

RESEARCH STUDY

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Associations of Fast-Food Consumption Patterns, Sugar-Sweetened Beverages, and Fibre Intake with Blood Cholesterol in Young Adult

Hubungan Pola Konsumsi Makanan Cepat Saji, Minuman Berpemanis, dan Asupan Serat dengan Kolesterol Darah pada Dewasa Muda

Hesti Permata Sari^{1*}, Afina Rachma Sulistyoning¹, Sifa Aulia Wicaksari¹, Windi Prisria Putri¹, Elok Widyaningtyas¹¹Department of Nutrition Science, Faculty of Health Sciences, Jenderal Soedirman University, Banyumas, Central Java, Indonesia**ARTICLE INFO**

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***Correspondent:**

Hesti Permata Sari

hesti.sari@unsoed.ac.idDOI:
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ABSTRACT**Background:** Hypercholesterolemia, defined as cholesterol levels of 200 mg/dl or above, is often attributable to lifestyle shifts, including changes in dietary habits, particularly noticeable in young adults.**Objectives:** This study seeks to establish the relationship between patterns of fast food and sugar-sweetened beverage (SSB) consumption, dietary fiber intake, and blood cholesterol levels in young adults.**Methods:** An observational, cross-sectional study was conducted on 100 participants, selected through purposive sampling. The selection criteria included age between 18-25, non-smokers, no prior diagnosis of dyslipidemia or CHD, no family history of dyslipidemia, and not currently on a diet. The Food Frequency Questionnaire (FFQ) was used to gather data on fast food and SSB intake, dietary fiber intake was assessed through food records, and cholesterol levels were measured using the Easy Touch GCU tool. The chi-square likelihood test and Spearman rank were used to analyze the data.**Results:** The study revealed that 48% of participants had cholesterol levels of ≥ 200 mg/dl. Descriptive analysis showed that 46% of participants frequently consumed fast food, 53% frequently consumed SSBs, and all participants had a daily fiber intake of less than 25 g. Bivariate analysis revealed significant correlations between cholesterol levels and patterns of fast-food consumption (p -value=0.000), SSB intake (p -value=0.000), and dietary fiber intake (p -value=0.019), all with a negative directional correlation.**Conclusions:** Young adults with cholesterol levels of ≥ 200 mg/dl were predominantly those who frequently consumed fast food and SSBs, and had a low intake of dietary fiber.**INTRODUCTION**

Hypercholesterolemia is a condition characterized by an increase in total cholesterol levels exceeding 200 mg/dL in adults aged 18 years and over¹. High blood cholesterol levels can obstruct blood circulation and escalate the risk of cardiovascular diseases, including heart disease and stroke, potentially leading to death. According to the World Health Organization (2021), high cholesterol levels are responsible for 2.6 million deaths globally (4.5% of total deaths)². In Indonesia, the prevalence of high cholesterol, as recorded at the Non-Communicable Diseases Integrated Development Post and Public Health Center, was 52.3%, with 48% in men and 54.3% in women.¹ As per the National Basic Health Research (2018), 28.8% of the Indonesian population aged ≥ 15 years exhibited above-normal total cholesterol levels³. These data indicate that hypercholesterolemia, typically found in the elderly population, is now prevalent among young adults⁴.

The increase in dyslipidemia and cardiovascular disease prevalence has been linked to technological achievements that have instigated shifts in lifestyle and consumption patterns⁵. These behavioral transformations have led to unhealthy snacking habits, including low consumption of fruits and vegetables and excessive intake of energy and fats⁶. These trends can be attributed to psychological factors such as interest, desire, willpower, emotions, attitude, reaction, and motivation, which can influence food choices in the everyday lives of young adults⁷.

The dietary habits of young adults are considerably diverse and often align with trends, disregarding the nutritional content of the food consumed⁸. This leads to an increase in fast food consumption among young adults in the modern era. The National Basic Health Research (2018) states that the national prevalence of consuming high-fat and high-cholesterol foods, characteristic of fast food, more than once a day is 41.7%. Central Java Province exhibits a

higher consumption prevalence of 58.4%³. Previous studies have indicated that consuming fast food more than three times a week increases the risk of hypercholesterolemia by 8.4 times⁹. This is because fast food is high in calories, saturated fats, salt, and low in fiber and vitamins. When consumed excessively over an extended period, fast food can trigger an increase in LDL cholesterol levels¹⁰.

In addition to the proliferation of fast food, the popularity of sugar-sweetened beverages (SSBs) among young adults has also surged. The 2018 National Basic Health Research revealed that 56.43% of the young adults aged 20-24 in Indonesia consumed SSBs more than once a day³. Previous studies have indicated that individuals consuming SSBs more than once a day have higher cholesterol levels compared to those consuming SSBs less than once a month¹¹. SSBs contain fructose, which, when ingested in large quantities, can disrupt blood lipid metabolism¹².

A prior study in South Africa discovered that high consumption of SSBs could potentially lead to a decrease in fruit and vegetable intake¹³. The 2018 National Basic Health Research also revealed that 94.7% of individuals aged ≥ 5 years in Central Java consume insufficient quantities of vegetables and fruit, defined as less than five servings per day in a week. Prior studies have suggested a negative correlation between fiber intake and cholesterol levels. Individuals with regular fiber intake were found to have a 7.7 times lower risk of hypercholesterolemia¹⁴. This is because fiber can help decrease cholesterol levels by promoting its excretion through feces, a low fiber intake may risk elevating cholesterol levels in the body¹⁵.

Young adults are expected to be in optimal health and should not be demonstrating an increase in non-communicable disease indicators such as hypercholesterolemia. Previous research findings suggest that an elevation in blood cholesterol levels during adulthood could lead to an increased risk of coronary heart disease. Maintaining blood cholesterol levels throughout young adulthood may decrease the lifetime risk of developing atherosclerotic cardiovascular disease¹⁶. Unhealthy dietary habits in young adults can lead to alterations in lipid metabolism, thereby contributing to increased blood cholesterol levels. Therefore, it is essential to investigate whether fast food and SSB consumption, along with fiber intake, correlate with blood cholesterol levels in young adults. This is crucial because young adults, who are integral to the nation's future development, must maintain their health¹⁷.

METHODS

This quantitative study, employing a cross-sectional approach, was conducted from January to July 2023. The study sample comprised 100 individuals, selected through minimum sample size calculation with an anticipated 10% dropout rate, from the population of young adults in North Purwokerto District. Data collection was performed using the purposive sampling method, with inclusion criteria set for participants aged between 18-25 years and willing to participate in the study. The exclusion criteria encompassed regular or

electric smokers, individuals with a diagnosis of dyslipidemia or CHD, those with a family history of dyslipidemia, and individuals on a diet. This study received ethical clearance from the Health Research Ethics Commission (KEPK) of the Faculty of Health Sciences, Universitas Jenderal Soedirman, as indicated by letter number 1030/EC/KEPK/II/2023.

Data collection for blood cholesterol levels was conducted using the Point of Care Testing (POCT) method with the Easy Touch GCU tool to measure total cholesterol levels. Blood sampling was performed through the capillary vein in the fingertip, following established procedural steps. The cholesterol level measurements in this study were categorized into two groups in accordance with the National Cholesterol Education Program: a normal category (<200 mg/dL) and a high category (≥ 200 mg/dL)¹⁸.

Data regarding fast food consumption patterns refer to the frequency of fast-food consumption by the participants in the month preceding data collection. Similarly, the consumption pattern of sugar-sweetened beverages pertains to the participants' consumption of such beverages in the month prior to data collection. Information on consumption patterns of fast food and sugar-sweetened beverages was collected using the Food Frequency Questionnaire (FFQ), which includes a list of fast food and sweetened beverages commonly found in participants' environment. Consumption patterns were evaluated on daily, weekly, and monthly scales. After analysis, data on consumption patterns of fast food and sugar-sweetened beverages were categorized according to the median. Score below the median indicated infrequent consumption, while score above the median suggested frequent consumption. Data on fiber intake were collected using the estimated 3x24-hour food record method, with records taken on two weekdays and one weekend day.

The collected data were subjected to univariate test to identify the characteristics of the respondents, followed by a correlation test. The relationship between fast food consumption patterns and sugar-sweetened beverage consumption patterns, and blood cholesterol levels were analyzed using the Chi-Square likelihood test. The variable of fiber intake was analyzed using the Spearman rank test on a ratio data scale. This was necessary because the overall fiber intake data exhibited a constant value, making it unsuitable for correlation tests using a categorical data scale. Data analysis was performed using IBM SPSS Statistics version 26 software.

RESULTS AND DISCUSSION

The study included 100 participants, comprising 25% men and 75% women. Men and women exhibit different food preferences, which can influence cholesterol levels. Men are typically inclined to consume more vegetables and fruits, thereby having higher fiber intake than women¹⁹. Women, on the other hand, are more likely to skip breakfast, which can lead to overeating in subsequent meals and potentially elevate blood cholesterol levels²⁰. The majority of participants were young adults, with 35% being 21 years old. Most respondents (76%) lived in boarding houses, while others lived with their parents. The majority of respondents had

a medium income, falling within IDR 500,000 to IDR 1,000,000.

Table 1. Characteristics of research participants in North Purwokerto District

Variable	n	%
Gender		
Male	25	25.0
Female	75	75.0
Age		
19 years	20	20.0
20 years	28	28.0
21 years	35	35.0
22 years	16	16.0
25 years	1	1.0
Residential Status		
Live Alone	76	76.0
Live With Parents	24	24.0
Pocket Money		
Low (<IDR 500.000)	14	14.0
Medium (IDR 500.000 – IDR 1.000.000)	49	49.0
High (>IDR 1.000.000)	37	37.0
Cholesterol Levels		
Normal (<200 mg/dl)	52	52.0
High (≥200 mg/dl)	48	48.0

The descriptive analysis results in Table 1 reveal that 48% of participants had cholesterol levels of ≥200 mg/dl. These findings underscore that elevated cholesterol levels can also affect younger age groups. This supports previous research that found 80.6% of students experienced hypercholesterolemia²¹. As elevated blood cholesterol levels are generally asymptomatic,

participants are likely to be unaware of their condition and neglect regular health check. The high percentage of participants with above-normal cholesterol levels suggest that individuals in adulthood should start conducting regular health checks to prevent the onset of hypercholesterolemia.

Table 2. Distribution data and variable characteristics of fast food and sugar-sweetened beverage consumption patterns among young adults in North Purwokerto District based on blood cholesterol levels

Variable	Cholesterol Levels						p-value	OR
	Normal		High		Total			
	n	%	n	%	n	%		
Fast Food Consumption Pattern by Median								
Infrequent (<310)	37	68.5	17	31.5	54	54.0	0.000*	4.498
Frequent (≥310)	15	32.6	31	67.4	46	46.0		
Sugar-Sweetened Beverage (SSB) Consumption Pattern by Median								
Infrequent (<110)	35	74.5	12	25.5	47	47.0	0.000*	6.176
Frequent (≥110)	17	32.1	36	67.9	53	53.0		

*) p-value is significant if <0.05, analyzed using Chi-Square Likelihood test

Table 2 reveals that respondents with high cholesterol levels (>200 mg/dL) were more prevalent among those with frequent fast food consumption patterns (67.4%). The statistical significance value (p-value=0.000) indicates a significant relationship between fast food consumption patterns and blood cholesterol levels. Young adults who frequently consume fast food are 4.498 times more likely to have high cholesterol levels compared to those who consume fast food less frequently. High cholesterol levels were also more

common in respondents with frequent consumption of sugar-sweetened beverages (67.9%). The statistical test results also showed a value of p-value=0.000, indicating a significant relationship between sugar-sweetened beverage consumption patterns and blood cholesterol levels. Young adults who frequently consume sugar-sweetened beverages are 6.176 times more likely to have high blood cholesterol levels compared to those who consume these beverages less frequently.

Table 3. Distribution data and variable characteristics of fiber intake among young adults in North Purwokerto District based on blood cholesterol levels

Variable	Mean±SD	Median	Range		Cholesterol Levels						P-value	r
					Normal		High		Total			
			Min	Max	n	%	n	%	n	%		
Fiber Intake by Median												
Infrequent (<310)	5.39±1.85	5.05	2.20	10.60	23	46.0	27	54.0	50	50.0	0.019*	-0.235
Frequent (≥310)					29	58.0	21	42.0	50	50.0		

*) p-value is significant if <0.05, analyzed using Spearman Rank test

Additionally, the fiber intake of all respondents in this study was found to be below the recommended amount (25 g/day). Therefore, a bivariate test was conducted using the Spearman Rank test with a ratio data scale, and fiber intake was categorized according to median. As per Table 3, statistical test results showed a significant relationship between fiber intake and blood cholesterol levels (p-value=0.019), with a negative correlation direction (r=-0.235). This finding is supported by the distribution of fiber intake data based on cholesterol levels, which shows a tendency for higher cholesterol levels among respondents with fiber intake below the median (54%).

The results of this study suggest a correlation between fast food consumption patterns and blood cholesterol levels in young adults. This finding aligns with previous research conducted on 201 students at Yarmouk University in Jordan, which showed that an increase in the frequency of fast-food consumption leads to elevated blood cholesterol levels. Fast food is a popular choice among the general public, particularly young adults²². According to the Food Frequency Questionnaire results, the types of fast food most frequently consumed by the participants include fried chicken, rissoles, French fries, *seblak* (a spicy and tangy dish with various ingredients), and fried tofu. While not all fast food negatively impact health, certain types can due to their high energy, trans fatty acids (TFA), simple carbohydrates, salt content, and low fiber content²³. The mechanism of increased cholesterol levels due to fast food consumption is associated with the high energy and low nutrient content of these foods, which can lead to a positive energy balance and nutrient deficiency²⁴. Excessive consumption of fast food, if not balanced with increased energy expenditure, can result in increased body fat deposits and cholesterol intake¹⁰. Moreover, a high intake of fast food can induce postprandial lipemia and lipid peroxidation, affecting LDL and HDL levels and triggering atherosclerosis in blood vessels²⁵.

In addition to fast food consumption, this study also found an association between the consumption of sugar-sweetened beverages and blood cholesterol levels. This finding aligns with prior research demonstrating a correlation between sugar-sweetened beverage consumption and increased total blood cholesterol levels²⁶. Another study involving American nurses revealed that a higher frequency of soft drink consumption led to increased total blood cholesterol levels and decreased high-density lipoprotein (HDL) cholesterol levels²⁷.

Sugar-sweetened beverages contain sweeteners such as sucrose (50% glucose and 50% fructose), High

Fructose Corn Syrup (HFCS) (45% glucose and 55% fructose or 48% glucose and 48% fructose), and fruit juice concentrates. All fructose is metabolized in the liver, leading to lipogenesis. If consumed excessively, the fructose in sugar-sweetened beverages will be metabolized into fat in the liver, resulting in de novo hepatic lipogenesis, atherogenic dyslipidemia, and insulin resistance. Increased fat content in the liver prompts the organ to produce and secrete very low-density lipoprotein (VLDL), which can elevate the blood lipid profile²⁸.

The high consumption of sugar-sweetened beverages is linked to social media usage and the influence of contemporary drink advertisements⁵. A previous study of young adults aged 18-24 years in Bangladesh identified several reasons for their consumption of sugar-sweetened beverages, including the drinks' appealing taste and refreshing quality (80.1%), comfort factor (8.6%), cost-effectiveness of flavored drinks (6.6%), easy access (2.6%), and peer influence (1.3%). Most than half of the respondents (54.5%) stated that they purchased sugar-sweetened beverages from local convenience stores²⁹.

The rise of contemporary food and beverage trends has impacted dietary behavior, particularly the consumption of fiber from vegetables and fruits. The findings of this study indicate a relationship between fiber intake and the blood cholesterol levels of young adults. These results support earlier studies that reported a correlation between fiber intake and total cholesterol levels, with an odds ratio (OR) of 7.7. This suggests that adhering to the recommended fiber intake increases the likelihood of maintaining normal cholesterol levels by 7.7¹⁴.

Despite the overall fiber intake of respondents in this study being below the recommended amount of 25 g per day³⁰, the results indicated that higher fiber consumption was associated with lower cholesterol levels. This suggests that respondents' fiber consumption was insufficient. However, this study found that even with low fiber intake, some respondents had normal cholesterol levels. This could be due to the natural metabolic capabilities of young adults, which can balance the chemical byproducts of the body's metabolism³¹. Other studies have also found that young adults have a higher metabolic capacity, which can increase energy expenditure and help control blood cholesterol levels³².

Additionally, fiber intake is not known to directly affect blood cholesterol levels. It requires regular consumption of 25-30 g of water-soluble fiber per day to lower cholesterol levels. Foods rich in water-soluble fiber, such as beans, apples, pears, carrots, broccoli, cucumber,

and oats, are recommended^{33,34}. Regular consumption of fiber, especially water-soluble fiber, can reduce cholesterol levels by binding to bile salts and excreting them in the stool. Increased excretion of bile salts can reduce blood cholesterol and increase the uptake of cholesterol from the blood into the liver³¹.

CONCLUSIONS

This study found associations between fast food consumption patterns, sugar-sweetened beverage consumption patterns, fiber intake, and blood cholesterol levels. Given that the fiber intake of all respondents was below the recommended amount, it is suggested that young adults increase their fiber intake to benefit from its role in controlling blood cholesterol levels.

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Author Contributions

HPS: conceptualization, investigation, methodology, supervision, writing–review and editing; ARS: methodology, writing–original draft; SAW: formal analysis, resources; WPP: methodology, formal analysis, writing–original draft; EW: writing–original draft, writing–review and editing.

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