

Original Research

Received 14 March 2026

Revised 18 April 2026

Accepted 22 May 2026

Natural Resources for Human Health 2026, Vol. 6 (1s): 111–117

KEYWORDS:

Adolescents, Diabetes Mellitus, Knowledge, Risk Factors Perception of Behavioral Control.

Correlation Between Knowledge and Perceived Behavioral Control and Diabetes Risk Factors in Adolescents

Rahmadaniar Aditya Putri^{1*}, Siti Nurjanah¹, Firdaus¹, Wesiana Heris Santy, Siti Nur Hasina¹

¹Department of Nursing, Faculty of Nursing and Midwifery, Universitas Nahdlatul Ulama Surabaya, Indonesia.

ABSTRACT: Diabetes mellitus (DM) is a chronic disease whose risk of occurrence in adolescents is increasing due to changes in lifestyle and behavioral patterns. Knowledge, perception of self-control, and behavioral control are important factors that influence DM risk factors in adolescents. This study aims to analyze the influence of knowledge and perception of behavioral control on diabetes mellitus risk factors in the adolescent age group. The method used is a quantitative study with a cross-sectional design, involving 100 adolescent respondents who were measured using a structured questionnaire. The independent variables were knowledge and perception of behavioral control, and the dependent variable was DM risk factors. The analysis test used linear regression with $\alpha < 0.05$. The results of the analysis showed that the coefficient of the knowledge variable had a significance value of 0.001, while the perception of control was 0.000, knowledge and perception of behavioral control had a very significant effect on DM risk factor variables. Adolescents with good knowledge and high perception of self-control tend to implement more effective behavioral control, thereby reducing the risk of diabetes mellitus. The importance of integrated educational interventions and behavioral coaching to prevent the development of diabetes risk factors in adolescents. Therefore, increasing access to information and strengthening perception of behavioral control should be a focus in DM prevention programs in this age group.

1. INTRODUCTION

Type 2 diabetes (T2DM), once known as adult-onset diabetes, is now a significant health problem worldwide, particularly among adolescents. Many factors, including lifestyle changes and lack of knowledge about the disease, contribute to the increased risk of obesity and diabetes in adolescents. It is crucial to learn about various diseases, such as diabetes mellitus, early on because it can influence a person's health behaviors, which will impact their future health.

The increasing number of diabetes cases in children contributes to the national diabetes rate. Of the ten most populous countries, Indonesia ranks 7th with 10.7 million people. According to the International Diabetes Federation (IDF), the world's highest number of people suffer from diabetes. Among the world's seven regions, Southeast Asia ranks third with a prevalence of 11.3%; Indonesia is the only Southeast Asian country on this list. Thus, Indonesia's contribution to the prevalence of diabetes in Southeast Asia is significant. A study conducted by (Mansyah & Rahmawati, 2021) explains the increasing incidence of diabetes mellitus in adolescents. According to the Indonesian Pediatrician Association (IDAI), there are 1,645 adolescents in Indonesia with diabetes mellitus, with approximately 60% of them female. In addition, data from the 2018 Riskesdas survey shows that the prevalence of diabetes mellitus diagnosed by doctors in Indonesians over the age of fifteen has increased by 2% compared to only 0.5% in 2013. This phenomenon indicates the need for screening. Type 2 diabetes mellitus in adolescents who show clinical signs of insulin resistance or have type 2 diabetes mellitus in the family.

According to the classification of the Department of Health (Depkes), adolescents are individuals aged 10 to 19 years. In many ways, adolescents are characterized by a high degree of instability. Additionally, we often hear that adolescence is the ideal time to try new things. It is intriguing to conduct further research on how adolescents are at risk of developing diabetes mellitus (DM) and how significant their role is in preventing DM in adults and the elderly. Diabetes mellitus, also known as diabetes, is a disease that causes high blood sugar levels, or hyperglycemia. Type 1 diabetes mellitus and type 2 diabetes are the two most common types of diabetes in children and adolescents. Type 1 diabetes has low insulin levels due to damage to the beta cells of the pancreas, while type 2 diabetes has normal insulin levels due to insulin resistance. The main causes of type 1 diabetes are genetic and autoimmune factors. Type 2 diabetes is caused by an unhealthy lifestyle and inappropriate medications. Adolescents with type 2 diabetes are often influenced by consumerist factors, such as a tendency to consume various types of food without following a healthy lifestyle (Force et al., 2022). One example of an unhealthy lifestyle is consuming fast food, which is high in calories, fat, and cholesterol. Managing your meal schedule and portion sizes can also affect blood sugar levels. The World Health Organization (WHO) states that diabetes can cause damage to various body systems over the long term. However, the American Diabetes Association notes that mild symptoms such as thirst, hunger, frequent urination, tingling, and rapid fatigue are often not detected. Diabetes is a chronic condition that can significantly alter a person's life. Reactive hyperglycemia, associated with changes in the hormonal system, may occur during adolescence (Sanjaya & Setiawan, 2024). When hormone levels return to normal, hyperglycemia may return to normal and not continue. Efforts to prevent an increase in blood sugar levels require sufficient knowledge, because knowledge determines a person's attitude and actions, including preventive measures for diabetes mellitus.

A person's level of knowledge greatly influences how they think and act in the future. A good understanding and perspective on diabetes may encourage people to take preventive measures early on. The risk of developing type 2 diabetes doubles in people who do not exercise or are inactive (Liu et al., 2025). Adolescents are highly vulnerable to health problems that will affect their development. They also tend to be immature in self-control, such as behavioral issues. It is possible to prevent type 2 diabetes mellitus, a metabolic disease, by making lifestyle changes, implementing dietary controls, and managing overweight and obesity. Education focused on lifestyle changes is crucial. However, educational efforts must also involve the entire family to educate them about the importance of lifestyle changes to prevent diabetes mellitus in adolescents. Knowledge as the basis for awareness and risk prevention: Good knowledge of the risk factors for diabetes mellitus (DM) in adolescents can increase awareness of the importance of avoiding risky lifestyles, such as unhealthy diets, lack of physical activity, and smoking. Adolescents who have good knowledge are more likely to take preventive measures that can reduce the risk of DM (Orok et al., 2024). Health education and knowledge about DM can significantly change preventive behavior among adolescents. With the right knowledge, adolescents are motivated to control risk factors through healthy eating, regular physical activity, and stress management (Hamada et al., 2023).

There are many negative things associated with teenagers, but if we think more positively, teenagers will become leaders in public health.. This study focused on adolescents with risk factors for diabetes mellitus by identifying their level of knowledge and perceived behavioral control. Therefore, the aim of this study was to determine the correlation between knowledge and perceived behavioral control and diabetes risk factors in adolescents.

2. MATERIALS AND METHODS

2.1 Materials

This research is a quantitative research design with a descriptive correlation method. The population of this study was adolescents aged 11-20 years. The sampling technique used was proportionate stratified random sampling with a sample size of 100 respondents, with the criteria of adolescents who do not experience mental or psychological disorders; Adolescents who can communicate well, both verbally and in writing. The independent variables in this study are knowledge about DM and perception of behavioral control, and the dependent variable is DM risk factors.

2.2 Data Collection Procedures

The instrument used was a questionnaire with a Likert scale consisting of sociodemographics (age, gender, and family history of diabetes), knowledge using the Diabetes Knowledge Questionnaire (DKQ), perceived behavioral control, and diabetes risk factors using the Finnish Diabetes Risk Score (FINDRISC). All variables used have been declared valid and reliable by previous research developed by Spencer from the University of Michigan and the University of California. The data collection procedure

for this study can be conducted after it has been approved and deemed ethically sound by the Chakra Brahmanda Lentera Institution with no. 027/07/VI/EC/KEP/LCBL/2025.

2.3 Data Analysis

Data analysis techniques used include univariate and bivariate analysis. Univariate analysis of respondents' sociodemographic variables, which were on an ordinal scale, used frequency distribution tables. Univariate analysis of knowledge, perceived behavioral control, and diabetes risk factors, which were on an interval scale, used median and standard deviation tables.

Bivariate analysis was performed using linear regression to determine the level of significance of the relationship between knowledge and diabetes risk factors (linear regression 1) and between perceived behavioral control and diabetes risk factors (linear regression 2). Data analysis was performed using the SPSS application version 25.0.

3. RESULTS AND DISCUSSION

3.1 Results

Table 1: Distribution of Adolescent Characteristics

No.	Demography (n=100)	f	%
1	Sex		
	Male	62	62
	Female	38	38
2	Ages		
	Early adolescent (11-14 years old)	30	30
	Middle adolescent (15-17 years old)	23	23
	Late adolescent (18-20 years old)	47	47
3	Family history of DM		
	There is a history	61	61
	No history	39	39

Table 1 above shows that the majority of respondents were in their late teens (18-20 years old) (47%), males were 62% more than females, and 61% had a family history of diabetes.

After testing for normality, all variables were normally distributed, and the mean and standard deviation (SD) values are shown below:

Table 2: Univariate Analysis Results

No.	Variable	Mean	SD	Minimum	Maksimum
1	Knowledge of DM	31,52	± 3,788	23	40
2	Perception of behavioral control	22,44	± 3,450	13	30
3	Risk factors	61,30	± 6,163	50	75

Table 3: Model Analysis

Model	R	R-Square	Adjusted R-Square	Std. Error of the Estimate
1	.995 ^a	.990	.989	.35677

a. Predictors: (Constant), Knowledge of DM, Perception of behavioral control

Table 4: Coefficient Analysis

Model	Unstandardized Coefficient		Standardized Coefficient		t	Sig
	B	Std Error	Beta			
(Constant)	-2.054	.520			-3.950	.000
Knowledge of DM	.237	.072	.258		3.295	.001
Perception_of behavioral control	.483	.083	.465		5.797	.000

a. Dependent Variable: Risk factors

Based on the linear regression statistical test, the coefficient of the knowledge variable on DM risk factors has a significance value of 0.001, a value <0.05 . This result concludes that the knowledge variable has a very significant influence on DM risk factors. The coefficient of the perceived behavioral control variable on DM risk factors has a significance value of 0.000, a value <0.05 . This result concludes that the perceived behavioral control variable has a very significant influence on DM risk factors.

Meanwhile, the r^2 value (R^2 in the summary table) is 0.990, indicating that the combined contribution of the knowledge and perceived behavioral control variables is 99.0%, while the remaining 1.0%, or 0.001, is contributed by other variables not included in this study. Therefore, the ϵ value is $\sqrt{0.001} = 0.1$. Based on the table above, the resulting multiple linear regression equation is: $Y = 0,072X_1 + 0,083X_2 + 0,1$

Y = Risk factors; X_1 = Knowledge of DM; X_2 = Perception of behavioral control

3.2 Discussion

Knowledge has a direct influence on DM risk factors of 0.258. This figure is positive, indicating that adolescents have good knowledge of preventing their risk factors. This good knowledge can be seen in the percentage of those who answered correctly in each knowledge indicator in the questionnaire, including: 52% understanding, 10% causes, 15% management, and 23% appropriate exercise. Knowledge about diabetes greatly influences the lifestyle of respondents. This is supported by Notoatmodjo (2007), who states that knowledge or cognition plays an important role in determining a person's behavior or actions. Behavior based on knowledge and positive attitudes tends to be long-lasting. A person's understanding influences their behavior because it allows them to recognize their personal needs and take responsibility for their lives (Kang et al., 2024). Cognitive knowledge, where a person gains understanding before finally acting, is often the source of new behavior. For example, understanding diabetes mellitus influences preventive behavior and shows that lack of knowledge is often caused by a lack of information or attitudes that influence how people respond to information. Everyone sees information differently. An individual's choice to accept or reject information will influence how they view that information. For example, a person may respond differently to something if they are interested in or agree with it.

Adolescents' knowledge about diabetes mellitus (DM) is very important for preventing and detecting risk factors for this disease early. Knowledge about DM includes understanding the symptoms, risk factors, healthy eating patterns, the importance of physical activity, and the consequences of uncontrolled disease. Adolescence is an important period in life because of the physical, mental, and social changes that can affect health risks, including diabetes mellitus. Other studies show that adolescents perceive better behavior control from various sources, such as the media and health education. This encourages them to adopt a healthy lifestyle to prevent DM (Hamada et al., 2023). However, education is still needed to correct certain misconceptions so that prevention can be carried out effectively. With prior knowledge, individuals can acquire new information. This new knowledge helps adolescents understand various aspects of health related to diabetes mellitus, indicating that most people understand how to prevent the disease. This shows that everyone has different levels of knowledge (Lemos et al., 2024). The number of diabetes mellitus cases in the surrounding community continues to rise because people are unaware of the risks, prevention, and management of the disease. As a result, it is important to conduct early screenings, especially among adolescents, to prevent the disease at an early stage. Adolescents may be more aware of the importance of diabetes prevention and early screening. Teenagers should be encouraged to adopt a healthy lifestyle to reduce negative perceptions about diabetes

and prediabetes. Through education and early detection, teenagers can reduce future healthcare costs and prevent more serious complications (Sartika et al., 2024).

Half of the respondents (47%) were aged 18-20 years. Late adolescence, those aged between 18 and 20 years, is a transitional age group towards young adulthood who are forming their self-identity, behavioral patterns, and long-term health habits. As they begin to gain wider access to information sources, such as schools, the internet, social media, and higher education, their level of knowledge about diabetes tends to vary, but is generally better than that of younger adolescents. However, due to the influence of the social environment, this understanding does not always correlate with the implementation of health behaviors. According to several studies, male and female adolescents differ in their knowledge and perceptions of health. One factor closely related to the risk of diabetes mellitus in adolescents is age. In general, compared to younger adolescents, those aged 15 to 19 have a higher risk of type 2 diabetes. This may be due to increased obesity, changes in diet, and a less active lifestyle as they get older (Ruze et al., 2023). The main risk factors for the development of type 2 diabetes are obesity and insulin resistance, which are more prevalent in older adolescents, especially those who have entered late adolescence. Hormonal changes that occur in adolescents also alter the body's sensitivity to insulin, increasing the risk of diabetes in this age group.

The majority of respondents (62%) were male. Male adolescents are often less concerned about their health and tend to underestimate the risk of chronic diseases such as diabetes compared to female adolescents. This can lead to less effective preventive behaviors, such as a sedentary lifestyle, smoking habits, and consumption of foods high in sugar and fat. Teenage boys are more likely to be obese, a major risk factor for type 2 diabetes (Malini et al., 2024). This condition of obesity is closely related to insulin resistance, which in turn increases the risk of diabetes mellitus. Obese men are more likely to develop insulin resistance, which can lead to type 2 diabetes, but women are more likely to experience metabolic changes that put them at risk for diabetes during puberty (Pahuja & Sanghvi, 2024). Knowledge about diabetes mellitus (DM) is lower in males if it is not supported by family history, formal education, or personal experience. Adolescents with a history of diabetes (for example, a parent or sibling with diabetes) are generally more aware of the risks of the disease. Most (61%) of respondents had a family history of diabetes. Studies show that family experience with diabetes encourages them to seek information, identify symptoms, and take preventative measures through healthy eating and exercise. However, without ongoing education and environmental support, health behaviors may not necessarily change even if knowledge increases. Researchers assume that good knowledge about diabetes mellitus can help reduce the risk of developing the disease in adolescents by encouraging preventative behaviors such as a healthy diet, adequate physical activity, and detecting symptoms of diabetes mellitus at an early stage. Understanding hereditary factors, which may be multigenic in nature, can serve as an initial screening tool for identifying high-risk individuals. Research shows that increased knowledge is followed by positive attitude changes and effective preventive behaviors toward DM risk factors, which contribute to a decrease in disease incidence (Kiran et al., 2024). Adequate knowledge builds the perception that risk can be controlled through healthy behavior. This strengthens adolescents' motivation to manage their lifestyle to avoid DM.

Perceived behavioral control has a direct influence on diabetes risk factors of 0.465. This positive value indicates that adolescents with high behavioral control can prevent their diabetes risk factors. The higher the perceived behavioral control regarding preventing diabetes risk factors, the more adolescents are aware of the importance of the knowledge they must possess. Perceived behavioral control is how easy or difficult it is to perform an action. Perceived behavioral control represents the strength of factors that make it easier or more difficult. This term refers to components that can help or hinder someone from performing a particular behavior. The situation and type of behavior to be performed can influence perceived behavioral control. Meanwhile, locus of control is related to an individual's belief that their success in doing anything depends on their efforts. Perceived behavioral control is more appropriate when this belief is related to a specific goal. High perceptions of self-control in adolescents are assumed to act as a protective factor. Adolescents who feel able to control their behavior and life choices are more likely to adopt a healthy lifestyle, such as regulating sugar intake, exercising regularly, and maintaining a healthy body weight, thereby reducing the risk of diabetes mellitus. Adolescents' perception of behavioral control has a direct influence on diabetes mellitus risk factors, including their ability to regulate their diet, physical activity, and other healthy lifestyle choices. Studies show that positive perceptions and good self-control encourage adolescents to adopt preventive behaviors against diabetes mellitus risk factors, such as physical inactivity and obesity (Tulchinsky et al., 2023). Adolescents often overlook the importance of behavioral control, increasing the likelihood of risk factors that can trigger DM. Perceived behavioral control is essential for controlling modifiable risk factors, such as unhealthy eating habits and lack of physical activity. With good perceived control, adolescents feel more capable of making health-promoting decisions, thereby reducing the risk of DM in this group.

(Silaban et al., 2023). Without a strong sense of control, increased knowledge is not enough to change behavior.

Risk factors for diabetes mellitus (DM) in adolescents can be divided into modifiable and non-modifiable factors. Age, gender, and a family history of diabetes mellitus are among the non-modifiable risk factors. Due to comparable genetic and environmental factors, a family history of diabetes is a strong predictor of DM risk in adolescents. Age is also a factor, as lifestyle changes that influence DM risk are more likely to occur as an individual becomes a young adult. Obesity (body mass index greater than 25 kg/m²), an unhealthy diet (high in sugar and saturated fat, low in fruits and vegetables), lack of physical activity, and smoking are among the modifiable factors. Insulin resistance, a key component of type 2 DM, is strongly associated with obesity. One common problem faced by adolescents is an unhealthy diet and a lack of physical activity. Contemporary lifestyle changes, such as increased consumption of fast food and use of social media, are associated with this problem. Social pressure, lifestyles driven by technological advances, and a lack of health education are other factors that increase the risk of DM in adolescents. Furthermore, stress and lack of family dietary supervision can increase the risk of diabetes. Researchers believe that by enabling adolescents to take control of their health, diabetes mellitus prevention in adolescents can be achieved through a multidimensional approach that includes health education based on demographic characteristics, family support, and environmental changes that support a healthy lifestyle. From adolescence, before the onset of more serious metabolic complications, early interventions such as increased physical activity, improved diet, and stress reduction are effective in reducing diabetes risk factors in adolescents and improving long-term quality of life.

4. CONCLUSION

This study shows that adolescents' knowledge, perceived self-control, and behavioral control significantly influence diabetes mellitus (DM) risk factors in the adolescent age group. Adolescents with good knowledge about DM tend to be more aware of risk factors and the importance of a healthy lifestyle, thereby reducing the likelihood of developing diabetes. Furthermore, high perceived self-control also acts as a protective factor, encouraging adolescents to control risky behaviors, such as unhealthy eating habits, lack of physical activity, and smoking. Effective behavioral control, which reflects the ability to regulate and change daily habits, also contributes to the reduction of DM risk factors in adolescents.

5. ACKNOWLEDGMENT

We would like to thank all youth who are willing to become research respondents and who have collaborated with researchers during data collection and the research process. Thanks are conveyed to Nahdlatul Ulama University Surabaya in terms of research funding and motivation for research

References

- [1] Force, U. P. S. T., Mangione, C. M., Barry, M. J., Nicholson, W. K., Cabana, M., Chelmow, D., Coker, T. R., Davidson, K. W., Davis, E. M., & Donahue, K. E. (2022). Screening for depression and suicide risk in children and adolescents: US preventive services task force recommendation statement. *Jama*, 328(15), 1534–1542.
- [2] Hamada, Y., Quartagno, M., Law, I., Malik, F., Bonsu, F. A., Adetifa, I. M., Adusi-Poku, Y., D'Alessandro, U., Bashorun, A. O., & Begum, V. (2023). Association of diabetes, smoking, and alcohol use with subclinical-to-symptomatic spectrum of tuberculosis in 16 countries: an individual participant data meta-analysis of national tuberculosis prevalence surveys. *EClinicalMedicine*, 63.
- [3] Kang, J., Me, R. C., & Kamarudin, K. M. (2024). A healthy lifestyle persuasive design model based on behavioral analysis. *Learning and Motivation*, 87, 102021.
- [4] Kiran, A., Shah, N. A., Khan, S. M., Ahmed, H., Kamran, M., Yousafzai, B. K., Ahmad, Z., Yoo, S., Han, H., & Alasqah, I. (2024). Assessment of knowledge, attitude, and practices regarding the relationship of obesity with diabetes among the general community of Pakistan. *Heliyon*, 10(8).
- [5] Lemos, C. A., Oliveira, T. Z., Cunha, J. P. A., Costa, D. V. M., Zanetti, M. O. B., Dantas, R. A. S., Varallo, F. R., & Pereira, L. R. L. (2024). Instruments to assess diabetes knowledge, skills and attitudes of people living with diabetes mellitus: A COSMIN-based systematic review. *Diabetes & Metabolic Syndrome: Clinical Research & Reviews*, 18(3), 102974.
- [6] Liu, W., Ren, B., Zhu, X., Lin, S., Lei, S., & Feng, B. (2025). Self-management knowledge, attitudes, and behaviors among patients with type 2 diabetes mellitus in a community of western China: A cross-sectional study. *Geriatric Nursing*, 61, 34–

40.

- [7] Malini, H., Hazira, K., Kardila, I. Y., & Lenggogeni, D. P. (2024). The relationship of knowledge about Diabetes Mellitus risk factors with the healthy lifestyle among nursing students. *Jurnal Kesehatan*, 15(2).
- [8] Orok, E., Kabiawu, Y., Aderohunmu, Z., & Obiwulu, D. (2024). Knowledge, attitude, and perceived risks related to diabetes mellitus among university students in Southwestern Nigeria. *Heliyon*, 10(4).
- [9] Pahuja, V., & Sanghvi, S. (2024). Childhood obesity in South Asian population. *Obesity pillars*, 12, 100148.
- [10] Ruze, R., Chen, Y., Xu, R., Song, J., Yin, X., Wang, C., & Xu, Q. (2023). Obesity, diabetes mellitus, and pancreatic carcinogenesis: Correlations, prevention, and diagnostic implications. *Biochimica et Biophysica Acta (BBA)-Reviews on Cancer*, 1878(1), 188844.
- [11] Sanjaya, L. R., & Setiawan, Y. (2024). Faktor risiko diabetes melitus tipe-II pada remaja. *Citra Delima Scientific Journal Of Citra Internasional Institute*, 8(1), 66–73.
- [12] Sartika, M., Armi, A., & Susanti, D. P. (2024). Determinan Penyebab Diabetes Melitus (DM) Pada Remaja Di SMAN 3 Tambun Selatan Kabupaten Bekasi. *Jurnal Medika Malahayati*, 8(1), 24–28.
- [13] Silaban, E. M. L., Widdefrita, W., Nadira, N. A., & Novelasari, N. (2023). Differences in Adolescent Knowledge and Attitude About Prevention Risk Factors for Type 2 DM Using the Emo-Demo at Adabiah 2 High School, Padang in 2023. *Jurnal Promosi Kesehatan Mandiri*, 1(1), 15–27.
- [14] Tulchinsky, T., Varavikova, E., & Cohen, M. (2023). Chapter 6—Family health and primary prevention. *The New Public Health*, 467–549.