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RELATIONSHIP BETWEEN THE CONSUMPTION OF MILK, FAT, AND OIL WITH HYPERTENSION AND DIABETES MELLITUS IN ADOLESCENTS

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ABSTRACT

Background: *The prevalence and hypertension of diabetes mellitus (DM) in Indonesia continue to increase, mainly due to unhealthy lifestyles, including uncontrolled consumption of milk, fat, and oil. Teenagers, as the next generation, are at high risk if their diet is unbalanced. This research explores the influence of milk, fat, and oil consumption on the risk of hypertension and DM in adolescents, to provide new insights into prevention efforts. The aim is to analyze the relationship between the proportion of milk, fat, and oil consumption on hypertension and diabetes mellitus in adolescents based on doctor's diagnosis by province*
Method: *This type of research is quantitative research with a cross-sectional approach based on secondary data. The research sample was teenagers selected through a stratified random sampling method, to ensure a more accurate representation according to the characteristics of the population.*
Result: *This study revealed that milk consumption did not have a significant relationship with hypertension and diabetes mellitus, while fat and oil consumption was shown to be significantly related to an increased risk of these two diseases in various provinces*
Conclusion: *Milk consumption does not show a significant relationship with hypertension and Diabetes Mellitus (DM). In contrast, the consumption of fats and oils was significantly associated with an increased risk of both diseases. These results highlight the need for education and nutritional interventions to reduce the control of fat and oil consumption in adolescents to prevent hypertension and DM in various provinces.*

Keywords: *Diabetes Mellitus, Hypertension, Diet, Adolescents*

INTRODUCTION

Hypertension is a medical condition characterized by an increase in systolic blood pressure ≥ 140 mmHg and diastolic ≥ 90 mmHg, exceeding the normal limit. As a major risk factor for cardiovascular disease, hypertension is often not recognized by sufferers, so it is nicknamed the "silent killer". Many individuals experience hypertension without showing clear symptoms, so this condition is often ignored until it causes serious complications (Khikma & Sofwan, 2021). Diabetes mellitus (DM) is a metabolic disease characterized by chronic hyperglycemia, caused by disorders in the insulin mechanism, insulin secretion, or both. This condition can trigger various complications if not well controlled. Typical symptoms of diabetes include polyuria (frequent urination), polydipsia (frequent thirst), polyphagia (frequent hunger), and unexplained weight loss. A diagnosis of DM can be made if a person experiences classic symptoms accompanied by random plasma glucose levels ≥200 mg/dL, fasting plasma glucose ≥126 mg/dL, 2-hour plasma glucose after the Oral Glucose Tolerance Test (OGTT) ≥200 mg/dL, or HbA1c levels ≥6.5% as examined using standardized methods (Damayanti et al., 2023).

According to the World Health Organization (WHO), hypertension is one of the leading causes of premature death worldwide, affecting more than 1.28 billion adults. Several studies have shown that many adolescents are unaware that they have a history

of hypertension so this condition continues into adulthood, this can increase the risk of morbidity and mortality (Diana & Hastono, 2023). Meanwhile, WHO also reports that more than 422 million people live with diabetes, with the majority suffering from diabetes mellitus type 2 caused by an unhealthy lifestyle. Diabetes mellitus can cause cardiovascular disorders which are quite serious diseases if not treated immediately so they can increase hypertension (Lestari et al., 2021). Non-communicable diseases such as hypertension and diabetes mellitus (DM) are increasingly becoming a serious concern in Indonesia, along with the increasing prevalence in recent years. Based on (Riset Kesehatan Dasar (Riskesdas), 2018), the prevalence of hypertension in the population aged ≥18 years has experienced a significant spike, from 9.4% in 2013 to 34.11% in 2018. A similar trend is also seen in diabetes mellitus, where the prevalence in the population aged ≥15 years increased from 1.5% in 2013 to 2.0% in 2018. This increase reflects changes in people's lifestyles, such as consumption of foods high in fat and sugar, lack of physical activity, and increasing other risk factors (Riskesdas, 2013).

Modern lifestyle has become an inseparable part of people's lives, including in daily consumption patterns. In this practical era, food choices are often based more on ease and speed of serving, the progress of the fast food industry along with the development of the era with the existence of an online application that provides services for ordering food and very teenagers consume fast food and cause changes in eating behavior (Sumartini, 2022). A diet high in fat, salt, and sugar is increasingly dominant, increasing the risk of various degenerative diseases, especially hypertension and diabetes mellitus. This unhealthy change in eating patterns is one of the main factors in the increasing prevalence of both diseases in society. If not balanced with awareness of the importance of consuming healthy foods and an active lifestyle, this condition becomes one of the causes of the increase in degenerative diseases, one of which is hypertension and diabetes mellitus (Yuantari, 2022). Dairy products contain many components with potential anti-diabetic effects, including calcium, vitamin D, magnesium, and protein. However, the benefits of these components may be offset by the diabetogenic effects of the saturated fatty acids in dairy products (Atmarita et al., 2017). Observational study findings have been mixed for the association between total dairy intake and the risk of type 2 diabetes mellitus (T2DM). Several studies have suggested that the consumption of dairy products is protective against the incidence of T2DM. Gloria Kang GJ et al.'s study found a modest but statistically significant inverse association between dairy intake, particularly daily milk intake, and the risk of T2DM. Consumption of yogurt and fermented products was cross-sectionally associated with lower odds of developing T2DM. In addition, yogurt consumption was associated with lower glucose and TAG levels, as well as lower systolic blood pressure and insulin resistance (Eussen et al., 2016). Finally, full-fat dairy products, non-fermented dairy products, and milk were positively associated with T2DM (Brouwer-Brolsma et al., 2018).

Based on the facts and theories that have been explained, most of the saturated fat intake in young adults or adolescents in Prungahan Kulon Village is included in the excessive category. This is because respondents more often consume foods that are sources of saturated fat (meat) and sources of vegetable fat (palm oil and coconut milk) (Khoirunnisa et al., 2024). Previous studies also showed that consumption patterns of foods high in saturated and trans fats are associated with an increased risk of hypertension and DM. However, these studies were mostly conducted in developed countries, so the results do not necessarily follow the social and cultural context of Indonesian society (Sacks et al., 2017). This study is important to conduct because

adolescents are an age group that is vulnerable to changes in consumption patterns due to urbanization and lifestyle changes. In addition, this study analyzes local consumption data and evaluates the relationship between certain types of food and chronic diseases, especially in provinces that have unique characteristics in consumption patterns and disease prevalence.

This study aims to analyze the relationships between the proportion of milk, fat, and oil consumption with hypertension and diabetes mellitus (DM) in adolescents, analyze the prevalence of hypertension and DM based on region, and provide new insights into dietary patterns that affect their health. This study also uses a quantitative approach with a cross-sectional design. Data were collected through a dietary survey using a validated food frequency questionnaire (FFQ), as well as blood pressure measurements. Data analysis was performed using logistic regression to evaluate the relationship between milk, fat, and oil consumption with the risk of hypertension and DM.

METHODS

This study used a quantitative design with a cross-sectional approach. The data used were secondary data from the 2023 Indonesian Health Survey (IHS) which was conducted in the period August to October 2023. The cross-sectional approach was applied to analyze the relationship between milk, fat, and oil consumption and the risk of hypertension and diabetes mellitus (DM) in adolescents based on doctor's diagnoses in various provinces.

The population of this study included adolescents in all provinces of Indonesia who met the inclusion criteria, namely those aged 15-18 years, had complete data on milk, fat, and oil consumption, and had blood pressure and blood sugar levels. Meanwhile, the exclusion criteria included adolescents with a history of chronic diseases other than hypertension and diabetes mellitus, adolescents who were on a special diet that affected fat and oil consumption patterns, and incomplete or invalid data. The independent variables in this study were milk, fat, and oil consumption, while the dependent variables were hypertension and diabetes mellitus.

Data on milk, fat, and oil consumption patterns were collected using a Food Frequency Questionnaire (FFQ) that has been tested for validity. Meanwhile, data on hypertension and diabetes mellitus diagnoses were obtained from medical records documented in the 2023 SKI. Blood pressure measurements were carried out using a digital tensiometer, while blood sugar levels were measured using the Accu-Chek rapid detection device. Body weight measurements were carried out using a digital scale with an accuracy of 0.1 kg, while height or body length was measured using a height-measuring device with an accuracy of 1 mm. This weight and height data were then used to calculate the Body Mass Index (BMI). High or low BMI can contribute to the risk of hypertension and diabetes mellitus with the formula: BMI = Body weight (kg) / height (m)2. How to determine the number of respondents who have hypertension over 18 years old X with the number of residents aged 18 years: 100%. BMI classifications are underweight, normal, overweight, Obesity I, and Obesity II. The research procedure included blood pressure measurements conducted twice with a 5-minute interval in a sitting and quiet condition, blood sugar level measurements in a fasting condition for at least 8 hours, and data collection on milk, fat, and oil consumption through a FFQ questionnaire filled out by the respondents. The data obtained were analyzed to see the relationship between milk, fat, and oil consumption and the incidence of hypertension and DM.

Data analysis was carried out through univariate analysis to describe sample characteristics and data distribution, bivariate analysis with chi-square test to test the

relationship between independent and dependent variables, and multivariate analysis using logistic regression to determine the most influential factors on the incidence of hypertension and DM. Data processing was carried out using SPSS version 26 and Microsoft Excel. The Indonesian Health Survey (IHS) has obtained an ethics clearance letter from the National Health Research and Development Ethics Commission (KEPPKN) with the number HK.01.07/MENKES/156/2023.

RESULTS AND DISCUSSION

Table 1 shows that the highest proportion of daily milk and food consumption is in the Java and Bali region (15.3%), indicating that most of the population in this region consumes milk and its processed products every day. On the other hand, the lowest proportion of daily milk and its processed products consumption is in the Nusa Tenggara region (5.2%), indicating limited access or differences in consumption habits. Furthermore, the highest proportion of weekly milk and its processed products consumption is in the Sumatra region (39.0%), reflecting a more common weekly milk consumption pattern compared to other regions, while the lowest weekly consumption is in the Java and Bali region (20.7%), despite having the highest daily and monthly consumption levels. In addition, the proportion of monthly milk and its processed products consumption peaks in the Java and Bali region (70.7%), further confirming the dominance of this region in overall consumption frequency, while the lowest proportion of monthly consumption is in the Maluku region (48.0%), indicating less frequent consumption habits in the region. Nationally, when averaged across all regions in Indonesia, the proportion of milk and food consumption is recorded at 8.8% for daily intake, 30.5% for weekly intake, and 60.6% for monthly intake, illustrating a tendency toward less frequent consumption among the majority of the population.

These differences reflect the social, economic, and cultural influences that contribute to the eating habits of people in each region. Factors such as access to food sources, purchasing power, and inherited habits play a role in these consumption patterns (BPS, 2023).

Table 1. Distribution of Proportion of Milk Consumption and Its Foods by Region of Indonesia 2023

Region	≥ 1 time per day			1-6 times per week			≤ 3 times per month		
	Min	Max	$\bar{X} \pm$ SD	Min	Max	$\bar{X} \pm$ SD	Min	Max	$\bar{X} \pm$ SD
Sumatera	6.3	10.0	7.3 ± 1.1	25.9	39.0	29.9 ± 3.7	54.5	66.7	62.6 ± 3.6
Jawa dan Bali	6.1	15.3	10.5 ± 3.2	20.7	34.3	27.4 ± 5.6	50.3	71.7	62.0 ± 7.8
Nusa Tenggara	5.2	5.9	5.5 ± 49	24.9	28.9	26.9 ± 2.8	63.5	69.9	67.6 ± 3.2
Kalimantan	6.0	13.4	8.6 ± 2.8	30.1	38.8	34.6 ± 3.3	55.1	59.7	56.7 ± 1.7
Sulawesi	5.3	9.7	7.3 ± 1.6	27.2	36.4	30.7 ± 3.3	53.9	67.0	61.9 ± 4.5
Maluku	9.6	13.4	11.5 ± 2.6	33.1	38.7	35.9 ± 3.9	48.0	57.3	52.6 ± 6.5
Papua	7.7	13.4	11.1 ± 2.0	22.8	38.0	31.3 ± 5.2	48.6	65.1	57.4 ± 5.8
Indonesia	5.2	15.3	8.8 ± 2.6	20.7	39.0	30.5 ± 4.67	48.0	71.7	60.6 ± 5.7

The high daily milk consumption in Java and Bali can be attributed to better access to dairy products, wide distribution, and higher levels of economic well-being. In contrast, the low consumption in Nusa Tenggara may be due to limited local milk production, less affordable prices, and a consumption pattern that relies more on other protein sources such as fish and seafood (Ummah, 2022). Interestingly, weekly consumption patterns show a different trend, with Sumatra having the highest weekly milk consumption rate. This could be due to people's preference for consuming milk not daily, but in a periodic consumption pattern, perhaps due to price factors or the availability of other alternatives. In contrast, the low weekly

consumption in Java suggests a possible difference in consumption habits, with people more likely to consume milk regularly in small amounts rather than consuming it in larger weekly frequencies.

Table 2. Distribution of Proportion of Oil and Fat Consumption by Region of Indonesia 2023

Regional	≥ 1 time per day			1-6 times per week			≤ 3 times per month		
	Min	Max	$\bar{X}$ ± SD	Min	Max	$\bar{X}$ ± SD	Min	Max	$\bar{X}$ ± SD
Sumatera	30.6	49.6	41.5 ± 6.48	32.9	43.7	37.8 ± 3.66	14.1	29.4	20.5 ± 4.5
Jawa dan Bali	40.0	66.0	54.2 ± 10.0	22.9	34.9	29.9 ± 4.22	7.0	27.8	15.9 ± 6.9
Nusa Tenggara	34.3	50.3	42.3 ± 11.3	32.4	34.7	33.5 ± 1.62	15.0	33.3	24.1 ± 12.9
Kalimantan	39.8	56.0	45.7 ± 6.37	30.3	44.2	37.5 ± 5.37	13.7	20.8	16.7 ± 2.6
Sulawesi	26.7	51.5	37.6 ± 8.46	29.6	46.1	39.5 ± 6.07	18.9	28.1	22.8 ± 3.0
Maluku	33.8	39.5	36.6 ± 4.03	34.8	37.8	36.3 ± 2.12	22.7	31.4	27.0 ± 6.1
Papua	25.1	43.6	31.7 ± 7.97	31.0	48.3	39.7 ± 7.14	25.4	30.6	28.5 ± 2.1
Indonesia	22.9	48.3	36.4 ± 5.78	7.0	33.3	21.2 ± 6.31	25.1	66.0	42.2 ± 10.1

Table 2 shows that the highest proportion of Fat and Oil consumption per day is found in the Java and Bali regional areas (66.0%) and the lowest proportion of Fat and Oil consumption is found in the Papua regional area (25.1%), for the highest proportion of Fat and Oil consumption per week is found in the Papua regional area (48.3%) and the lowest proportion of Fat and Oil consumption is found in the Java and Bali regional areas (22.9%), the highest proportion of Fat and Oil consumption per month is found in the Nusa Tenggara region (33.3%) and the lowest proportion of Fat and Oil consumption is found in the Java and Bali regional areas (7.0%), Nationally the proportion of Fat and Oil consumption in Indonesia is average for daily consumption of 36.4%, weekly 21.2% and monthly 42.2%. The Nusa Tenggara region showed the highest daily consumption figures, which is likely influenced by the habit of cooking with a lot of oil, such as frying or using coconut milk in various traditional dishes. In contrast, lower fat and oil consumption in Maluku may be associated with a diet that is more based on boiled, grilled, or roasted foods, as well as the availability of oil which may be more limited compared to other regions.

Table 3. Distribution of Hypertension and Diabetes Mellitus Prevalence by Region of Indonesia in 2023 based on doctor's diagnosis

Regional	Hypertension based on diagnosis			Hypertension measurement results			Diabetes Mellitus based on diagnosis		
	Min	Max	X±SD	Min	Max	X±SD	Min	Max	X±SD
Sumatera	4.3	8.8	6.9±1.2	21.4	28.3	24.2±2.0	1.3	2.8	1.8 ±0.4
Jawa dan bali	6.9	12.6	9.5 ±2.2	21.7	32.8	29.3±3.9	2.1	3.9	2.7 ±0.7
Nusa Tenggara	6.3	6.8	6.5±0.3	24.5	26.4	25.4±1.3	1.0	1.8	1.4 ±5.7
Kalimantan	7.2	11.1	8.4±1.5	28.0	38.7	31.8±4.5	1.7	3.1	2.1 ±8.0
Sulawesi	5.3	12.1	7.8±2.3	26.5	29.5	27.7±1.1	1.4	2.7	2.0 ±7.4
Maluku	4.3	4.4	4.3±0.1	20.8	25.6	23.2±3.3	0.9	1.2	1.0 ±0.2
Papua	2.2	7.0	5.0±1.9	19.4	27.5	23.7±2.9	0.2	1.8	1.2 ±0.6
Indonesia	2.2	12.6	7.3±2.2	19.4	38.7	26.7±3.9	0.2	3.9	1.9 ±0.7

Table 3 shows that the highest prevalence of hypertension according to diagnosis occurs in the Java and Bali regional area (12.6%) and hypertension according to the highest measurement results occurs in the Kalimantan region (38.7%) while the lowest prevalence of hypertension occurs in the Papua regional area (2.2%). The highest prevalence of diabetes mellitus occurs in the Java and Bali regional area (3.9%) and the lowest prevalence of diabetes mellitus occurs in the Papua regional area (0.2%). National figures show a

prevalence of hypertension of 7.3% and a prevalence of diabetes mellitus of 1.9%.

Human lifestyle due to urbanization, modernization, and globalization is one of the causes of the increase in Hypertension and Diabetes Mellitus. Hypertension and diabetes mellitus are degenerative diseases that often occur due to unhealthy diet and lifestyle (Ifalahma et al., 2023). Therefore, preventive efforts through nutrition education, implementation of a healthy diet, and physical activity are crucial steps in reducing the risk of chronic diseases in the future. Increasing public awareness of the importance of a healthy lifestyle, including consuming a balanced nutritious diet, sufficient physical activity such as simple to heavy physical exercise such as walking around the yard, jogging using a running machine, and maintaining eating habits by implementing 3j (amount, type, and time of eating), is the key to reducing the incidence of diabetes mellitus in Indonesia (Suryawan et al., 2023). Government policies and community-based health programs also play an important role in supporting the prevention and management of this disease effectively.

Table 4 shows the results of the analysis of the proportion of the relationship between milk consumption, whether daily, weekly, or monthly, did not have a significant relationship with the prevalence of hypertension or diabetes mellitus in adolescents. In the consumption pattern ≥ 1 time per day, no significant relationship was found with the prevalence of hypertension based on the diagnosis p-value 0.192, hypertension based on measurement (p-value 0.985), and diabetes mellitus (p-value 0.152). In the consumption pattern of 1-6 times per week, there was no significant relationship with the prevalence of the disease for hypertension based on diagnosis (p-value 0.972), for hypertension based on measurement (p-value 0,957), and for diabetes mellitus (p-value 0,588), with a very small beta coefficient, indicating that milk consumption at this frequency has almost no effect on the prevalence of hypertension or diabetes mellitus. Likewise, in the consumption pattern ≤ 3 times per month, no significant relationship was found for hypertension based on diagnosis (p-value 0.520), for hypertension based on measurement (p-value 0,961), and for diabetes mellitus (p-value 0.815). Overall, the consumption pattern of milk and its derivatives is not strongly or significantly related to the prevalence of hypertension and diabetes mellitus, either in daily, weekly, or monthly consumption.

Table 4. Relationship between the Proportion of Milk Consumption and its Processed Products with the Prevalence of Hypertension and Diabetes Mellitus in Indonesia in 2023 based on doctor's diagnosis

Milk and milk product consumption patterns	Hypertension based on diagnosis	Hypertension measurement results	Diabetes Mellitus based on diagnosis
≥ 1 time per day			
Beta	0.180	-0.005	0.062
Kostan	5.707	26.774	1.373
Koefesien korelasi (r)	0.213	0.003	0.234
p-value	0.192	0.985	0.152
1-6 times per week			
Beta	0.003	0.008	-0.014
Kostan	7.216	26.498	2.346
Koefesien korelasi (r)	0.006	0.009	0.089
p-value	0.972	0.957	0.588
≤ 3 times per month			
Beta	-0.042	-0.006	-0.005
Kostan	9.848	27.069	2.220
Koefesien korelasi (r)	0.106	0.008	0.039
p-value	0.520	0.961	0.815

Based on the data above, indicates that milk consumption is not the main factor influencing the risk of both diseases. Milk and its processed products are food sources that contain high levels of calcium, protein, magnesium, potassium, zinc, and phosphorus per calorie (Badzlina & Triyanti, 2019). Previous research by Anwar R. showed that milk can contribute to maintaining normal blood pressure because milk is a good source of calcium, but to prevent hypertension, low-fat milk should be chosen (Anwar, 2014) Although there is no significant direct relationship, various epidemiological studies support that adequate consumption of milk and its processed products, even at moderate levels, can help reduce the risk of diabetes (Zong et al., 2014). Milk contains various important nutrients such as high-quality protein, calcium, magnesium, and bioactive fatty acids, which can play a role in improving glucose metabolism and insulin sensitivity.

The results of the analysis in Table 5 can conclude that fat and oil consumption patterns have a significant relationship with the prevalence of hypertension and diabetes mellitus. In the consumption pattern ≥ 1 time a day, a significant relationship was found with the prevalence of hypertension based on the doctor's diagnosis (p-value 0.001), the prevalence of hypertension based on measurement (p-value 0.004), and diabetes mellitus (p-value 0.005). The beta coefficient indicates that the higher the consumption of fats and oils per day, the prevalence of hypertension and diabetes mellitus tends to increase. The strength of the relationship showed a fairly strong relationship between fat and oil consumption and the two diseases on the frequency of daily consumption.

Table 5. Relationship between the Proportion of Fat and Oil Consumption and the Prevalence of Hypertension and Diabetes Mellitus in Indonesia in 2023 based on doctor's diagnosis

Fat and Oil Consumption Patterns	Hypertension based on diagnosis	Hypertension measurement results	Diabetes Mellitus based on diagnosis
≥ 1 time per day			
Beta	0.114	0.178	0.031
Kostan	2.488	19.228	0.621
Koefesien korelasi (r)	0.510	0.454	0.437
p-value	0.001	0.004	0.005
1-6 times per week			
Beta	-0.127	-0.207	-0.033
Kostan	11.919	34.268	3.122
Koefesien korelasi (r)	0.321	0.300	0.264
p-value	0.046	0.064	0.105
≤ 3 times per month			
Beta	-1.465	-0.289	-0.053
Kostan	31.907	32.876	3.047
Koefesien korelasi (r)	0.527	0.458	0.463
p-value	<0.001	0.003	0.003

The results of the analysis also showed that there was a significant relationship between the proportion of fat and oil consumption patterns 1-6 times per week with the prevalence of hypertension based on doctor's diagnosis (p-value 0.046) and hypertension based on measurement (p-value 0.064), but not significantly related to the prevalence of diabetes mellitus (p-value 0.105). The correlation coefficient indicates a weak relationship. There was a relationship between the proportion of fat and oil consumption patterns ≤ 3 times per month with the prevalence of hypertension based on diagnosis (p-value <0.001), hypertension based on measurement (p-value 0.003), and diabetes mellitus (p-value 0.003). The correlation coefficient suggests a strong relationship, that

infrequent consumption of fats and oils can contribute to a decrease in the prevalence of hypertension and diabetes mellitus.

According to research by Susilowati & Waskita, the consumption of fatty and sweet foods has a strong relationship with the increasing prevalence of diabetes mellitus. The use of oil and coconut milk in food is the main factor that contributes to the high levels of fat in the daily consumption pattern (Susilowati & Waskita, 2019). Meanwhile, other studies show that the habit of consuming excessive fat is also closely related to increased blood pressure. High-fat intake can increase levels of LDL (low-density lipoprotein) cholesterol in the blood, which over time will accumulate on the walls of blood vessels and form atherosclerotic plaque. This accumulation causes the narrowing of blood vessels, reduced elasticity, and impaired blood flow, which ultimately triggers hypertension. This condition can also increase blood volume and pressure in the circulatory system, thereby worsening the risk of hypertension and other cardiovascular diseases (Wijaya et al., 2020).

CONCLUSION

This study shows that consumption of milk and processed foods has no significant relationship with the incidence of hypertension and diabetes mellitus in adolescents. In contrast, consumption of fat and oil has a significant relationship with an increased risk of both diseases. These findings underline the importance of nutritional education and intervention policies to reduce excessive consumption of fat and oil to prevent hypertension and diabetes mellitus from adolescence. Therefore, efforts to increase awareness of healthy eating patterns must continue to be encouraged through targeted education and regulation programs.

This study has several advantages that make it relevant in understanding the relationship between milk, fat, and oil consumption with hypertension and diabetes mellitus in adolescents. One of the main advantages is the use of data from the 2023 Indonesian Health Survey (IHS) which covers a national scope so that the results of this study can represent the condition of food consumption patterns and the prevalence of metabolic diseases in various regions of Indonesia. However, this study also has several weaknesses that need to be considered in interpreting the results. One of the main limitations is the cross sectional study design, which only observes the relationship between variables at one point in time without being able to determine a direct cause and effect. relationship. To understand the long-term impact of milk, fat, and oil consumption on hypertension and diabetes mellitus, further research with a longitudinal design is needed.

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CONFLICT OF INTEREST

All authors declared that there was no conflict of interest.

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