=lipid\\_panel\\_hdl\\_ratio](https://www.urmc.rochester.edu/encyclopedia/content.aspx?ContentTypeID=167&ContentID=lipid_panel_hdl_ratio)