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Factors That Affect High Blood Cholesterol Levels in Public Health Students Class of 2024 Gorontalo State University

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ABSTRACT

Cardiovascular diseases are a group of non-communicable diseases that are one of the main health problems in the world. One of the main risk factors is high cholesterol levels. According to the World Health Organization, cardiovascular disease causes about 17.9 million deaths each year out of the total global deaths. In Indonesia, based on Riskesdas 2018, around 28.8% of the population aged ≥15 years have high cholesterol levels. The Gorontalo City Health Office in 2025 reported 81 cases of coronary heart disease, 3,069 cases of hypertension, and 63 cases of stroke related to high cholesterol. In addition, lifestyle changes such as skipping breakfast, excessive use of gadgets, consumption of Ultra Processed Foods, and poor sleep quality are thought to affect cholesterol levels in the blood. This study aims to analyze the factors that affect cholesterol levels in Public Health students of the 2024 batch of Gorontalo State University. An observational analytical method with a cross-sectional design was carried out at Gorontalo State University on 83 respondents selected through accidental sampling. Data were collected through questionnaires and portable cholesterol checkers, and then analyzed univariate and bivariate using chi-square test (p=0.05). The results showed that there was no association between breakfast habits (p=0.338) and gadget use (p=0.101) and high cholesterol levels. There was a relationship between the consumption of Ultra Processed Food (p=0.001) and sleep quality (p=0.018) with high cholesterol levels in public health students of the class of 2024. Ultra Processed Food consumption and sleep quality were related to cholesterol levels, while breakfast habits and gadget use were not related. It is recommended to maintain a balanced diet, limit Ultra Processed Foods, improve sleep quality, and implement an active lifestyle to prevent increased cholesterol levels and non-communicable diseases.

INTRODUCTION

Non-Communicable Diseases (NCDs) are one of the main health problems that continue to increase both globally and nationally. Cardiovascular disease is the highest cause of death due to NCDs with a percentage of about 39% of total deaths. *World Health Organization* (WHO) reports that cardiovascular disease causes about 17.9 million deaths each year in the world (WHO, 2024) . One of the main risk factors for cardiovascular disease is high cholesterol levels in the blood or hypercholesterolemia. This condition can trigger the formation of atherosclerosis plaques in the blood vessels which leads to coronary heart disease, hypertension, and stroke (Ma'rufi & , Rosita, 2014).

Cholesterol is one of the components of fat needed by the body for the formation of cell membranes, hormones, vitamin D, and bile acids (Triharyanto, 2020). However, if the cholesterol level in the blood exceeds the normal limit, it can cause serious health problems. High cholesterol levels are characterized by increased levels of *Low Density Lipoprotein* (LDL) and triglycerides and low levels *High Density Lipoprotein* (HDL). This condition causes the accumulation of fat on the walls of blood vessels thus inhibiting blood flow and increasing the risk of cardiovascular disease (Suciawati, 2025).

Based on WHO data in 2021, high cholesterol levels cause around 2.6 million deaths globally and are the main factor in atherosclerosis (WHO, 2021). In Indonesia, the results of Riskesdas in 2018 show that around 28.8%

of the population aged ≥15 years have high cholesterol (Ministry of Health of the Republic of Indonesia, 2018). This phenomenon suggests that cholesterol problems do not only occur in the elderly age group, but are also beginning to be found in young adults, including students (Sri) *et al*., 2024).

In Gorontalo Province, the increase in non-communicable disease cases can also be seen from data from the Gorontalo City Health Office in 2025 which recorded 81 cases of coronary heart disease, 3,069 cases of hypertension, and 63 cases of stroke (Gorontalo City Health Office, 2025). The high number shows that risk factors such as high cholesterol levels need special attention, especially in the productive age group and students who are prone to lifestyle changes.

Changes in the lifestyle of current students tend to lead to unhealthy behaviors, such as the habit of skipping breakfast, the use of gadgets for a long duration, and consumption *Ultra Processed Food* (UPF), and poor sleep quality. The habit of skipping breakfast can lead to lipid metabolism disorders due to irregular eating and increased consumption of excess food at the next meal. Research by Yu et al. (2023) shows that breakfast habits are not associated with increased cholesterol levels and the risk of cardiovascular disease (Yu *et al*., 2023).

In addition, excessive use of gadgets leads to sedentary behavior or reduced physical activity. This condition reduces the body's energy expenditure and triggers the occurrence of fats and cholesterol in the blood. Research by Khan et al. (2024) shows that the duration of using gadgets of more than two hours per day is associated with increased LDL and triglyceride levels and decreased HDL levels at a young age (Khan *et al*., 2024).

Konsumsi *Ultra Processed Food* It is also one of the factors that is suspected to affect cholesterol levels. UPF is a food that goes through a high processing process and generally contains high amounts of sugar, salt, saturated fat, and food additives (Khasanah *et al*., 2025). Excessive consumption of UPF can lead to disruption of lipid metabolism and increase the risk of obesity and hypercholesterolemia. Research by Nouri et al. (2023) shows that high UPF consumption is associated with increased triglyceride and LDL levels in the blood (Nouri *et al*., 2023).

Another factor that also affects cholesterol levels is sleep quality. Poor sleep can disrupt the body's hormonal and metabolic balance, increasing the risk of strengthening fats in the blood. Research by Yoshitaka et al. (2008) shows that suboptimal sleep quality is associated with disorders of lipid profiles, especially increased triglycerides and decreased HDL (Yoshitaka *et al*., 2008).

Based on initial observations of Public Health students of the 2024 batch of Gorontalo State University, it was found that there are tendencies in risky behaviors such as the habit of skipping breakfast, high use of gadgets, frequent consumption of UPF, and poor sleep quality. In addition, some students also have a family history of high cholesterol. This condition shows that students as a young age group still have an increased risk of experiencing increased cholesterol levels in the blood.

Research on the factors that affect cholesterol levels in college students is still limited, especially those that examine several behavioral factors at the same time. Therefore, this study is important to analyze the relationship between breakfast habits, gadget use, *Ultra Processed Food* consumption, and sleep quality with high blood cholesterol levels in public health students of the 2024 batch of Gorontalo State University.

RESEARCH METHODS

The type of research used in this study is Observational Analysis with a *cross-sectional* design. This design was chosen because it allows researchers to analyze factors that affect cholesterol levels in the blood in public health students of the 2024 batch of Gorontalo State University. This design was chosen because it allows the measurement of cholesterol levels and the collection of information about students' lifestyle habits simultaneously at one time, so that it can assess the relationship between lifestyle factors and cholesterol levels.

RESULTS

Table 1 Characteristics of Respondents

Up to Cholesterol	**n**	**(%)**
Height	41	49,4
Low	42	50,6
Quantity	83	100
Breakfast Habits	**n**	**(%)**
Less	37	44,6
Good	46	55,4
Quantity	83	100
Use of Gadgets	**n**	**(%)**
Height	77	92,8
Low	6	7,2
Quantity	83	100
Konsumi *Ultra Processed Food*	**n**	**(%)**
Height	45	54,2

Low	38	45,8
Quantity	83	100
Sleep Quality	**n**	**(%)**
Less	71	85,5
Good	12	14,5
Quantity	83	100

Based on table 1, respondents with low cholesterol levels were more (50.6%), compared to respondents with high cholesterol levels (49.4%). In terms of breakfast habits, most respondents had good breakfast habits (55.4%), while respondents with less breakfast habits (44.6%). The use of gadgets in the respondents was dominated by the high category, which was (92.8%), while the use of low gadgets was only (7.2%). In the consumption of *Ultra-Processed Food* (UPF), most respondents were in the high consumption category of (54.2%), compared to low consumption of (45.8%). Meanwhile, in sleep quality, most respondents had poor sleep quality, which was 985.5%, while good sleep quality was only (14.5%). In general, the characteristics of the respondents showed that although most students had low cholesterol levels, there was still a considerable proportion with high use of gadgets, high UPF consumption, and poor sleep quality as risk factors that could affect the increase in cholesterol levels in the blood.

Table 2 Results of Analysis of Breakfast Habits with Blood Cholesterol Levels in Public Health Students Class of 2024 Gorontalo State University

Breakfast Habits	**Up to Cholesterol**				**Quantity**		***p-value***
	Abnormal		**Normal**				
	n	**%**	**n**	**%**	**n**	**%**	
Less	20	54,1	17	45,9	37	100	
Good	20	43,5	26	56,5	46	100	**0,338**
Total	40	48,2	43	51,8	83	100	

Based on table 2, the proportion of respondents with abnormal cholesterol levels was higher in the group with less breakfast habits (54.1%) than in good breakfast habits (43.5%). However, the results of the statistical test showed a *p-value* of 0.338 ($p > 0.05$), so there was no relationship between breakfast habits and cholesterol levels in the blood in the 2024 batch of Public Health Students of Gorontalo State University.

Table 3 Results of Analysis of the Use of Gadgets with Cholesterol Levels in the Blood in Public Health Students Class of 2024 Gorontalo State University

Use of Gadgets	**Up to Cholesterol**				**Quantity**		***p-value***
	Abnormal		**Normal**				
	n	**%**	**n**	**%**	**n**	**%**	
Height	35	45,5	42	54,5	77	100	
Low	5	83,3	1	16,7	6	100	**0,101**
Total	40	48,2	43	51,8	83	100	

Based on table 3, the proportion of respondents with abnormal cholesterol levels was higher in the group of low gadget use (83.3%) compared to high gadget use (45.5%). However, the results of the statistical test showed a *p-value* of 0.101 ($p > 0.05$), so there was no relationship between the use of gadgets and blood cholesterol levels in the 2024 batch of Public Health Students at Gorontalo State University.

Table 4 Results of Analysis of *Ultra Processed Food* Consumption with Blood Cholesterol Levels in Public Health Students Class of 2024 Gorontalo State University

Ultra Processed Food *Consumption*	**Up to Cholesterol**				**Quantity**		***p-value***
	Abnormal		**Normal**				
	n	**%**	**n**	**%**	**n**	**%**	
Height	29	64,4	16	35,6	45	100	
Low	11	28,9	27	71,1	38	100	**0,001**
Total	40	48,2	43	51,8	83	100	

Based on table 4, the proportion of respondents with abnormal cholesterol levels was higher in the group with high *consumption of Ultra Processed Food* (64.4%) than in the respondents with normal cholesterol levels (35.6%). The results of the statistical test showed a p-value of 0.001 ($p < 0.05$), so there was a relationship between the consumption *of Ultra Processed Food* and blood cholesterol levels in the 2024 batch of Public Health Students of Gorontalo State University.

Table 5 Results of Analysis of Sleep Quality with Cholesterol Levels in the Blood in Public Health Students Class of 2024 Gorontalo State University

Sleep Quality	Up to Cholesterol				Quantity		*p-value*
	Abnormal		Normal				
	n	%	n	%	n	%	
Less	38	53,5	33	46,5	71	100	**0,018**
Good	2	16,7	10	83,3	12	100	
Total	40	48,2	43	51,8	83	100	

Based on table 5, the proportion of respondents with abnormal cholesterol levels was higher in respondents with poor sleep quality (53.5%) than in good sleep quality (16.7%). The results of the statistical test showed a *p-value* of 0.018 ($p < 0.05$), so there was a relationship between sleep quality and blood cholesterol levels in the 2024 batch of Public Health Students of Gorontalo State University.

DISCUSSION

The Relationship between Breakfast Habits and High Cholesterol Levels in the Blood in Public Health Students Class of 2024 Gorontalo State University

Based on the results of the bivariate analysis, a *p-value* = 0.338 ($p > 0.05$) was obtained, so it can be concluded that there is no relationship between breakfast habits and blood cholesterol levels in public health students of the 2024 batch of Gorontalo State University.

Breakfast habits are not the only factor that affects cholesterol levels in the blood. Cholesterol levels are also influenced by overall diet, physical activity, saturated fat consumption, and genetic factors (Sari *et al*., 2024). Respondents who have less breakfast habits can still experience high cholesterol if the food consumed at other times contains high fat and does not do physical activity (Preliminary) *et al*., 2025). On the other hand, respondents with good breakfast habits can also still experience increased cholesterol levels if their daily diet is unbalanced and their physical activity is low (Firdausi *et al*., 2025).

Breakfast has an important role in maintaining the body's metabolic balance and helping to control appetite throughout the day (Arimoto *et al*., 2023). The habit of skipping breakfast can lead to irregular eating and increase the risk of consuming high-fat foods at the next meal (Yu *et al*., 2023). However, the results of this study show that breakfast habits have not shown a significant association with total cholesterol levels.

The results of this study are in line with the research of Firdausi et al. (2025) which showed that there was no significant relationship between breakfast habits and cholesterol levels. Research by Sari et al. (2024) also states that cholesterol levels are more influenced by overall diet than breakfast habits alone.

Based on observations in the field, some respondents who had less breakfast habits admitted to replacing breakfast with snacks or fast food during the day. In addition, some respondents with good breakfast habits also still eat high-fat foods such as fried foods. This shows that the quality of the food consumed is more influential than the frequency of breakfast alone.

The Relationship between Gadget Use and High Cholesterol Levels in the Blood in Public Health Students Class of 2024 Gorontalo State University

Based on the results of the bivariate analysis, a *p-value* = 0.101 ($p > 0.05$) was obtained, so it can be concluded that there is no relationship between the use of gadgets and blood cholesterol levels in public health students of the 2024 batch of Gorontalo State University.

High use of gadgets does not always lead to an increase in cholesterol levels in the blood. This is because cholesterol levels are also influenced by other factors such as physical activity, diet, and lifestyle of respondents (Khan *et al*., 2024). Although most of the respondents have a high use of gadgets, some respondents still do physical activity or exercise so that fat metabolism in the body continues to run well (Carwite *et al*., 2022).

Excessive use of gadgets can lead to sedentary or sedentary behavior that risks increasing fat accumulation in the body (Khan *et al*., 2024). In addition, a high duration of using gadgets can also lead to reduced physical activity time and affect a person's sleep patterns (Putri *et al.*, 2023). However, the results of this study show that the use of gadgets has not shown a significant relationship with cholesterol levels in the blood.

The results of this study are in line with previous research which showed that the use of gadgets does not have a direct relationship with cholesterol levels if respondents still have sufficient physical activity and a good diet (Carwite *et al*., 2022). However, other studies mention that the use of gadgets for a long duration can increase the risk of sedentary behavior that affects the body's metabolic health (Khan *et al*., 2024).

Based on observations in the field, most of the respondents use gadgets for academic activities, social media, and entertainment. However, some respondents still do outdoor activities and light exercise so that the use of gadgets does not completely cause a decrease in physical activity. This may be the reason why no significant relationship was found between the use of gadgets and cholesterol levels in the blood in this study.

The Relationship between *Ultra Processed Food* and High Cholesterol Levels in the Blood in Public Health Students Class of 2024 Gorontalo State University

Based on the results of the bivariate analysis obtained a *p-value* = 0.001 (p < 0.05), it can be concluded that there is a relationship between the consumption *of Ultra Processed Food* and blood cholesterol levels in public health students of the class of 2024 at Gorontalo State University.

Konsumsi *Ultra Processed Food* can increase the risk of abnormal cholesterol levels due to food *Ultra Processed Food* generally contains high amounts of saturated fats, sugars, salt, and food additives (Nouri *et al*., 2023). This content can affect lipid metabolism in the body so that it increases the level of *Low Density Lipoprotein* (LDL) and triglycerides in the blood (Donat Vargas *et al*., 2021).

Students tend to consume *Ultra Processed Food* Because it is more practical, easy to obtain, and has an affordable price. In addition, the dense lecture activities cause some students to choose fast food and packaged food as an alternative to daily consumption (Khasanah *et al*., 2025). Konsumsi *Ultra Processed Food* Persistently can lead to lipid metabolism disorders and increase the risk of cardiovascular disease (Nouri *et al*., 2023).

This research is in line with (Khuzaimah *et al*., 2025) that there is a significant relationship between high UPF consumption and increased bad cholesterol levels and decreased good cholesterol levels in the adult population. Similar research conducted (Zahirah, 2025) also showed a significant relationship between the frequency of UPF consumption and the high cholesterol category.

Based on observations in the field, most of the respondents often consume foods such as instant noodles, fried foods, packaged snacks, and sugary drinks in their daily activities. These habits are influenced by the ease of access to fast food in the environment around campus and the lifestyle of students who tend to choose practical food. This shows that the high consumption of *Ultra Processed Food* is one of the factors that contribute to the increase in cholesterol levels in the blood in the respondents.

The Relationship between Sleep Quality and High Blood Cholesterol Levels in Public Health Students Class of 2024 Gorontalo State University

Based on the results of the bivariate analysis, a *p-value* = 0.018 (p < 0.05) was obtained, so it can be concluded that there is a relationship between sleep quality and blood cholesterol levels in public health students of the 2024 batch of Gorontalo State University.

Poor sleep quality can affect the body's metabolism and increase the risk of lipid profile disorders in the blood (Yoshitaka *et al*., 2008). Lack of sleep can lead to hormonal imbalances such as leptin and ghrelin that play a role in appetite regulation and fat metabolism (Muniroh *et al*., 2018). In addition, poor sleep quality can also increase stress hormones such as cortisol which affects the increase in cholesterol levels in the blood (Kartika *et al*., 2024).

Students often experience irregular sleep patterns due to academic activities, the use of gadgets at night, and the habit of staying up late. This condition can cause rest time to be reduced and affect the body's metabolic process (Putri *et al*., 2023). If it occurs continuously, poor sleep quality can increase the risk of health problems including hypercholesterolemia.

The results of this study are in line with the research of Yoshitaka et al. (2008) which showed that poor sleep quality is associated with increased triglycerides and decreased HDL levels in the blood. Research by Kartika et al. (2024) also states that poor sleep duration and quality can increase the risk of lipid metabolism disorders at a young age.

Based on observations in the field, most of the respondents have a habit of sleeping late at night due to the use of gadgets and lecture activities. In addition, some respondents admitted that they often experienced sleep deprivation due to academic assignments and the use of social media before bed. This shows that sleep quality is one of the factors that contribute to the increase in cholesterol levels in the blood in the respondents of this study.

CONCLUSIONS AND SUGGESTIONS

Based on the results of a study on factors that affect high blood cholesterol levels in students of the Department of Public Health, Gorontalo State University, it can be concluded that there is no relationship between breakfast habits and gadget use with high cholesterol levels in the blood. Meanwhile, there is a significant relationship between the consumption of *Ultra Processed Food* (UPF) and sleep quality with high blood cholesterol levels in students of the Department of Public Health class of 2024. In this regard, students are expected to be able to implement a healthy lifestyle by reducing the consumption of *Ultra Processed Food* (UPF), maintaining sleep quality, increasing physical activity, and paying attention to a balanced diet to prevent an increase in cholesterol levels in the blood. The institution is also expected to increase education and health promotion related to the prevention of high cholesterol in students. In addition, for future researchers, it is recommended to use different research methods and add other variables related to cholesterol levels in the blood in order to obtain more in-depth and comprehensive research results.

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