



Hypertension and Cholesterol among Late Adults in Indonesia: A Cross-Sectional Population-Based Survey

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Abstract

The global prevalence of hypertension is relatively high. In 2012, the death rate due to cardiovascular disease reached 17 million per year, with 45% of the contributors being hypertension. In 2015, globally, cholesterol cases accounted for 4.5% of ischemia of heart disease and 2% of strokes. Until 2017 and 2020, cholesterol disease was mainly experienced by adults aged 20 years or more, with a percentage of 10% of the population. **Objective:** The purpose of this study was to determine the relationship between hypertension and cholesterol. **Methodology:** The design study used data from the 5th batch of the Indonesia Family Life Survey (IFLS-5) organized by the Rand Corporation. IFLS-5 was conducted in 2014-2015, with 16,204 households and 50,148 individuals interviewed. Stratified random sampling to select respondents from the province to the place of residence. This study used a cross-sectional study design with inclusion and exclusion criteria from a total of 11,062 respondents. **Results:** Respondents with late-adult criteria in Indonesia were 50.17% women aged 51.98 (\pm 9.51), 84.04% married, 22.22% high school graduates, 70.14% Javanese, and 59.88% urban residents. The prevalence of cholesterol in late adults in Indonesia was 8.26% (95% CI: 0.08 – 0.09). The prevalence of hypertension in late adulthood in Indonesia was 20.91% (95% CI: 0.20 – 0.22). The results showed that cholesterol (OR = 4.06, 95% CI 3.53 – 4.67, p = <0.001) was statistically significant with hypertension. **Conclusion:** The prevalence of hypertension and cholesterol among late adults in Indonesia shows that hypertension and cholesterol are statistically significant and there was a relationship between people suffering from hypertension and having potential cholesterol disease.

Keywords: *adult, cholesterol, hypertension*

Introduction

The global prevalence of metabolic syndrome namely hypertension and cholesterol are relatively high. In 2012, the death rate due to cardiovascular disease was 17 million per year, and 45% of deaths were due to hypertension.^{1,2} Hypertension cases in the world were 22% of the total population with prevalence in Southeast Asia at 27%.^{3,4} In Indonesia, on the other hand, the cases were 34.11% of the population in 2018.⁵ The condition was actually worse especially in South Sumatra with cases of hypertension were 54.3% of the population in 2011.⁶

Alongside hypertension, the death rate for cholesterol cases in the world is relatively high. In 2015 globally, there were cases of increased blood cholesterol (hypercholesterolemia), 4.5% of ischemic heart disease, and 2% of strokes.⁷⁻⁹ While cases in the United States between 2017 and 2020 are experienced by adults aged 20 years or older, with a percentage of 10% of the population.¹⁰ Likewise with Nigeria where adults are more likely to be affected by cholesterol, with an increase of 27-52% of the population, while Africa is 26% higher than Nigeria.^{7,11} The highest prevalence in Southeast Asia is Malaysia at 47.7%, while Indonesia is 41.9%.^{12,13} As

a result, metabolic syndrome due to hypertension and hypercholesterolemia becomes a global health concern. Adult humans are estimated to 20-30% of people in the world experiencing metabolic syndrome.¹⁴

This study was conducted to determine the prevalence of hypertension and cholesterol in late adults and determine the relationship between hypertension and cholesterol.

Methods

Study Design and Sampling

The data represented in this study used data from the Indonesia Family Life Survey Wave 5 (IFLS-5) organized by Rand Corporation. The IFLS-5 was conducted in 2014-2015, with 16,204 households and 50,148 individuals interviewed. This data represents all of Indonesia using stratified random sampling to select respondents from the provincial to residence level. This study uses a cross-sectional design with inclusion criteria: people 40 or older. Exclusion criteria: people who do not have complete data or unknown data. The total number of respondents in this study was 11.062.

Measurement

The outcome of this study was hypertension. Hypertension refers to the person who has hypertension diagnosed by a doctor/paramedic/nurse. The independent factor was cholesterol. Cholesterol refers to a person with high cholesterol diagnosed by a doctor/paramedic/nurse/midwife. Sociodemographic factors include gender, age, marital status, education, ethnicity, and residence.

Statistical analysis

This research is an observational analytic study. Descriptive research is used to determine the characteristics of this study. Inferential research is used to determine the relationship between hypertension and cholesterol. Logistic regression was used to analyze the relationship between hypertension and cholesterol.

Results

Table 1 Baseline Characteristic of Hypertension and Cholesterol (N = 11.062)

Characteristics	Number	%
Sociodemographic		
Gender	Male	5,550 50.17
	Female	5,512 49.83
Age	Mean (\pm SD)	51.98 (\pm 9.51)
	Median (min : max)	50 (40 : 101)
Marital Status	Married	9,296 84.04
	Single	1,766 15.96
Education	University	1,209 10.93
	Senior High School	2,458 22.22
	Junior High School	1,717 15.52
	Elementary	5,678 51.33
Ethnicity	Javanese	7,759 70.14
	Sumatra	1,134 10.25
	Bali and East of Indonesia	1,669 15.09
	Others	500 4.52
Residence	Urban	6,624 59.88
	Rural	4,438 40.12

Table 2 Prevalence of Cholesterol

Characteristic	Number	%	95% CI
Prevalence			
Hypertension			
No	8,749	79.09	0.78 - 0.22
Yes	2,313	20.91	0.20 - 0.22
Cholesterol			
No	10,148	91.74	0.91 - 0.92
Yes	914	8.26	0.08 - 0.09

In this study, there were a total of 11,062 respondents in Indonesia who met the inclusion and exclusion criteria with 50.17% women, had an average age of 51.98 (\pm 9.51) with a married status of 84.04% and a senior high school education level of

22.22% with Javanese ethnicity 70.14 % live in urban areas 59.88% (Table 1).

Based on Table 2, the hypertension prevalence among late adults in Indonesia was 20.91% (95% CI: 0.20 - 0.22). Eight thousand seven hundred forty-nine respondents did not have hypertension (79.09%, 95% CI: 0.78 - 0.22). The cholesterol prevalence among late adults in Indonesia was 8.26% (95% CI: 0.08 - 0.09). Ten thousand one hundred forty-eight respondents did not have cholesterol (91.74%, 95% CI: 0.91 - 0.92).

Table 3 Simple Logistic Regression

Factors	Number	% of event	OR	95% CI	P-value
Cholesterol					
No	10,148	18.48	1		< 0.001
Yes	914	47.92	4.06	3.53 - 4.67	

Simple logistic regression is used to analyze the relationship between hypertension and cholesterol. The result indicated that cholesterol (OR = 4.06, 95% CI 3.53 - 4.67, p = <0.001) was statistically significant with hypertension (Table 3).

Discussion

In general, people with hypertension have a relatively high potential to increase cholesterol levels in the blood. This is because cholesterol is fat in the body that settles so that hypertension quickly occurs in the body.⁶ This study revealed that the prevalence of hypertension and cholesterol in women in Indonesia was 50.17%. This is in line with previous studies where the risk of cholesterol and hypertension was more experienced by women, namely 53.1%, especially in Indonesia with specific cholesterol conditions.¹⁵ As was the case in Malaysia, women were said to be more with 52.2%, Philippines at 51.8%, Thailand at 46.7%, and Vietnam at 35% of the population.¹² From this data, it shows that there is comfort where the prevalence of women is higher due to the influence of menopause at an advanced age.

In addition to the gender categories, the elderly in late productive age has the potential for hypertension and cholesterol. The previous conducted research also states that a person who has entered the age of 45-59 years tends to experience hypertension because of decreased body condition and susceptibility to chronic disease.¹⁶ So that cholesterol levels quickly increase due to lack of movement, and dietary intake of ready-to-eat dishes containing fat and high salt have consequences of increasing cholesterol and developing

hypertension.¹⁷ This also aligns with previous studies where prevalence is highest at 50-69 years in Australia, Malaysia, the Philippines, and Vietnam. While in Thailand, the age range is 45-59 years.¹² From the results of these characteristics, national survey data can estimate the prevalence of dyslipidemia (hypertensive cholesterol) which is influenced by logistical, cultural, and regulatory problems faced by patients in each country.

The analysis of the result showed that there is a relationship between hypertension and cholesterol; with the prevalence of cholesterol in Indonesia was 8.26% (95% CI: 0.08 - 0.09) compared to previous research which was 2.99% (95% CI: 1.860-4.812).¹⁸ On the other hand, the prevalence of hypertension in Indonesia is 20.91% (95% CI: 0.20 - 0.22). Compared to China, the age up to 60 years is 4.22 (3.84-4.64 with a total sample of 17,437).¹⁹ The result of simple logistic regression is used to analyze the relationship between hypertension and cholesterol indicating that cholesterol (OR = 4.06, 95% CI 3.53 - 4.67, $p < 0.001$) was statistically significant with hypertension. Similarly, previous studies showed that the results of the p-value were < 0.001 , which means that there is a relationship between cholesterol and hypertension in patients over 40 years of age.²⁰

Furthermore, hypertensive cholesterol can cause further risk, for instance, Cardiovascular Diseases (CVD). This study is in line with previous studies, which stated that cholesterol interacts with high blood pressure (hypertension) in causing CVD.^{21,22} Possible mechanisms to explain an association between cholesterol and hypertension are dietary cholesterol-related endothelial dysfunction and arterial stiffness. Serum cholesterol is strongly associated with endothelial dysfunction and reduced nitric oxide bioavailability,²³ which can lead to ossification. In rabbits fed cholesterol, increased oxidative stress, which caused endothelial dysfunction, was found. Oxidative stress reduces kidney dopamine receptor function in rats, leading to sodium retention.^{24,25} These overall mechanisms are results of some risk factors.

Risk factors that play a role in the occurrence of hypertension and cholesterol are both uncontrollable (major) and controllable (minor). The uncontrollable risk factors are such as heredity, gender, race and age. While the risk factors that can be controlled, one of which is diet. Wrong diet with too large amount of cholesterol can form deposits on the walls of blood vessels, causing atherosclerosis.^{26,27} This leads further to hypertension and cholesterol disease.

Conclusions

The prevalence of hypertension and cholesterol among late adults in Indonesia shows that hypertension and cholesterol are statistically significant and there was a relationship between people suffering from hypertension and having potential cholesterol disease.

Ethical Clearance

The IFLS has been reviewed and approved by Institutional Review Boards, the United States, and Gadjah Mada University, Indonesia.

Acknowledgment

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Authors' Contributions

UE design and study analysis; IH Collected and contributed data; UE and IH Performed the analysis; UE and IH wrote the paper and approved the final version of the manuscript.

Competing Interests

The authors declare there was no conflict of interest in this study.

Abbreviation

IFLS: Indonesia Family Life Survey

SPC: single-pill combinations

CVD: Cardiovascular Diseases

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