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The Correlation Between Knowledge, Attitudes, and Behaviors Regarding Added Sugar and The Risk of Diabetes Mellitus in Adolescents

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ABSTRACT

Background: Diabetes mellitus is a growing health concern among adolescents, with excessive added sugar consumption being a major contributing factor. Knowledge, attitudes, and behaviors related to added sugar intake play an important role in reducing the risk of diabetes.
Method: This study used a quantitative correlational design with a cross-sectional approach. A total of 159 adolescents from SMP Negeri 1 Cilongok were selected using proportional random sampling. Data were collected using questionnaires measuring knowledge, attitudes, behaviors, and diabetes risk using the PRESTARt instrument. Data were analyzed using the chi-square test.
Results: The results showed a significant relationship between knowledge and behavior with the risk of diabetes mellitus ($p = 0.032$ and $p = 0.002$). However, no significant relationship was found between attitudes and diabetes risk ($p = 0.203$).
Conclusion: Knowledge and behavior regarding added sugar consumption are significantly associated with the risk of diabetes mellitus in adolescents, while attitudes do not show a significant relationship.

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1. INTRODUCTION

Diabetes mellitus is a condition characterized by elevated blood glucose levels caused by decreased insulin activity or secretion, or both[1]. The most common type is type 2 diabetes, which occurs when the body becomes resistant to insulin or fails to produce sufficient insulin[1]. Risk factors include genetic predisposition, obesity, and unhealthy lifestyles such as physical inactivity, smoking, and poor dietary habits, particularly high sugar consumption[2]. Added sugars, defined as sugars incorporated during food processing or preparation, such as in sweetened beverages and processed foods, play a significant role in unhealthy diets that increase diabetes risk[3]. The WHO recommends limiting added sugar intake to less than 5% of total daily energy; however, adolescents often exceed this amount, consuming approximately 60–108 grams per day[4,5].

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Globally, diabetes prevalence among adults aged 20–79 years reached 10.5%, with nearly half of cases undiagnosed, and projections estimate that 783 million people will live with diabetes by 2045[6]. In Indonesia, cases among children and adolescents have increased significantly, with 1,654 adolescents aged 10–14 years diagnosed in 2023[7]. National data also show an increasing trend, with diabetes prevalence rising from 1.5% in 2013 to 2.0% in 2018[8]. Regionally, Banyumas Regency reported 23,388 cases in 2023[9], influenced by unhealthy dietary habits such as frequent consumption of sugary foods and beverages[10].

Family history increases diabetes risk by 2–3 times due to genetic and environmental influences[11]. According to Bloom's theory, knowledge influences attitudes and behavior, which ultimately shape health practices[12]. Previous studies confirm that knowledge about healthy diets affects eating behavior and diabetes risk, where low knowledge contributes to unhealthy habits and poor glycemic control[13,14].

Adolescent diabetes is also linked to metabolic syndrome, obesity, and insulin resistance associated with poor diet and lifestyle[15,16]. Although average sugar intake among Indonesian adolescents is 17.9 grams per day, some exceed WHO recommendations, and high exposure to sweetened beverage marketing contributes to consumption patterns[17,18]. Therefore, this study aims to analyze the relationship between knowledge level, attitudes, and behaviors regarding added sugar and the risk of diabetes mellitus among adolescents.

2. RESEARCH METHOD

This study employed a quantitative correlational design with a cross-sectional approach to examine the relationship between knowledge, attitudes, and behaviors regarding added sugar consumption and the risk of diabetes mellitus among adolescents. The research was conducted at SMP Negeri 1 Cilongok, Banyumas, involving 159 adolescents aged 14-15 years, selected through proportional random sampling.

Data collection was carried out using a questionnaire divided into three sections. The first section assessed knowledge about added sugars, with 10 true/false questions about the types and health impacts of added sugars. The second section measured attitudes towards added sugars using a Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree) for 10 statements. The third section evaluated behaviors related to added sugar consumption, including the frequency of consuming sugary foods and drinks, using a similar Likert scale.

To assess the risk of diabetes mellitus, the PRESTARt instrument was used, which takes into account factors such as body mass index (BMI), screen time, family history of diabetes, and eating habits. High-risk criteria include: BMI ≥ +1 SD (overweight/obese), Screen time ≥ 2 hours/day, High sugar intake, and Low physical activity.

The study was conducted with proper ethical approval from the school and informed consent from both parents and participants. The questionnaires were distributed in the classroom, and students were given 20-30 minutes to complete them. Afterward, the data were collected and analyzed using the chi-square test, with a significance level of $p < 0.05$.

To calculate body mass index (BMI), the following formula was used:

$$\text{BMI} = \frac{\text{Weight (kg)}}{\text{Height (m)}^2}$$

This study followed ethical guidelines, ensuring participants' confidentiality and allowing them to withdraw at any time without consequence.

3. RESULT AND DISCUSSIONS

3.1 Univariate Analysis

Table 1. Respondent Characteristics (n = 159)

Characteristic	Frequency (n)	Percentage (%)
Age		
15 Years	60	37,7

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14 Years	99	62,3
Gender		
Male	72	45,3
Female	87	54,7
BMI		
Underweight (-3 SD to < -2 SD)	37	23,3
Normal (-2 SD to +1 SD)	101	63,5
Overweight (+1 SD to +2 SD)	18	11,3
Obese (> +2 SD)	3	1,9

Based on Table 1, of the 159 respondents studied, the majority were aged 14 years, totaling 99 adolescents (62.3%). Based on gender, the majority were female, with 87 adolescents (54.7%). From the BMI results, most respondents were in the normal category, with 101 adolescents (63.5%).

Table 2. Risk of Diabetes Mellitus in Adolescents

Variable	Frequency (n)	Percentage (%)
Risk of Diabetes Mellitus		
High	21	13.2
Low	138	86.8

Based on Table 2, of the 159 respondents, 138 adolescents (86.8%) had a low risk of developing diabetes mellitus.

Table 3. Respondents' Knowledge Level (n = 159)

Variable	Frequency (n)	Percentage (%)
Knowledge Level		
High	147	92,5
Low	12	7,5

Based on Table 3, out of 159 respondents, 147 adolescents (92.5%) had a high level of knowledge about added sugar.

Table 4. Respondents' Attitudes Toward Added Sugar (n = 159)

Variable	Frequency (n)	Percentage (%)
Attitude		
Positive Attitude	149	93,7
Negative Attitude	10	6,3

Based on Table 4, of the 159 respondents, 149 adolescents (93.7%) had a positive attitude toward added sugar consumption.

Table 5. Adolescents' Behavior Toward Added Sugar Consumption (n = 159)

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Variable	Frequency (n)	Percentage (%)
Behavior		
Good	81	50,9
Poor	78	49,1

Based on Tables 5, of the 159 respondents, 81 adolescents (50.9%) demonstrated good behavior regarding added sugar consumption.

3.2 Bivariate Analysis

Table 6 The Relationship Between Knowledge Level and Risk of Diabetes Mellitus

Variable	Incidence of Diabetes Mellitus		Total (n)	p-value
	Low Risk (n)	High risk (n)		
Knowledge Level				
High	130	17	147	0,032
Low	8	4	12	
Total	**138**	**21**	**159**	

Based on Table 6, among 147 respondents with a high level of knowledge, 17 respondents (11.6%) had a high risk of diabetes mellitus. Meanwhile, among 12 respondents with a low level of knowledge, 4 respondents (33.3%) had a high risk. The Chi-square test showed a p-value of 0.032 ($p < 0.05$), indicating a significant relationship between knowledge about added sugar and the risk of diabetes mellitus.

Table 7. The Relationship Between Attitude and Risk of Diabetes Mellitus in Adolescents

Variable	Incidence of Diabetes Mellitus		Total (n)	p-value
	Low Risk (n)	High risk (n)		
Attitude				
Positive	128	21	149	0.203
Negative	10	0	10	
Total	**138**	**21**	**159**	

Based on Table 7, among 149 respondents with a positive attitude, 21 respondents (14.1%) were at high risk. Among 10 respondents with a negative attitude, 1 respondent (10%) was at high risk. The Chi-square test showed a p-value of 0.203 ($p > 0.05$), indicating that there is no significant relationship between attitude and the incidence of diabetes mellitus in adolescents.

Table 8. The Relationship Between Attitude and Risk of Diabetes Mellitus in Adolescents

Variable	Incidence of Diabetes Mellitus		Total (n)	p-value
	Low Risk (n)	High risk (n)		
Behavior				
Good	77	4	81	0.002
Poor	61	17	78	
Total	138	21	159	

Based on Table 8, among 81 respondents with good behavior, 4 adolescents (4.9%) were at high risk. Meanwhile, among respondents with poor behavior, 17 adolescents (21.8%) were at

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high risk. The Chi-square test resulted in a p-value of 0.002 ($p < 0.05$), indicating a significant relationship between behavior and the risk of diabetes mellitus in adolescents.

The results of this study show that adolescents with a higher level of knowledge about added sugars exhibited healthier consumption behaviors, leading to a lower risk of diabetes mellitus. This finding aligns with previous research suggesting that knowledge is an important factor in promoting healthy dietary habits. Adolescents with a better understanding of the harmful effects of excessive sugar consumption are more likely to make healthier food choices, which in turn reduces their risk of developing diabetes mellitus[13].

However, this study also revealed that attitudes towards controlling added sugar consumption did not show a significant relationship with a reduced risk of diabetes mellitus. This finding is consistent with previous studies suggesting that positive attitudes alone may not be sufficient to influence behavior change. Although adolescents may be aware of the negative effects of sugar, without appropriate behavioral interventions, their attitudes may not translate into actual practices[14].

On the other hand, this study found that high consumption of added sugars was significantly associated with an increased risk of diabetes mellitus. This finding highlights the importance of addressing dietary behaviors in public health interventions. Previous studies have demonstrated that excessive intake of added sugars, particularly from sugar-sweetened beverages, contributes to insulin resistance, obesity, and ultimately diabetes[19,20]. National reports have also emphasized that poor dietary habits, including high sugar consumption, are major contributors to the increasing prevalence of diabetes among adolescents[15].

This study further highlights the importance of education regarding the risks of added sugars in preventing diabetes. The significant relationship between knowledge and healthier behaviors suggests that providing adolescents with adequate information about the effects of added sugars can play a crucial role in reducing diabetes risk. This is in line with global health recommendations advocating for public health interventions aimed at reducing added sugar consumption among adolescents[4].

In conclusion, while knowledge about added sugars is strongly associated with healthier dietary behaviors, attitudes alone do not appear to be sufficient to reduce the risk of diabetes mellitus. These findings emphasize the importance of improving both knowledge and behavior in diabetes prevention. Future interventions should focus not only on enhancing adolescents' knowledge but also on strategies that support the translation of knowledge into sustainable behavioral changes.

4. CONCLUSION AND RECOMMENDATION

Based on the findings of this study, it can be concluded that there is a significant relationship between knowledge and behavior regarding added sugar consumption and the risk of diabetes mellitus in adolescents. However, no significant relationship was found between attitudes and the risk of diabetes mellitus. These findings indicate that improving knowledge and promoting healthy behaviors are essential strategies in reducing the risk of diabetes among adolescents. Further research is recommended to explore intervention strategies that can effectively translate knowledge into sustained behavioral changes.

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