



THE RELATIONSHIP BETWEEN KNOWLEDGE, ATTITUDES, AND PERCEIVED RISKS RELATED TO DIABETES MELLITUS IN ADOLESCENTS

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ABSTRACT

Diabetes Mellitus is a chronic metabolic disease characterized by prolonged elevated blood glucose levels that can lead to organ damage. Many adolescents have a diet high in sugar, fast food, and sugary drinks, as well as a lack of physical activity due to gadget use and a sedentary lifestyle. These habits can lead to obesity and insulin resistance, which are major factors in the development of diabetes. The problem is worsened by limited adolescent knowledge regarding the definition, risk factors, symptoms, and prevention of diabetes mellitus. Attitudes and perceived risks related to diabetes, including the importance of physical activity, treatment, prevention of complications, and risk control, also remain low. Therefore, assessing adolescents' knowledge and attitudes about diabetes mellitus is essential. This study aims to determine the relationship between knowledge and attitudes and perceived risks related to diabetes mellitus among adolescents. The study used a quantitative method with a cross-sectional design. The population consisted of adolescents at SMAN 4 Kota Pangkalpinang, with a sample of 277 respondents selected through simple random sampling. The instruments used were a knowledge questionnaire and an attitudes and perceived risk questionnaire. Data were analyzed using the Spearman Rho test. The results showed a significant relationship between knowledge and attitudes and perceived risks related to diabetes mellitus (p value 0.00, r 0,405). The study recommends providing health education for adolescents to improve their understanding of diabetes mellitus.

Keyword: Diabetes Mellitus, knowledge and attitudes

INTRODUCTION

Diabetes is a chronic metabolic disease characterized by elevated blood glucose (or blood sugar) levels, which over time cause serious damage to the heart, blood vessels, eyes, kidneys, and nerves. Diabetes is one of the leading causes of death worldwide (WHO, 2024). The WHO predicts an increase in the number of people with diabetes in Indonesia from 8.4 million in 2000 to around 21.3 million in 2030. The prevalence of diabetes mellitus continues to show a significant increase globally. Globally, the International Diabetes Federation (IDF) reports that in 2024 there were approximately 589 million adults (aged 20–79 years) living with diabetes, and by 2050, the number of adults living with diabetes is estimated to increase to 852.5 million. This trend shows a sharp increase, mainly due to lifestyle changes, obesity, and an increase in metabolic

Article History:

Received: March 4, 2026; Revised: May 9, 2026; Accepted: May 12, 2026



risk factors. In the adolescent and young adult age group, a 2024 study showed an increase in Type 2 Diabetes cases that are increasingly found at a younger age, indicating a shift in the epidemiology of diabetes, which was previously dominant in adults (Gunawan et al., 2024).

IDF data for 2024 shows that Indonesia has a diabetes prevalence rate of 11.3% among people aged 20–79 years, or around 20.43 million people (International Diabetes Federation, 2025). Meanwhile, the 2023 Indonesian Health Survey (SKI) reported that the prevalence of DM based on doctor's diagnosis among all age groups in Indonesia was 877,531 people, and the prevalence of DM among those aged ≥ 15 years was 638,178 people (BKPK, 2023). Indonesia ranks 5th out of the 10 countries with the highest number of adults (20–79 years) with DM, with 19.5 million in 2021, and is predicted to remain in 5th place out of the 10 countries with the highest number of sufferers, with 28.6 million in 2024 (PERKI, 2024).

Diabetes mellitus is generally associated with adults and the elderly, but the prevalence of type 2 diabetes among adolescents shows an increasing trend due to lifestyle changes, such as unhealthy diets, lack of physical activity, and obesity (WHO, 2022). Recent studies indicate that the incidence of diabetes mellitus, primarily type 2, among children and adolescents in 2021 was approximately 41,600 new cases (Wu et al., 2022). Another study shows that several large countries/regions in the world have varying incidence rates ranging from 285 to 734 per 100,000 population (Pappachan et al., 2024). Based on data from the Bangka Belitung Provincial Health Department in 2023, the number of people with diabetes mellitus in 2022 aged 15 years and above was 26,835, with the Pangkalpinang area ranking second highest with 5,404 people with diabetes mellitus (Dinas Kesehatan Provinsi Kepulauan Bangka Belitung, 2023).

Adolescents may be at high risk of developing diabetes mellitus due to a lack of knowledge about diabetes, its symptoms, risk factors, and prevention. Research findings (Aristia et al., 2024) show that 76% of adolescents at SMK X in Sidoarjo did not know the causes of DM and dietary rules, while 78% did not know the importance of DM treatment for controlling blood sugar. Research by Yunarlin et al. (2024) found that the respondents' knowledge (67%) and attitudes (56%) were in the adequate category. Their eating behaviors related to animal and plant protein intake were dominated by tofu, eggs, and tempeh, while in terms of food types, they still consumed fast food, lacked vegetable and fruit intake, and consumed cakes/sweet foods.

Several research findings indicate that adolescents have good knowledge about diabetes but their behavior does not support a healthy lifestyle. The results of the study by Kinivaldy et al. (2023) found that late adolescents had good knowledge (91.5%) and good attitudes (81.4%), but their behavior did not support healthy living, such as frequently consuming fried foods (60.3%) and eating snacks such as sweet bread (63.6%).

The results of research on the level of knowledge, attitudes, and perceived risks related to diabetes mellitus among adolescents in Pangkalpinang City are not yet known, so further identification is needed. This study is planned to be conducted at SMA Negeri 4 Pangkalpinang because based on a survey of students at SMA Negeri 4 Pangkalpinang, it was found that many students consume fried foods, sweet foods such as donuts, mochi, and spaghetti, and frequently drink soft drinks. Based on the results of a field study of 33 adolescents at SMA Negeri 4 Pangkalpinang, it was found that the majority of

Article History:

Received: March 4, 2026; Revised: May 9, 2026; Accepted: May 12, 2026



respondents were overweight, with 39.4% being overweight and 51.51% being obese. Furthermore, the average random blood sugar level in these adolescents was 124.5 mg/dL. These results indicate a tendency for increased blood sugar levels in adolescents with BMIs in the overweight and obese categories. This condition indicates that excess weight in adolescents can be a risk factor for glucose metabolism disorders and an increased risk of diabetes mellitus at a younger age. Based on the above description, the researcher is interested in conducting research on the relationship between knowledge, attitudes, and risks related to diabetes mellitus among adolescents at SMAN 4 Kota Pangkalpinang.

METHOD

This study used an analytical observational research method with a cross-sectional approach. The purpose of this study was to determine whether there was a relationship between knowledge, attitudes, and perceived risks related to diabetes mellitus among adolescents at SMAN 4 Kota Pangkalpinang. This study was conducted at SMAN 4 Kota Pangkalpinang with a sample size of 277 people, using simple random sampling with the Research Randomizer application. The questionnaires used were knowledge questionnaires and attitude and perceived risk questionnaires related to diabetes mellitus, which were adopted from the study by Orok et al. (2024) entitled "Knowledge, Attitude, and Perceived Risks Related to Diabetes Mellitus Among University Students in Southwestern Nigeria".

The questionnaire on attitudes and perceived risks related to diabetes mellitus used a Likert scale, so the validity test used was the Pearson correlation test. The instrument is considered valid if the calculated r value is greater than the table r value, or if the sig-tailed value is <0.05 , then the instrument is valid. The reliability test results for the questionnaire on attitudes and perceived risks related to diabetes mellitus yielded a Cronbach's alpha of 0.712, indicating that a Cronbach's alpha value >0.7 indicates that the questionnaire is reliable.

The knowledge questionnaire consisted of 22 questions with true or false answer choices. The questionnaire was scored as 1 if the respondent answered correctly and 0 if the respondent answered incorrectly. The scores obtained were added up, then divided by the total and multiplied by 100%. There were three assessment categories: poor knowledge $< 50\%$, moderate knowledge 50–69%, and good knowledge $\geq 70\%$. The questionnaire on attitudes and perceived risks related to diabetes mellitus consisted of 10 questions with answer choices of strongly agree, agree, neutral, disagree, and strongly disagree. The questionnaire was scored as follows: 5 points for strongly agree, 4 points for agree, 3 points for neutral, 2 points for disagree, and 1 point for strongly disagree.

RESULTS AND DISCUSSION

1. Respondent Characteristics

The characteristics of respondents described in this study are age, gender, whether or not they have heard information about diabetes mellitus, whether or not they have family members with diabetes mellitus, family members with diabetes mellitus, and sources of information about diabetes mellitus. This study involved 277 respondents.

The characteristics of respondents based on age in this study show that the majority were in their middle adolescence, numbering 266 people (96%), and the minority were in their late adolescence, numbering 11 people (4%). The results

Article History:

Received: March 4, 2026; Revised: May 9, 2026; Accepted: May 12, 2026



of the study on the characteristics of respondents based on age can be seen in Table 1 below.

Table 1. Respondent Characteristics Based on Age at SMAN 4 Kota Pangkalpinang

No	Age Categories	Frequency	Percentage (%)
1	Early Adolescence	0	0
2	Middle Adolescence	266	96
3	Late Adolescence	11	4
Total		277	100

The characteristics of respondents based on gender in this study show that the majority of respondents were female, numbering 197 (71%), and more than a quarter of respondents were male, numbering 80 (29%). The results of the study on the characteristics of respondents based on gender can be seen in Table 2 .

Table 2. Respondent Characteristics Based on Gender at SMAN 4 Kota Pangkalpinang

No	Gender	Frequency	Percentage (%)
1	Female	197	71
2	Male	80	29

The characteristics of respondents based on whether or not they had heard of diabetes mellitus in this study showed that the majority of respondents had heard of diabetes mellitus (social media, parents, health workers, school, friends, and several sources of information), namely 249 people (90%), while 24 respondents (8.7%) had never heard of diabetes mellitus. The sources of information for respondents' knowledge about diabetes mellitus were as follows 79 respondents obtained information from social media (29%), 16 respondents from their parents (6%), 10 respondents from health workers (4%), 6 respondents from school (2%), 4 respondents from friends (1%), and the majority of respondents obtained several sources of information, totaling 134 respondents (48%). The results of the study on respondent characteristics based on sources of information about diabetes mellitus can be seen in Table 3.

Table 3. Characteristics of Respondents Based on Sources of Information about Diabetes Mellitus at SMAN 4 Kota Pangkalpinang

No	Sources of Information	Frequency	Percentage (%)
1	Social Media	79	29
2	Parents	16	6
3	Health Workers	10	4
4	School	6	2
5	Friends	4	1
6	Several Sources of information	134	48
Total		240	90

The characteristics of respondents based on whether or not they had family members with diabetes mellitus in this study showed that the majority of family not affected by diabetes melitus, totaling 206 people (74%), and a quarter of respondents had family affected by diabetes melitus, totaling 71 people (26%). The majority of respondents' family members with diabetes mellitus were their

Article History:

Received: March 4, 2026; Revised: May 9, 2026; Accepted: May 12, 2026



grandmother/ grandfather, totaling 62 people (87%), and 9 respondents had family members with diabetes mellitus, namely uncles, aunts, and cousins (13%). This can be seen in Table 4.

Table 4. Respondent Characteristics Based on the Presence or Absence of Family Members with Diabetes Mellitus at SMAN 4 Kota Pangkalpinang

No	Presence or Absence of Family Members Affected by Diabetes Mellitus	Frequency (n)	Percentage (%)
1	Family Not Affected by Diabetes Mellitus	206	74
2	Family Affected by Diabetes Mellitus	71	26

2. Knowledge About Diabetes Mellitus Among Adolescents At SMAN 4 Kota Pangkalpinang

Knowledge about diabetes mellitus among adolescents at SMAN 4 Kota Pangkalpinang found that the majority of respondents had good knowledge, totaling 221 people (79.8%), less than a quarter of respondents had moderate knowledge, totaling 47 people (17%), and the rest of the respondents had poor knowledge, totaling 9 people (3.2%). The results of the study on knowledge about diabetes mellitus at SMAN 4 Pangkalpinang City can be seen in Table 5.

Table 5. Knowledge About Diabetes Mellitus Among Adolescents At SMAN 4 Kota Pangkalpinang

Knowledge	Frequency (n)	Percentage (%)
Good Knowledge	221	79,8
Moderate Knowledge	47	17
Poor Knowledge	9	3,2
Total	277	100

Diabetes mellitus (DM) is a chronic disease whose prevalence continues to increase worldwide, including among young people. Over the past decade, various studies have shown that the incidence of diabetes among adolescents and young adults has increased significantly, especially type 2 diabetes, which was previously found mainly in adults. This phenomenon is associated with lifestyle changes, high-calorie diets, lack of physical activity, and an increase in obesity among young people (D'Souza et al., 2023). These conditions emphasize the importance of adolescents' understanding and knowledge of diabetes mellitus as an early prevention measure.

The results of this study show that the majority of respondents have good knowledge (79.8%). These results are in line with the findings of Hutomo et al. (2025), which show that the majority of adolescents have good knowledge about diabetes mellitus (89.5%). The results of research by Sasqia and Mutiah (2025) also show that more than half of adolescents have good knowledge (50.6%) and the rest have sufficient knowledge about diabetes mellitus.

The results of this study differ from those of studies conducted between 2020 and 2025, which show that adolescents' knowledge of diabetes mellitus is still low to moderate. For example, research by Akter et al. (2022) on secondary school students in Bangladesh found that only about 38% of respondents had a good level of knowledge about diabetes, while the rest had limited understanding, especially in terms of prevention and complications of the disease. Similar results were also found by Zemba et al. (2023) in Burkina Faso,

Article History:

Received: March 4, 2026; Revised: May 9, 2026; Accepted: May 12, 2026



which showed that most adolescents did not understand risk factors such as obesity, high-sugar diets, and lack of physical activity.

Good knowledge about diabetes is influenced by several factors. In recent years, advances in information and communication technology, particularly social media, have significantly increased public knowledge about chronic diseases such as diabetes mellitus. Social media has now become a widely used source of health information for the public and enables the rapid, widespread, and interactive dissemination of information about healthy diets, physical activity, blood sugar monitoring, and testimonials from diabetes mellitus patients. This has had a positive impact on increasing the knowledge of the public and diabetes mellitus patients.

The results of this study indicate that the majority of adolescents have good knowledge due to sources of information such as social media, family history, health workers, and others. The sources of information that respondents used to learn about diabetes mellitus were as follows: 79 respondents obtained information from social media (28.5%), 16 respondents from their parents (5.8%), 10 respondents from health workers (3.6%), 6 respondents from school (2.2%), 4 respondents from friends (1.4%), and the majority of respondents obtained information from multiple sources, totaling 134 respondents (48.4%).

Several studies show that the use of social media as a health education tool increases knowledge and positive behavior towards DM management. Research conducted by Alshamran et al. (2025) in the *Cureus* journal shows that people who actively use social media and frequently access educational content about diabetes mellitus have higher levels of knowledge and healthier lifestyles compared to those who do not.

In addition, a comprehensive analysis conducted by Alfian et al. (2021) found that social media education interventions can increase patient knowledge, improve self-management skills, and even lower HbA1c levels, indicating that blood sugar control has improved. Several studies have found a relationship between sociodemographic factors and adolescents' knowledge levels. Adolescents with highly educated parents, a family history of diabetes, and who have attended health education sessions tend to have better knowledge (Elsahoryi et al., 2024). Meanwhile, those who do not have access to health information, especially in rural areas, demonstrate lower levels of knowledge. This indicates that knowledge about diabetes does not only depend on individual factors, but is also influenced by the social and economic environment.

3. Attitudes And Perceived Risks Related to Diabetes Mellitus Among Adolescents at SMAN 4 Kota Pangkalpinang

Attitudes and perceived risks related to diabetes mellitus among adolescents at SMAN 4 Kota Pangkalpinang found that the majority of respondents had positive attitudes, totaling 275 people (99.3%), and negative attitudes, totaling 2 people (7%). The results of the study on attitudes and perceived risks related to diabetes mellitus among adolescents at SMAN 4 Pangkalpinang City can be seen in Table 6.

Article History:

Received: March 4, 2026; Revised: May 9, 2026; Accepted: May 12, 2026



Tabel 6. Attitudes And Perceived Risks Related to Diabetes Mellitus Among Adolescents at SMAN 4 Kota Pangkalpinang

Attitudes And Perceived Risks Related to Diabetes Mellitus	Frequency (n)	Percentage (%)
Positive Attitude	275	99,3
Negative Attitude	2	0,7
Total	277	100

Diabetes mellitus (DM) is a non-communicable disease whose prevalence continues to increase worldwide, including among young people. Adolescence is an important phase in a person's development, during which their health behaviors begin to take shape and will have an impact on their health in adulthood. Therefore, understanding attitudes and risks of DM among adolescents is very important for the prevention of this disease.

The results of the study found that the attitudes and perceived risks related to diabetes mellitus among adolescents at SMAN 4 Kota Pangkalpinang showed that the majority of respondents had positive attitudes (99.3%). Attitude is a person's response or tendency to assess an object, either positively or negatively, which then influences their behavior. In the context of health, attitudes reflect how individuals view the importance of disease prevention and the extent to which they are motivated to maintain a healthy lifestyle. Perceived risk is the degree to which individuals believe they are likely to become ill. This perception is very important because it can determine an individual's motivation to take preventive measures.

Research shows that most adolescents have a positive attitude toward diabetes prevention, even though their knowledge about this disease is not yet optimal. Research by Nugraheni and Isfandiari (2022) on public health students in Indonesia found that a positive attitude is closely related to diabetes prevention measures. Students who have a positive attitude toward diabetes prevention are more likely to engage in healthy behaviors such as maintaining a healthy diet, exercising, and avoiding excessive sugar consumption.

Research shows that many adolescents have a general awareness of the risks of diabetes, but do not always personally feel that they are actually at high risk. A study by Chu et al. (2023) found that only about 30% of overweight adolescents in the United States are aware that they are at high risk for diabetes mellitus. Most adolescents do not realize that their lifestyle, especially unhealthy eating habits and lack of physical activity, can increase this risk.

Research conducted by Laurina et al. (2025) in Indonesia shows that perceived susceptibility and perceived severity have a significant influence on DM prevention behavior in adolescents. The study found that the higher a person's perceived risk, the more likely they are to take preventive measures such as reducing fast food consumption and increasing physical activity.

However, positive attitudes are not always reflected in concrete actions. Chu et al. (2023) revealed that some adolescents with positive attitudes toward diabetes prevention still exhibit unhealthy behaviors, such as lack of physical activity or a tendency to consume sugary drinks. This reveals that, in addition to attitude, other factors such as motivation, environmental support, and self-efficacy contribute significantly to the promotion of concrete preventive behaviors.

Article History:

Received: March 4, 2026; Revised: May 9, 2026; Accepted: May 12, 2026



The Relationship Between Knowledge, Attitudes, and Risks Related to Diabetes Mellitus in Adolescents at SMAN 4 Kota Pangkalpinang

The results of this study indicate that there is a relationship between knowledge and attitudes and risks related to diabetes mellitus among adolescents at SMAN 4 Kota Pangkalpinang with a significance value of 0.00, which means that the significance value is < 0.05 . The strength of the relationship between knowledge and attitudes and perceived risks is 0.405, where a value of 0.40 to 0.59 indicates a moderate correlation. The correlation direction criterion in this study is positive, which means that the relationship between the two variables is unidirectional, where the higher the knowledge, the more positive the attitude. The results of the correlation test between knowledge and attitudes and risks related to diabetes mellitus among adolescents at SMAN 4 Pangkalpinang City can be seen in Table 7.

Tabel 7. The Relationship Between Knowledge, Attitudes, and Risks Related to Diabetes Mellitus in Adolescents at SMAN 4 Kota Pangkalpinang

Correlation	p-value	Strength of Correlation (<i>r</i>)	Arah Korelasi
The Relationship Between Knowledge, Attitudes, and Risks Related to Diabetes Mellitus	0,00	0,405	Positive

The results of this study indicate that there is a relationship between knowledge and attitudes and risks related to diabetes mellitus among adolescents at SMAN 4 Kota Pangkalpinang with a significance value of 0.00, which means that the significance value is < 0.05 . The strength of the relationship between knowledge and attitudes and perceived risks is 0.405, where a value of 0.40 to 0.59 indicates a moderate correlation.

Knowledge is the basis for forming an individual's attitude towards a health issue. Adolescents who have a good understanding of the definition of DM, risk factors, and prevention methods tend to have a more positive attitude towards efforts to prevent this disease. The study by Lisna et al. (2023) shows that increasing adolescents' knowledge through interactive education methods can improve positive attitudes towards type 2 DM prevention. The results of this study show that students who receive education through participatory methods are more motivated to adopt a healthy lifestyle compared to students who only receive regular lectures. Similar findings were reported by Nugraheni and Isfandiari (2022), who studied health students at Airlangga University. This study showed a significant relationship between knowledge and attitudes toward type 2 diabetes prevention ($p < 0.05$). Students with higher knowledge tended to have positive attitudes toward healthy lifestyles, such as reducing consumption of sugary foods and increasing physical activity.

Knowledge and attitudes play an interrelated role in determining the risk level of adolescents for DM. Adolescents with low knowledge and negative attitudes tend to have unhealthy lifestyles that increase the risk of DM, such as prolonged sitting, consumption of sweetened beverages, and infrequent exercise. The study by Julliyana et al. (2024) shows a relationship between a sedentary lifestyle and the risk of DM in adolescents. The results of this study confirm that passive behavior is one of the main factors increasing the risk of DM in young people.

Article History:

Received: March 4, 2026; Revised: May 9, 2026; Accepted: May 12, 2026



Adolescence is a crucial period for the formation of healthy lifestyle behaviors. Adequate knowledge about DM is expected to foster positive attitudes and preventive behaviors against the risk of this disease. However, various studies show that good knowledge is not always followed by appropriate changes in attitudes and behaviors Mustaffar et al. (2025). Therefore, it is important to examine the relationship between knowledge, attitudes, and the risk of DM in adolescents in order to design effective prevention strategies.

CONCLUSION

The results of the study show that knowledge about diabetes mellitus among adolescents at SMAN 4 Kota Pangkalpinang found that the majority of respondents had good knowledge. In addition, attitudes and perceived risks related to diabetes mellitus among adolescents at SMAN 4 Kota Pangkalpinang found that the majority of respondents had positive attitudes. The final results of this study indicate that there is a relationship between knowledge and attitudes and perceived risks related to diabetes mellitus among adolescents at SMAN 4 Kota Pangkalpinang, whereby the higher the knowledge about diabetes mellitus, the more positive the attitudes and perceived risks related to diabetes mellitus become.

ACKNOWLEDGMENTS

The author would like to thank the Poltekkes Kemenkes Pangkal Pinang and SMAN 4 Kota Pangkalpinang for their support in conducting this research.

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Article History:

Received: March 4, 2026; Revised: May 9, 2026; Accepted: May 12, 2026