

## RELATIONSHIP OF CHOLESTEROL LEVEL AND BLOOD PRESSURE ON HYPERTENSION PATIENTS AT PUSKESMAS LOA BAKUNG

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### Abstract

Hypertension is a non-transmissible disease that poses a health problem and is often found in basic healthcare facilities. One of the risk factors for hypertension is high total cholesterol levels. The purpose of this study is to analyze the correlation between cholesterol levels and blood pressure on hypertensive patients at Puskesmas Loa Bakung (Loa Bakung Community Health Center). This study utilizes descriptive-analytical observational cross-sectional method. The population in this study is hypertensive patients at the Puskesmas Loa Bakung. The sample data used in this study consists of all hypertension patients who came for blood tests in November 2024. The sample size was 67 people. The data was analyzed using the Spearman correlation test. The p-values for systolic and diastolic blood pressures are 0.232 and 0.483, respectively. The result shows no significant correlation between cholesterol levels and the occurrence of hypertension.

**Keywords:** Cholesterol Levels, Blood Pressure, Hypertension

### Introduction

Hypertension is a condition where systolic blood pressure reading is 140 mmHg or higher, and/or diastolic blood pressure reading is 90 mmHg or higher (Kemenkes 2024). Hypertension is one of the risk factors of cardiovascular disease (Yusvita, Handayani, and Amaliah 2022). The World Health Organization (WHO) states that hypertension is the number one cause of death in the world. According to *Data Joint National Committee on Prevention, Detection, Evaluation, and Treatment on High Blood Pressure VII*, almost 1 billion of the world's population lives with hypertension (Permatasari, Suriani, and Kurniawan 2022)

These data show that hypertension is still a threat to the world's population. In 2000, there were 38.4 million people with hypertension in Asia and by 2025 this number will increase by 57% to 67.3 million (Permatasari et al. 2022). According to the Institute for Health Metrics and Evaluation (IHME) 2017 data, among 1.7 million deaths in Indonesia, the four major causes are hypertension (23.7%), hyperglycemia (18.4%), smoking behavior (12.7%) and obesity (7.7%)(Yusvita et al. 2022)

One of the risk factors for hypertension is high total cholesterol levels. Hypertension is linked to total cholesterol lipid abnormalities, where the presence of dyslipidemia increases the risk of developing hypertension that increases cardiovascular morbidity and mortality. Increases in Coronary Heart Disease (CHD) and Hypertension occur epidemiologically when serum total cholesterol exceeds 193.2 mg/dl (Hidayati et al. 2020).

Atherosclerosis is blocked arteries due to cholesterol buildup on the inner walls of the artery. Cholesterol, fat and other substances can thicken the walls of the arteries so that the blood vessels become narrower and restrict the blood flow. The higher the cholesterol level, the higher the atherosclerosis process in the blood vessels. When fat is deposited in the muscle cells of the arteries,

their elasticity decreases and leads to complications in blood pressure regulation. If this continues to happen, the body will compensate by increasing heart function. The heart will pump blood harder to ensure the blood oxygen level can be met. The consequences are hypertension and cardiovascular disease (Yusvita et al. 2022).

Several studies focus on the relationship between total cholesterol levels and the incidence of hypertension. Among them, Yusvita, et al. (2022), and Permatasari, et al. (2022) found the relationship between cholesterol levels and the incidence of hypertension.

The goal of this study is to determine the relationship between cholesterol levels and blood pressure on hypertensive patients at Puskesmas Loa Bakung (Loa Bakung Community Health Center).

## Methodology

The design of this study is descriptive analytical observational cross sectional, with all dependent and independent variable data taken at one time. The study was conducted at Puskesmas Loa Bakung. The population in this study was hypertension patients at Puskesmas Loa Bakung. The sample in this study was all hypertension patients who came for blood tests in November 2024.

The data obtained in this study are secondary data in the form of blood test results performed by the Laboratorium Kesehatan Kota Samarinda. The blood pressure measurement data was taken using an Omron sphygmomanometer performed by Puskesmas staff as part of Prolanis (chronic disease management program) activities. The number of samples obtained was 67 people. The sampling method used was total sampling because the data obtained was less than 100. The data analysis used in this study was descriptive analysis and correlation test with the Spearman method.

## Dataset

The following table summarizes the sample data of 67 patients at Loa Bakung Community Health Center who came for blood test. The data are characterized by sex, age, cholesterol level, and blood pressure measurement.

**Table 1 Frequency Distribution of Sex, Age, Cholesterol Level, and Blood Pressure**

Characteristic	Frequency	%
Sex		
a. Male	19	28.4
b. Female	48	71.6
Age (Year)		
a. < 40	2	3
b. ≥ 40	65	97
Cholesterol Level		
a. Hypercholesterolemia	52	77.6
b. Normal	15	22.4
Blood Pressure		
a. Hypertension	46	68.7
b. Normal	21	31.3

As shown in Table 1 above, the majority of hypertension patients are female (71.6%, 48 patients). Among the samples, 65 patients (97%) are 40 years or older and only 2 patients (3%) are under 40 years

of age. Additionally, 52 patients (77.6%) have hypercholesterolemia, and 46 patients (68.7%) have hypertension.

**Table 2. Correlations between Total Cholesterol Levels and Blood Pressure**

<b>Correlation</b>	<b>r</b>	<b>p- value</b>
Total Cholesterol Levels and Systolic Blood Pressure	0,148	0,232
Total Cholesterol Levels and Diastolic Blood Pressure	0,087	0,483

The results of Spearman's correlation test as depicted in Table 2 shows p-values for systolic and diastolic blood pressures are 0.232 and 0.483, respectively. The results show no significant correlation between total cholesterol levels and systolic and diastolic blood pressures in hypertension patients at Puskesmas Loa Bakung.

### Analysis

Among 67 hypertensive patients as shown in Table 1, the proportion of female patients is higher at 71.6% compared to male patients at 28.4%. Hypertension occurs more in postmenopausal women because the transition process from productive to non-productive periods is caused by decreased levels of estrogen and progesterone hormones. Several hormones during menopause have an addictive effect on increasing blood pressure including a relative increase in androgen levels, activation of the renin angiotensin system, increased endothelial plasma levels, and increased insulin resistance. Steroid hormones in women have an effect that regulates the renin angiotensin system and affects the production of angiotensin and sodium metabolism. Decreased estrogen levels during menopause result in increased regulation of the renin angiotensin system and increased plasma renin activity. The presence of various physiological changes can also cause hypertension in menopausal women (Karwiti et al. 2024).

Table 1 shows that the majority (97%) of hypertensive patients are 40 years or older. Age is a risk factor that is closely related to hypertension where blood pressure will increase according to a person's age, especially after 40 years (Basalamah, Ahri, and Arman 2021). This is because the arteries begin to stiffen and thicken, making it difficult for the heart to pump blood through the arteries (Lestari 2015));Purnama, Mawar Nusri, and Kriswiastiny 2023). Furthermore, a study by Fajar Apriyadi (2020) shows that there is a significant relationship between increasing age and the incidence of hypertension. Another study by Purnama, et al. (2023) states that age is a risk factor that cannot be changed. The results of this study are in agreement with another study by Margarita, et al. (2013) at the Santa Elisabeth Hospital Medan, which found the highest number (96%) of hypertensive patients were in the age group of 40 years or older. Additionally, research by Marnaek Irfan Albertus Manurung at the Deli Serdang Regional General Hospital in 2016 also showed that the highest proportion (95.2%) of hypertension cases with inpatient care in 2014 was in the age group of 40 years and older. This shows that hypertension is closely related to age. the older a person is, the greater the risk of developing hypertension (Rohmani, Rumaseb, and Apay 2023)

Based on Table 1, out of 67 respondents, 52 respondents (77.6%) showed hypercholesterolemia, and 15 respondents (22.4%) had normal cholesterol levels. Cholesterol is an essential component of the structural membranes of all cells and is a major component of brain and nerve cells. Cholesterol is found in high concentrations in glandular tissue and in the liver where cholesterol is synthesized and stored. Cholesterol is an intermediate material in the formation of a number of important steroids, such as bile acids, folic acid, hormones, adrenal cortex hormones, estrogen, androgen and progesterone. High cholesterol levels can be a risk factor for hypertension in the elderly (Febrianto Lesar, Modjo, and

Sudirman 2023). Additionally, Table 1 also shows that 21 respondents (31.3%) no longer experience high blood pressure because they have been treated with blood pressure lowering medication.

Table 2 shows that there is no significant relationship between cholesterol levels and the incidence of hypertension. From the analysis above, the p-value between cholesterol levels and systolic blood pressure is 0.232 and the p-value between cholesterol levels and diastolic blood pressure is 0.483. The results of the study above are in line with research by Jamini, Yunita, and Negara (2020). The results of this study indicate that there is no relationship between blood cholesterol levels and hypertension with a p value = 0.219. However, the results of this study are not in line with the research conducted by Rika Nofia, Yanti, and Andra (2019), which found a relationship between cholesterol levels and blood pressure in people with hypertension (p-value = 0.002). Another study by Solikin and Muradi (2020) also showed that there was a significant relationship between blood cholesterol levels and the degree of hypertension (p-value = 0.004).

A person with high cholesterol levels does not always experience increased blood pressure. Generally, high blood pressure (hypertension) is always accompanied by increased cholesterol in the blood. In a study published by the American Journal of Epidemiology, people who do not eat meat (vegetarians) have much lower blood pressure than those who consume meat. The study concludes that there is a difference in blood pressure levels in both of them which is caused by the consumption of animal protein and fat. Hence, blood cholesterol levels are not always the cause of hypertension because increased blood pressure/hypertension can be caused by several factors such as stress, lifestyle, diet, age, occupation, education, obesity, and others. Not all people with hypercholesterolemia suffer from hypertension and not all people with hypertension suffer from hypercholesterolemia, but high blood cholesterol levels tend to increase blood pressure (Pratama et al. 2024)

The absence of a significant correlation between cholesterol levels and the incidence of hypertension in this study can be caused by various factors. Patients who suffer from high cholesterol, including patients who regularly visit the health center and internal medicine polyclinic will continue to receive education and treatment from doctors to mitigate the risks that can occur due to high cholesterol levels. As such, these hypercholesterolemia patients will strive to maintain their blood pressure stability. As they continue to live a healthy lifestyle by maintaining a healthy diet and exercise regularly, the risk factors for hypertension in cholesterol patients will be reduced (Pratama et al. 2024)

## **Conclusion**

Among the 67 patients in this study, 71.7% are female, 97% are of 40-years or older, and 77.6% have hypercholesterolemia. Based on the statistical analysis on the relationship between cholesterol levels and blood pressure in hypertensive patients at the Puskesmas Loa Bakung, there was no significant correlation between cholesterol levels and the incidence of hypertension.

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