Jurnal SMART Keperawatan, 2026, 13 (1), 17-21
http://www.stikesyahoedsmg.ac.id/ojs/index.php/sjkp
Received 30 September; Revised 23 October; Accepted 30 October 2025

SKJP 2026
pISSN 2301-6221; eISSN 2502-5236

SURVEY AND ANALYSIS OF DIABETES RISK FACTORS IN ADOLESCENTS: A CROSS-SECTIONAL STUDY

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ABSTRACT

Introduction: Diabetes Mellitus, also known as diabetes mellitus, is a disease in which blood sugar levels in the body are quite high, so the body cannot produce or use insulin, so blood sugar cannot be metabolized and this disease can affect anyone. Emergency cases of Diabetes Mellitus have the potential to attack teenagers who currently have consumptive habits so that they tend to consume various types of food without following a healthy lifestyle. **Objective:** The purpose of this study is to conduct a survey and analyze the risk factors for diabetes in teenagers. **Methods**: This type of quantitative research uses a cross-sectional design. This study will be conducted at MA Ibnul Qoyyim. The population in this study is all students at MA Ibnul Qoyyim. The sampling technique uses total sampling. The instruments in this study are a glucotest tool and a diabetes risk factor questionnaire. Data analysis in this study uses the Kendal tau test. **Results**: The results of the study showed that all respondents (100%) had a high-sugar food consumption pattern, with low physical activity (81.81%). The majority of respondents' nutritional status is in the normal category (72.72%) and have no family history of diabetes (90.01%). **Conclusion:** The analysis concluded that there was a significant association between consumption patterns, physical activity, nutritional status, and family history, with adolescent blood sugar levels. This suggests that lifestyle factors are dominant and can be modified to prevent diabetes from a young age.

Keywords: Consumption patterns; Family history; Juvenile diabetes; Nutritional status; Physical activity

INTRODUCTION

Diabetes Mellitus or also known as diabetes/sugar disease is a disease where the blood sugar level in the body is quite high so that the body cannot produce or use insulin, so that blood sugar cannot be metabolized and this disease can attack anyone (Handari et al., 2023). The development of an increasingly modern era makes humans adapt quickly to circumstances, where a modern lifestyle has become a secondary need in society (Maidartati et al., 2022). This can be seen in today's eating habits, which prioritize convenience over health. Unhealthy lifestyle choices, such as fast food and high-fat, sugary, and salty foods, have led to an increase in non-communicable diseases, including diabetes mellitus (Widodo et al., 2012).

Diabetes mellitus is a non-communicable disease characterized by high blood sugar levels. It also falls into a group of metabolic diseases characterized by hyperglycemia, caused by abnormal insulin secretion, suboptimal insulin production, or both (P2PTM, 2019). Today's lifestyles have undergone significant transformations, affecting both adolescents and adults (Khan et al., 2024).

Fast food and ready-to-eat meals are popular, but consuming too much sugar can lead to illnesses, including diabetes mellitus (Maidartati et al., 2022). The prevalence of type 1 diabetes mellitus in children under 18 in Indonesia has increased 70-fold from 2010 to 2023 according to the Indonesian Pediatrician Association (IDAI). Currently, there are a total of 1,645 patients with diabetes in 13 cities, including Padang, Yogyakarta, Solo, Bandung, Jakarta, Medan, Palembang, Semarang, Malang, Makassar, Denpasar, Manado, and Surabaya. Of this number, approximately 46.23% of diabetes sufferers are in the 10-14 year

age range, while another 31.05% are in the 5-9 year age range, 19% are aged 0-4 years, and the remaining approximately 3% are over 14 years old.

The majority of diabetes sufferers in children are girls (59.3%), while the rest are boys (Zulissetiana et al., 2020). In 2022, Indonesia ranked first as the country with the highest number of type-1 diabetes sufferers in the Southeast Asia region, reaching 41.8 thousand people (Organisasi International Diabetes Federation (IDF), 2022). This makes Indonesia the nation and country with the highest number of diabetes sufferers in ASEAN, and also makes Indonesia rank 34th out of a total of 204 countries on a global scale (IDF, 2022).

Diabetes Mellitus emergencies have the potential to affect adolescents because they are a group that frequently consumes various types of food without balancing it with a healthy lifestyle and behavior. As many as 87% of the total indicates that adolescents consume fast food and junk food quite frequently (Silalahio et al., 2016). The knowledge each individual possesses plays a crucial role in shaping their future attitudes and actions. For example, insight and perceptions regarding diabetes mellitus will influence behavior and actions in the community, with the hope of initiating early prevention. Lack of exercise or lack of physical activity is twice as likely to increase the risk of developing type 2 diabetes as those who participate in regular exercise (Denicolò et al., 2021).

There have been several literature studies that have established a description of risk factors related to diabetes mellitus in adolescents, which state that the risk factors found include advances in social media-based technology, smoking trends, family history, gender, diet, physical activity, obesity, and knowledge (Imelda, 2018). A preliminary study conducted at MA Ibnul Qoyyim revealed that 3 out of 10 children interviewed lacked knowledge about the risk factors that trigger diabetes mellitus. Eight children reported frequently consuming sweet foods and paying little attention to their impact on their health. This information serves as the basis for determining policies for the prevention and control of diabetes mellitus. Based on this background, this study aims to conduct a survey and analysis of diabetes risk factors in adolescents at MA Ibnul Qoyyim.

METHOD

This quantitative study uses a cross-sectional design. The study will be conducted at MA Ibnul Qoyyim. The population is all 55 12th-grade students of MA Ibnul Qoyyim. The sampling technique used is total sampling. The instruments used are a glucose test and a diabetes risk factor questionnaire prepared by the researcher. The risk factor questionnaire includes Consumption Patterns, Physical Activity, Nutritional Status (BMI), and Family History of Diabetes. Validity (>0.361) and reliability (0.88) were tested. The Kendal tau test was used for analysis. This study has passed the ethics approval from the STIKES Surya Gloal Yogyakarta ethics committee with number 4.29/KEPK/SSG/VII/2025.

RESULTS

Table 1. Characteristics of Respondents of Islamic Senior High School Students (n = 55)

Characteristics	Category	n	%
Gender	Female	55	100,0
Age (years old)	15–16	20	36,4
	17–18	35	63,6
Breakfast Habits	Regular	28	50,9
	Irreguler	27	49,1

The results of Table 1 show that all respondents were female, aged 15 to 18 years. The majority of respondents had irregular breakfast habits, namely 27 (49.1%).

Table 2 Respondent Risk Factor Analysis Data

Characteristic	Category	n	%
Consumption Patterns	High consumption of sweet foods (≥ 4x/week)	55	100
	Fast food consumption (≥ 2x/week)	49	89,09
	Sufficient fruit and vegetable consumption (≥ 5x/week)	30	54,55
Physical Activity	Low (<150 minutes/week)	45	81,81
	Moderate (150-300 minutes/week)	7	12,73

SKJP 2026
pISSN 2301-6221; eISSN 2502-5236

	High (>300 minutes/week)	3	5,45
Nutritional Status (BMI)	Normal weigh	40	72,72
	Excess weight	3	5,45
	Obesity	2	3,63
	Underweight	10	18,18
Family History of Diabetes	There is a history of diabetes	5	9,09
	No history of diabetes	50	90,01
GDS Test Results	Normal	53	96,36
	Pre-diabetes	2	3,64
	Diabetes	0	0

Table 2 shows the results of the analysis indicating that all respondents (100%) had a high-sugar food consumption pattern, with low physical activity (81.81%). The majority of respondents had normal nutritional status (72.72%), and had no family history of diabetes (90.01%).

Bivariate Analysis

Table 3 Correlation analysis of consumption patterns, physical activity, nutritional status, and family history with blood sugar levels in adolescents

Risk Factor	P-Value	Information
Consumption Patterns	0,020	Significant (p<0,05)
Physical Activity	0,003	Significant (p<0,05)
Nutritional Status (BMI)	0,045	Significant (p<0,05)
Family History of Diabetes	0,001	Significant (p<0,05)

Table 3 shows that the results of the correlation analysis show a significant relationship between consumption patterns, physical activity, nutritional status, and family history with blood sugar levels in adolescents.

DISCUSSION

Food Consumption Patterns shows the results 100% of respondents reported consuming foods high in sugar and fat more than four times per week. This indicates low awareness among adolescents about the importance of a balanced diet. According to Amalia et al., (2023) Indonesian teenagers' daily sugar consumption tends to exceed recommendations, which increases the risk of obesity and diabetes. Low fruit and vegetable consumption (30%) exacerbates the risk of insulin resistance.(Muzakki, 2021).

A total of 81.81% of respondents reported low levels of physical activity (<150 minutes/week), reflecting a sedentary lifestyle heavily influenced by gadget use and low participation in sports. Low levels of physical activity have been shown to increase the risk of insulin resistance and body fat accumulation. These findings support a study by the Basic Health Research (Riskesdas) that showed that 56.5% of adolescents in Indonesia lack physical activity (Antimas et al., 2017).

Nutritional Status (BMI) shows the results 72.72% of respondents were overweight or obese, a major risk factor for type 2 diabetes. Obesity causes increased body fat levels, which impacts insulin sensitivity (Hendra & Rahmad, 2019). These findings strengthen research that obesity plays a major role in the pathogenesis of diabetes, especially at a young age (Unicef, 2019). Family History of Diabetes shows the results as many as 9.09% of respondents had a family history of diabetes. Although the percentage was small, this factor was shown to significantly influence blood sugar levels (p<0.001). Genetic factors cannot be changed, but the risk can be reduced through lifestyle modifications.(Aulya et al., 2018).

The results showed blood sugar level examination that 96.36% of respondents had normal blood sugar levels, and 3.64% were classified as pre-diabetic. These findings indicate the potential for serious health problems if early intervention is not sought (Nurhayani, 2022). This is in line with the statement Liao et al., (2019) Pre-diabetes in adolescence is a strong predictor of type 2 diabetes in adulthood.

Relationship of risk factors to blood sugar levels shows that the results statistical analysis showed a significant association between family history, dietary patterns, physical activity, and nutritional status with blood sugar levels (p<0.05). Lifestyle factors are the dominant variables that can be modified to reduce the risk of diabetes (Anwar et al., 2023). Promotional efforts such as nutrition education, limiting sugar consumption, and increasing physical activity should be prioritized.

These findings emphasize the need for diabetes prevention programs starting in adolescence. Schools and health professionals play a crucial role in fostering healthy habits, such as the "Isi Piringku" campaign, providing sports facilities, and routine health screenings. This research can serve as a basis for local governments to design adolescent health policies based on real-world risk data.

The limitations of this study include its cross-sectional design, which only describes the relationship between risk factors and diabetes risk events at a specific point in time. Therefore, it cannot explain a direct cause-and-effect relationship between variables. Some data were obtained through questionnaires, thus relying heavily on respondents' honesty and memory.
This has the potential to introduce recall bias, particularly in questions regarding diet, physical activity, and family history. Furthermore, the population was limited to one Islamic high school (madrasah aliyah), so the results cannot be generalized to the entire adolescent population in other regions or schools with different characteristics.

CONCLUSION

That all respondents had a high-sugar food consumption pattern with low physical activity. The majority of respondents had a normal nutritional status and no family history of diabetes. The analysis of correlation tests revealed a significant relationship between consumption patterns, physical activity, nutritional status, and family history, with adolescent blood sugar levels. This suggests that lifestyle factors are dominant and can be modified to prevent diabetes from a young age.

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Jurnal SMART Keperawatan, 2026, 13 (1), 17-21
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pISSN 2301-6221; eISSN 2502-5236
Received 30 September; Revised 23 October; Accepted 30 October 2025

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