

# Association between fat and fiber intake and cholesterol levels in patients with coronary heart disease: A cross-sectional study in Southeast Sulawesi, Indonesia

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## Abstract

**Background:** The prevalence of coronary heart disease continues to increase globally, and it is important to understand the factors associated with it.

**Objective:** This study aimed to explore the association between fat and fiber intake with cholesterol levels in patients with coronary heart disease at the Outpatient BLUD Bahteramas General Hospital, Southeast Sulawesi Province, Indonesia.

**Methods:** A cross-sectional study design was employed in this study. Data were collected from 55 patients with coronary heart disease using a semi-quantitative food frequency questionnaire and laboratory data on total cholesterol and HDL levels.

**Results:** There was no significant association between fat and fiber intake with cholesterol level ( $p > 0.05$ ).

**Conclusion:** No significant association was found between fat and fiber intake with cholesterol levels in patients with coronary heart disease. However, other factors may be contributing to the high cholesterol among these patients. Thus, future research is needed and considers using larger sample sizes to confirm the results. In the meantime, it is crucial to continue providing nutrition consultations that emphasize the importance of a balanced diet for patients with coronary heart disease.

**Keywords:** fat intake; cholesterol; fiber; coronary heart disease

## Background

Coronary heart disease (CHD) is a life-threatening condition, responsible for 30% of deaths worldwide (Pudiastuti, 2013) and is primarily caused by atherosclerosis, which begins with the accumulation of cholesterol, particularly LDL cholesterol, in the artery walls (Supriyono, 2008). The process results

in the narrowing of the coronary blood vessels, reducing the supply of oxygen and blood, leading to chest pain and disrupted heart function. Risk factors for CHD include hypertension, high cholesterol, poor diet, a sedentary lifestyle, and a lack of exercise. Of these, the most common cause is food intake, with a high-fat diet and a lack of fiber intake being significant contributors to CHD (Bustan, 2007; Effendy et al., 2015).

Fat consumption, particularly saturated fat, is a major contributor to high blood cholesterol levels (Effendi et al., 2009). Increased consumption of saturated fat and cholesterol increases the concentration of LDL cholesterol in the blood (Effendi et al., 2020; Fathila et al., 2015). In contrast, unsaturated fats can help reduce blood cholesterol levels and decrease the risk of atherosclerosis and cardiovascular disease. While fat is essential, too much of it can be harmful, causing the narrowing of heart arteries and leading to CHD.

Dietary fiber plays an essential role in reducing blood cholesterol levels. Soluble fiber, found in fruits and vegetables, is effective in lowering LDL levels without lowering HDL cholesterol levels (Belitz et al., 2008). Fiber can bind excess fat in the digestive tract and excrete it with feces. Consuming at least 28 grams of fiber per day can lower cholesterol levels by 15-19% (Belitz et al., 2008). Research shows that people who consume 35 grams of fiber per day have a one-third lower risk of suffering from CHD than those who consume 15 grams of fiber per day (Notoatmodjo, 2003).

Studies have shown that CHD patients consume high amounts of foodstuffs containing fat and have a low intake of fiber. Increasing fiber intake can significantly lower cholesterol levels in the blood, especially if done routinely (Winarno, 2004). The hospital data from Bahteramas Cardiac Polyclinic indicates that the number of CHD patients has been increasing year by year, highlighting the need to understand the relationship between fat and fiber intake and cholesterol status in CHD sufferers.

To sum, a high-fat diet and a lack of fiber intake are significant contributors to CHD. While fat is essential, too much of it can be harmful, causing high blood cholesterol levels and leading to CHD. This study aimed to analyze the association between fat and fiber intake with rate cholesterol in CHD patients at the BLUD Bahteramas Hospital, Kendari, Indonesia.

## Methods

### Study Design

A cross-sectional study design was employed in this study.

### Samples/Participants

A total of 55 out of 130 CHD patients were selected for this study using consecutive sampling. The inclusion criteria for the samples were patients diagnosed with CHD, who were willing to participate in the study and provide the necessary data, and were able to communicate effectively.

### Instruments

Data were collected using a semi-quantitative food frequency questionnaire (FFQ) form and laboratory data on total cholesterol and HDL levels of patients (Nindya et al., 2021). The FFQ form was found to be valid and reliable, with a Cronbach's alpha analysis score of 0.757. The recommended daily fiber intake for optimal health results is 25-29 grams, and the recommended daily fat intake is 20-25% of total energy (702 kcal) per person. The recommended daily fat consumption is equivalent to 5 tablespoons of fat per person per day or 67 grams per person per day. The cholesterol level was obtained from the patient's laboratory examination results, and the recommended total cholesterol level is 200 mg/dl, which is considered normal. If the cholesterol level is greater than 200 mg/dl, it is considered high, indicating an increased risk of CHD (Adhila Fayasari, 2020).

### Data Collection

Data were collected in 2018 at the Outpatient Installation at the BLUD Bahteramas Hospital, Southeast Sulawesi. The data collected included fat intake, fiber intake, and cholesterol rate in patients with CHD. Researchers and enumerators collected data by measuring energy intake, saturated fat, unsaturated fat, cholesterol, and fiber using a Quantitative Food Frequency Questioner (SM FFQ), which was processed using Nutrisurvey.

To estimate the portion size consumed by the subject in terms of weight (grams), the frequency per day was multiplied by the portion size (grams) obtained from the grocery list. All lists of food ingredients consumed by research subjects were then calculated according to what was filled in the form. The weight consumed in grams/day for all food ingredients was then added up to obtain the total intake of nutrients from the subject.

### Data Analysis

The data were analyzed using SPSS Version 22 software, WHO-Anthroplus, and Nutrisurvey.

Univariate analysis was used to describe the characteristics of the subjects, while bivariate analysis was used to identify the relationship between variables. The chi-square test with Yates' correction was used for statistical analysis.

### Ethical Consideration

This research met the requirements and passed the ethical review conducted by the Kendari Ministry of Health Polytechnic, Indonesia. Prior to data collection, each respondent has signed informed consent.

## Results

### Characteristics of the Respondents

In this study, majority of the participants were males (70.9%) and aged between 50-59 (47.5%). Additionally, the majority of participants had abnormal fat intake (61.8%), insufficient fiber intake (98.1%), and high cholesterol levels (54.5%) (Table 1).

**Table 1** Characteristics of the participants

Characteristics	n	%
<b>Age (year)</b>		
40-49	9	16.3
50-59	26	47.3
≥ 60	20	36.4
<b>Gender</b>		
Men	39	70.9
Women	16	29.1
<b>Fat Intake</b>		
Normal	21	38.2
Abnormal	34	61.8
<b>Fiber Intake</b>		
Not enough	54	98.1
Enough	1	1.9
<b>Cholesterol Level</b>		
Normal	25	45.5
High	30	54.5

### Association between fiber intake and cholesterol level

The normal category for total cholesterol level is 200 mg/dl as recommended. If the level exceeds 200 mg/dl, it is considered high and increases the risk of CHD. Consumption of fiber-rich foods can help prevent hypercholesterolemia and CHD.

**Table 2** Fiber intake with cholesterol levels

Fiber intake	Cholesterol Level				Total	
	Normal		High		n	%
	n	%	n	%		
Not enough	24	44.4	30	55.6	54	100
Enough	1	100	0	0	1	100
Total	25	45.4	30	54.6	55	100

According to Table 2, among the 54 samples with inadequate fiber intake, 30 participants (55.6%) had high cholesterol levels, while only one sample had sufficient fiber intake and normal cholesterol levels. The results of the chi-square test with a *p*-value of 0.455 (<0.05) showed that the hypothesis was rejected, indicating no significant association between fiber intake and cholesterol levels.

### Association between fat intake and cholesterol level

Table 3 displays that 55.9% of the participants with abnormal fat intake had high cholesterol levels. The chi-square test resulted in a *p*-value of 0.80 (<0.05), indicating no association between fat intake and cholesterol levels.

**Table 3** Fat intake with cholesterol levels

Fat intake	Cholesterol Level				Total	
	Normal		High		n	%
	n	%	n	%		
Normal	10	47.6	11	52.4	21	100
Abnormal	15	44.1	19	55.9	38	100
Total	25	45.5	30	54.5	55	100

## Discussion

This study aimed to examine the association between fat and fiber intake and cholesterol levels in outpatient patients with CHD. However, the results indicated that there was no correlation between fat intake and cholesterol level. This finding contradicts previous studies as (Bintanah, 2020; Haryanti, 2010) that found a correlation between fat intake and total cholesterol and blood triglyceride levels. Other studies have also found a relationship between fat consumption and the incidence of hypercholesterolemia. The study suggests that factors such as age, gender, education, occupation, and the type of fat consumed may have influenced the results.

The study found that most of the samples were over 40 years old and male, which may explain the high cholesterol levels observed. Furthermore, the lack of emphasis on the type of food during nutrition consultations at the nutrition clinic may have contributed to the insufficient knowledge about the food that is good for consumption by CHD sufferers (Kasron, 2012). The study recommends a balanced diet consisting of 50-60% carbohydrates and no more than 25% fat. Additionally, the study suggests that fat and high cholesterol intake should be limited, especially for obese people, as they are at increased risk of CHD (Pudiasuti, 2013).

The study also revealed that there was no correlation between fiber intake and cholesterol levels, which is not in line with another study (Bintanah, 2020) that found an association between fiber intake and cholesterol. The study suggests that the lack of fiber intake in CHD patients is due to their eating habits, as they consume less food that is a source of fiber, especially water-soluble fiber. The study recommends a diet that includes soluble fiber, which helps lower cholesterol levels, and insoluble fiber, which is important for normal stomach function (Arora, 2008; Saimin et al., 2019).

While the study provides valuable insights into the association between fat and fiber intake and cholesterol levels in CHD patients, the sample size of the study may have limited its generalizability. Further research with a larger sample size is needed to validate the findings of this study.

## Conclusion

This study did not find a significant correlation between fat and fiber intake with cholesterol levels in outpatient patients with CHD. The results of this study suggest that other factors such as age, gender, and education level may also play a role in cholesterol levels. The findings highlight the importance of providing education and guidance to CHD patients regarding their dietary intake, especially regarding the types of fats and fiber they

consume. Further research is needed with a larger sample size to confirm these findings and provide more insight into the association between dietary intake and cholesterol levels in patients with CHD.

### Declaration Conflicting Interest

None.

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None.

### Author Contribution

All authors contributed equally in this study.

### Author Biography

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