

Factors Affecting Total Cholesterol Level in the Pre-Elderly and Elderly in Kedaung Village

Faktor-Faktor Risiko yang Mempengaruhi Kadar Kolesterol Total pada Pra-Lansia dan Lansia di Kelurahan Kedaung

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Abstract

The prevalence of hypercholesterolemia in Indonesia is recorded in the elderly group at 15.5%. Pre-elderly and elderly are at-risk groups who are prone to hypercholesterolemia, especially in several conditions, such as over-nutrition status, high fat and low fiber food intake, and having a family history of hypercholesterolemia. This study aims to analyze the factors that influence total cholesterol levels in pre-elderly and elderly people in Kedaung Village. The study was conducted analytically observational with a cross-sectional design. Respondents in this study were 50 pre-elderly and elderly obtained from sample calculations using stratified sampling techniques. Data collection was taken using an SQ-FFQ questionnaire and analyzed by univariate analysis showed the frequency distribution of respondents' characteristics, and bivariate analysis was conducted using a chi-square test to identify the relationship between variables. The results of the study reported that 56% of respondents with total cholesterol levels ≥ 200 mg/dL. A total of 70% of respondents consumed high fat intake, 58% of respondents consumed low fiber intake, 60% of respondents had overweight status, and 64% had a family history of hypercholesterolemia. Analysis showed that the determinant factors associated with respondents' total cholesterol levels were fat intake ($p=0.035$), fiber intake ($p=0.013$), and family history ($p=0.015$). Pre-elderly and elderly with total cholesterol levels ≥ 200 mg/dL were found in respondents with high fat intake, low fiber intake, and a family history of hypercholesterolemia.

Keywords: Risk factors, Hypercholesterolaemia, Elderly

Abstrak

Prevalensi kasus hiperkolesterolemia di Indonesia tercatat pada kelompok lanjut usia sebesar 15,5%. Pra-lansia dan lansia adalah kelompok berisiko yang rentan mengalami hiperkolesterolemia, terlebih pada beberapa kondisi, seperti status gizi lebih, asupan makanan tinggi lemak dan rendah serat, serta memiliki riwayat keluarga hiperkolesterolemia. Penelitian bertujuan untuk menganalisis faktor-faktor yang mempengaruhi kadar kolesterol total pada pra-lansia dan lansia di Kelurahan Kedaung. Penelitian dilakukan secara analitik observasional dengan desain *cross-sectional*. Responden dalam penelitian adalah pra-lansia dan lansia berjumlah 50 orang yang diperoleh dari perhitungan sampel menggunakan teknik *stratified sampling*. Pengumpulan data diambil menggunakan kuesioner SQ- FFQ dan dianalisis dengan uji univariat menampilkan data distribusi frekuensi karakteristik responden dan uji bivariate menggunakan uji *chi-square* untuk mengidentifikasi hubungan antar variabel. Hasil penelitian melaporkan 56% responden memiliki kadar kolesterol total > 200 mg/dl. Sebanyak 70% responden mengonsumsi asupan lemak tinggi, 58% responden mengonsumsi asupan serat yang rendah, 60% responden memiliki status gizi berlebih, dan 64% memiliki riwayat keluarga. Hasil analisis bivariate menunjukkan determinan faktor yang berhubungan dengan kadar kolesterol total responden adalah asupan lemak ($p=0,035$), asupan serat ($p=0,013$), dan riwayat keluarga ($p=0,015$). Pra-lansia dan lansia dengan kadar kolesterol total ≥ 200 mg/dL ditemukan pada responden dengan asupan lemak yang tinggi, asupan serat yang rendah, dan memiliki riwayat keluarga hiperkolesterolemia.

Kata Kunci: Faktor risiko, Hiperkolesterolemia, Lansia

INTRODUCTION

The problem of degenerative diseases in Indonesia is still one of the burden diseases that need to be addressed further. Some degenerative diseases with high prevalence include gout, osteoporosis, diabetes, hypertension, stroke, and hypercholesterolemia (1). The prevalence of hypercholesterolemia cases in the world reaches 45% and is the cause of death of 2.6 million people worldwide (2). Meanwhile, the prevalence of hypercholesterolemia cases in the Southeast Asian region currently reaches 30%, and Indonesia, as a country incorporated in the Southeast Asian region, with a prevalence of hypercholesterolemia of 35% (1). The prevalence of cholesterol cases reviewed in hypercholesterolemia cases in Indonesia was recorded at the age of 25-34 years at 9.3% and for ages 55-64 years at 15.5% (3). The elderly are vulnerable to hypercholesterolemia and also other comorbidities caused by high cholesterol levels above 200 mg/dl, such as ischemic heart disease and stroke (4).

Hypercholesterolemia is a condition of increasing blood cholesterol levels that exceed the normal threshold (≥ 200 mg/dL) (5). Prolonged hypercholesterolemia can cause atherosclerosis in blood vessels due to the accumulation and deposition of lipids in the walls of blood vessels (6). The elderly are at high risk of hypercholesterolemia due to several factors, such as the occurrence of insulin resistance due to changes in the body fat composition of the elderly from 14% to 30% and dietary intake with high-fat food consumption and minimal fiber consumption in the elderly can also affect cholesterol levels in the elderly (7,8). The results of the SKI data in 2023 reported that 38.5% of the pre-elderly age group and 35.6% of the elderly age group had the habit of consuming fatty foods ≥ 1 time per day. West Java Province is the second largest province with the habit of consuming fatty foods ≥ 1 time per day (9). In addition, nutritional status in the elderly can also affect blood cholesterol (10). Previous research states that 58.6% of overweight elderly nutritional status have high cholesterol levels (7). The relationship between blood cholesterol levels and nutritional status can be known through insulin resistance. Obesity causes fat accumulation in the visceral area and results in insulin resistance. Insulin resistance causes hypersecretion of pancreatic β -cells and hyperinsulinemia, which will have an impact on genes that cause fat metabolism disorders such as decreased HDL levels and increased LDL levels (11). Another factor that can cause hypercholesterolemia is family history. Previous research showed that 64.7% of respondents who experienced hypercholesterolemia had a family history of hypercholesterolemia (12).

Hypercholesterolemia is one of the main factors contributing to the high rate of degenerative diseases in the elderly. Although monitoring and data transparency on hypercholesterolemia cases in Kedaung Village is still minimal, data in Depok City in 2023 showed that cases of atherosclerosis, hypertension, and diabetes mellitus were included in the top 20 outpatient diseases in hospitals with Kedaung Village contributing to the incident, there were patients with hypertension over 15 years old reaching 3,283 cases and diabetes mellitus 380 cases (13). One of the main causes of these diseases is high cholesterol levels (14,15). Based on these problems, research is needed to identify risk factors that affect total cholesterol levels in pre-elderly and elderly people in Kedaung Village. Understanding the factors that contribute to hypercholesterolemia is expected to support the development of preventive interventions and health education that are more appropriate in reducing the incidence of

degenerative diseases, improving the quality of life of the elderly, and providing transparent data related to hypercholesterolemia in Kedaung Village which can be the foundation for further research at the village level and in the Depok City government.

METHODS

This study used a quantitative method with a cross-sectional approach conducted in August-September 2024 in Kedaung Village, Depok City. The sample used in this study amounted to 50 people obtained by calculating the minimum sample using the Lemeshow formula with a value of $p = 0.2$, $q = 0.8$, and $d = 0.01$ and adding a drop-out risk of 10% of the pre-elderly and elderly population in Kedaung Village. Data collection was carried out using a stratified sampling technique by determining the inclusion criteria of pre-elderly from the age of 45 to the age of 59 and elderly with the age of ≥ 60 years, living and residing in Kedaung Village, and willing to become respondents. The exclusion criteria of this study were not undergoing a certain diet and not having hearing and speech impairment.

Total cholesterol data collection was carried out using the Point Care Test Unit (POCT) method using an easy-touch GCU meter. Blood sampling was carried out in accordance with established procedures. The categorization of cholesterol levels in this study follows the guidelines set by the National Cholesterol Education Prog (NECP), which is divided into two categories, namely the normal category with cholesterol level values < 200 mg/dL and the high category with cholesterol level values ≥ 200 mg/dL (16).

Food intake data was taken using the Semi-Quantitative Food Frequency Questionnaire (SQ-FFQ) research instrument for the past month, which consists of a list of foods and drinks that are often found in the surrounding environment. The food intake studied is the fat intake and fiber intake of respondents, who will be assessed based on daily, weekly, and last one-month consumption with high and low consumption categorization using the AKG standards for the elderly (17). Nutritional status data was taken through anthropometric measurements of body weight using GOTO digital scales and height using one health microtome and then categorized into the normal nutritional status and overnutrition following the standard Kemenkes nutritional status indicators. Family History data was taken using an interview questionnaire. The data that has been obtained is then analyzed univariate to determine the characteristics of the respondents. Furthermore, the data were analyzed bivariate using the Chi-Square test to determine the relationship between variables. The implementation of this research has obtained a research permit from the Health Research Ethics Commission (KEPK) Prima Indonesia University with letter number 025/KEPK/UNPRI/VIII/2024.

RESULTS

a. Univariate Analysis

The characteristics of respondents include gender, age, total cholesterol level, nutritional status, and family history, presented in Table 1. The 50 respondents involved in the study were divided into 14% men and 86% women. The age proportion of respondents in this study was balanced, namely pre-elderly (25%) and elderly (25%). Total cholesterol levels showed that most respondents had high cholesterol levels (56%), and some had normal cholesterol levels (44%). In addition, most of the respondents had excess nutritional status

(60%). They had a family history of hypercholesterolemia (64%) and some others had normal nutritional status (40%) and did not have a family history of hypercholesterolemia (36%).

Table 1. Characteristics of Respondents in Kedaung Village

Variable	n	%
Sex		
Male	7	14
Female	43	86
Age		
Pre-elderly(45 – 59 years)	25	50
Elderly (≥ 60 Tahun)	25	50
Total Cholesterol Level		
Normal (<200 mg/dL)	22	44
High (≥ 200 mg/dL)	28	56
Nutritional Status		
Normal (< 25 kg/m ²)	20	40
Overweight ($\geq 25,1$ kg/m ²)	30	60
Family History		
Existing	32	64
None	18	36

b. Bivariate Analysis

The results of bivariate analysis in this study are presented in Table 2.

Table 2. Cross Distribution of Factors Associated with Total Cholesterol Levels

Variable	Kadar Kolesterol Total						<i>p-value*</i>
	Normal		High		Total		
	n	%	n	%	n	%	
Food Intake							
Fat Intake Based on RDA							
High (≥67 gr)	12	24	23	46	35	70	0,035*
Low (<67 gr)	10	20	5	10	15	30	
Fiber Intake Based on RDA							
High (≥25 gr)	14	28	8	16	21	42	0,013*
Low (<25 gr)	8	16	20	40	29	58	
Nutritional Status							
Normal (< 25 kg/m ²)	9	18	11	22	20	40	0,907
Overweight (≥ 25,1 kg/m ²)	13	26	17	34	30	60	
Family History							
Existing	10	20	22	44	32	64	0,015*
None	12	24	6	12	18	36	

The data results from the bivariate analysis presented in Table 2 show several variables that have a significant relationship with cholesterol levels, such as food intake, which includes fat intake ($p\text{-value}=0.035$), fiber intake ($p\text{-value}=0.013$), and family history ($p\text{-value}=0.015$). The factor that has no relationship with total cholesterol levels is the nutritional status ($p\text{-value}=0.907$).

DISCUSSION

The results showed that fat intake has a relationship with total cholesterol levels in pre-elderly and elderly people. These results are supported by the distribution of data which shows

that most respondents with high cholesterol levels have high fat intake (46%). This shows the tendency of high cholesterol found in respondents with high fat intake. These findings are in line with research by Fatma et al (2021) and Sofiatun et al (2022) which show that high fat intake is associated with total cholesterol levels in the elderly (7,18). For decades, various studies have explained that excessive consumption of fatty acids, especially saturated fatty acids, affects blood cholesterol levels which can cause hypercholesterolemia conditions. This happens because saturated fatty acids together with cholesterol in the diet work together to reduce the activity of LDL receptors in the liver so that the excretion of LDL in the blood is reduced and as a result, blood cholesterol levels will rise (19). In addition, with age the ability of LDL receptors in the blood will also decrease, while LDL receptors have a crucial role, which can inhibit cholesterol production in the body so that reduced LDL receptor activity in the body will increase cholesterol levels (20). Based on the results of the SQ-FFQ data, the majority of respondents like to eat foods that have high fat, such as consumption of coconut milk and foods fried using high temperatures so that this affects the total cholesterol levels of respondents. The results of research conducted by Nur et al (2019) show that cholesterol levels will decrease with low fat intake so that fat intake in the elderly needs to be considered because chronic hypercholesterolemia conditions due to high fat intake can cause lipid peroxidation conditions and postprandial lipemia, this will affect LDL and HDL levels in the blood and trigger the onset of atherosclerosis in blood vessels (21).

In addition to fat intake, fiber intake is also associated with total cholesterol levels in pre-elderly and elderly. These results are supported by the distribution of data, which shows that most respondents with high cholesterol levels have low fiber intake (40%), and respondents with normal cholesterol have high fiber intake (28%), indicating that the tendency of high cholesterol is found in respondents with low fiber consumption. The results of this study are in line with research conducted by Sofiatun et al. (2022), which reported that 64.4% of respondents who had high cholesterol levels had insufficient consumption of fiber intake (7). Based on SQ-FFQ data, the majority of respondents' fiber consumption is sufficient for the recommended daily fiber consumption (25 g/day). Previous research shows that consumption of adequate fiber intake has a 7.7 times greater potential to have normal cholesterol levels. The results of a meta-analysis study also showed that consumption of high-fiber foods has been shown to reduce total cholesterol levels (22). Various studies have reported that high fiber consumption can inhibit cholesterol production by increasing short-chain fatty acid synthesis and bile excretion; besides that, high fiber consumption can reduce body weight and slow glucose absorption, which affects insulin sensitivity (23). Other studies have also tested the effectiveness of fiber consumption in reducing cholesterol levels in the body. Fructooligosaccharide consumption of 8 g/day was effective in reducing total cholesterol and LDL cholesterol levels, but HDL, Free Fatty Acid (FFA), and triglyceride levels did not show a significant decrease (24).

Meanwhile, there is no relationship between nutritional status variables and total cholesterol levels in pre-elderly and elderly people, with data distribution showing that respondents with high cholesterol levels mostly have excess nutritional status. However, there is a tendency for respondents with high cholesterol levels to have excess nutritional status (34%) compared to normal nutritional status (22%). The results of this study are in line with

research conducted by Alpinia et al. (2020), which reported that nutritional status is not associated with total cholesterol levels (25). However, different research results reported that nutritional status was associated with total cholesterol levels, where the majority of respondents with high cholesterol levels had excess nutritional status (73.3%) (8). Various studies in recent decades have reported that overnutrition or even obesity has a high risk of hypercholesterolemia with the assumption that there are changes in body metabolism in obese individuals that result in insulin resistance, hypertension, low HDL, hypertriglyceridemia and lead to cardiovascular disease (26). Interestingly, another study reported that there was no association between nutritional status and total cholesterol levels (27). This shows that although anthropometric measurements can be used as a good indicator in detecting the nutritional status of individuals, the use of the IMT category should be avoided because IMT cannot accurately detect changes in body composition in the elderly; this is due to the decrease in muscle mass and increase in fat mass with increasing age and the height of the elderly who decrease with a hunched posture due to decreased bone density so that nutritional status with the IMT category is not accurate enough to detect the nutritional status of the elderly (28).

Family history has a relationship with total cholesterol levels in pre-elderly and elderly, with data distribution showing that respondents with high cholesterol levels have a family history of hypercholesterolemia (44%) and respondents with normal cholesterol levels do not have a family history of hypercholesterolemia (24%). This shows that the tendency of high cholesterol has a family history of hypercholesterolemia. Previous research reported that hereditary factors have the greatest role in determining individual serum cholesterol levels, such as the presence of gene mutation abnormalities (18). Genetic mutation disorders inherited from parents with heterozygous results only produce half the normal number of LDL receptors. This lower-than-normal number of LDL receptors leads to familial hypercholesterolemia. The condition causes the body to be unable to regulate LDL levels in the blood and this will affect the total cholesterol levels of individuals who have the condition (29).

CONCLUSIONS AND SUGGESTIONS

Fat intake, fiber intake, and family history are associated with total cholesterol levels. High fat intake contributes to increased total cholesterol levels, while adequate fiber intake can help lower total cholesterol levels. In addition, family history also plays an important role in influencing total cholesterol levels. However, nutritional status showed no significant association with total cholesterol levels. Research with a longitudinal design is needed to monitor changes in cholesterol levels over time, and further research is needed to explore other factors that may affect cholesterol levels in the elderly so that cholesterol-related research can be diverse and described more broadly and in-depth.

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