
Overview of Teenagers' Knowledge of Type 2 Diabetes Prevention at Semarang State High School 1

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Abstract

Type 2 diabetes mellitus shows a significant upward trend and is increasingly found in younger age groups, including adolescents. The 2023 Indonesian Health Survey (SKI) reported a prevalence of diabetes mellitus of 11.7% in people aged ≥ 15 years, reflecting the high national burden of this disease. Regionally, Bali is among the 10 provinces with the highest number of diabetes cases in Indonesia, with an increase in cases from 30,856 to 45,710 in 2024. The results of blood sugar screening by the Bali Provincial Health Office for the period January–May 2025 also showed cases of diabetes in adolescents aged 15–17 years, where 23 of 3,727 adolescents were confirmed to have diabetes and 259 had prediabetes, with the highest number of cases found in Klungkung Regency. Lack of knowledge about prevention is one of the factors that can potentially increase the risk of type 2 diabetes mellitus in adolescents. This study aims to describe the characteristics of respondents and the level of knowledge of adolescents about the prevention of type 2 diabetes mellitus at SMA Negeri 1 Semarang. The study used a descriptive design with adolescent respondents. The results showed that most respondents were 17 years old (40.6%), female (56.7%), had no family history of diabetes (94.5%), and accessed health information through the internet (45.1%). The level of knowledge was dominated by the good category (90.1%). These findings emphasize the importance of strengthening school-based health education as an early prevention measure for type 2 diabetes mellitus in adolescents.

Keywords: Type 2 Diabetes Mellitus, Knowledge, Prevention, Adolescents.

INTRODUCTION

Diabetes mellitus is one of the non-communicable diseases that has experienced a significant global increase over the past few decades. This condition is no longer confined to older age groups but has shown an epidemiological shift toward younger populations, including adolescents and young adults. This phenomenon is of serious concern, as adolescence represents a critical phase in the life cycle that should ideally be characterized by optimal physical health to support education, productivity, and future social contributions. Modern lifestyle changes, marked by low levels of physical activity, diets high in sugar and fat, and increasing academic and social pressures, have contributed to the rising risk of diabetes mellitus among younger age groups.

The International Diabetes Federation (IDF) Atlas 2025 reported that in 2024 approximately 589 million adults aged 20–79 years were living with diabetes worldwide, with 90% of these cases being type 2 diabetes mellitus. Indonesia is among the countries with a high diabetes burden and ranks fifth globally (IDF, 2021). At the regional level, Bali Province has shown a significant increase in diabetes cases, rising from 30,856 cases to 45,710 cases over the past two years. Blood glucose screening conducted in 2025 among adolescents aged 15–17 years in Bali identified cases of prediabetes and diabetes mellitus, with the highest number of cases found in Klungkung Regency, followed by Badung Regency, Gianyar Regency, and Denpasar City. These findings are consistent with national Riskesdas data, which indicate an increasing prevalence of type 2 diabetes mellitus among adolescents, confirming that diabetes is no longer limited to adulthood but has become a growing health threat among younger generations. This increasing prevalence is closely associated with the consumption of junk food, sugar-sweetened beverages, and low levels of physical activity, all of which have become increasingly accessible and affordable for adolescents (Qomariyah Mulia Agung, n.d.).

Type 2 diabetes mellitus is a chronic disease characterized by hyperglycemia resulting from insulin resistance, which over time can lead to various metabolic complications. The gradual

development of early symptoms often results in delayed diagnosis, particularly among adolescents who generally perceive themselves as healthy. This condition is further exacerbated by adolescents' low levels of awareness and knowledge regarding risk factors, early symptoms, and the importance of early detection of type 2 diabetes mellitus.

Various efforts have been undertaken by the government through the development of Integrated Non-Communicable Disease Development Posts (Pos Pembinaan Terpadu Penyakit Tidak Menular/Posbindu PTM) and the implementation of birthday-based health screening programs beginning in 2025. These programs aim to enhance early detection and prevention of non-communicable diseases among individuals aged 15 years and older, including adolescents. However, limited socialization and low adolescent participation have resulted in suboptimal utilization of these programs.

Adolescents' knowledge of type 2 diabetes mellitus is a key factor in disease prevention. Research has shown that increased knowledge through health education significantly influences diabetes prevention behaviors among adolescents (Fitriyani & Kurniasari, 2022; Silalahi, 2019). Insufficient knowledge contributes to low awareness among adolescents in adopting healthy lifestyles and engaging in early detection practices, which ultimately increases the risk of future complications (Halimatushadyah et al., 2025; Nurhidayanti et al., 2023). Therefore, measuring adolescents' level of knowledge regarding the prevention of type 2 diabetes mellitus is a crucial step in forming the basis for the design of more effective promotive and preventive interventions.

RESEARCH METHODS

This study was conducted at SMA Negeri 1 Semarang, Klungkung Regency, on October 17, 2025. The research design employed was descriptive quantitative. The population of the study consisted of all students of SMA Negeri 1 Semarang, with a sample of 293 respondents selected using stratified random sampling techniques.

Data were collected online through a knowledge-based questionnaire administered via Google Forms. The research instrument had undergone validity testing, with values ranging from 0.517 to 0.648, and reliability testing, yielding a Cronbach's Alpha value of 0.867.

The questionnaire link was distributed to respondents who met the established inclusion and exclusion criteria. Prior to completing the questionnaire, respondents were provided with an explanation of the study objectives and were required to complete an informed consent form. The collected data were subsequently reviewed to ensure completeness, validity, and the absence of duplicate entries. The entire research process was conducted in accordance with ethical research principles, and this study received ethical approval with approval number 664/E1.STIKESWIK/EC/IX/2025.

RESULTS AND DISCUSSION

Table 1. Frequency Distribution of Respondent Characteristics

Respondent Characteristics	Frequency (f)	Percentage (%)
Age		
15 Years	61	20,8 %
16 Years	94	32,1 %
17 Years	119	40,6 %
18 Years	19	6,5 %
Gender		
Female	164	56,0 %
Male	129	44,0 %

Family History of Type 2 Diabetes Mellitus		
There is	16	5,5 %
There isn't	277	94,5 %
Health Information Sources		
Internet	132	45,1 %
Friend	12	4,1 %
Family	53	18,1 %
Health Worker	68	23,2 %
Not yet known	28	9,6 %

Respondent characteristics are presented in Table 1, which shows that among the 293 respondents involved in this study, the majority were 17 years old, totaling 119 respondents (40.6%). The next characteristic indicates that most respondents were female, with 164 respondents (56.0%). In addition, the majority of respondents did not have a family history of type 2 diabetes mellitus, amounting to 277 respondents (94.5%). The most frequently accessed source of health information among respondents was the internet, used by 132 respondents (45.1%).

Table 2. Distribution of Adolescents' Knowledge Level Regarding Type 2 Diabetes Prevention Methods

Level of Knowledge	Frequency (f)	Percentage (%)
Good	264	90,1 %
Enough	19	6,5 %
Less	10	3,4 %
Total	293	100

Based on Table 2, it can be observed that of the 293 respondents, the majority had a good level of knowledge regarding the prevention of type 2 diabetes mellitus, with 264 respondents (90.1%). Despite this, there were still 19 respondents (6.5%) with a moderate level of knowledge and 10 respondents (3.4%) with a poor level of knowledge. A study by Aisyah et al. (2024) suggests that such conditions may be influenced by various internal and external factors, including limited access to health information, low individual motivation, and insufficient environmental support. These findings indicate the need for more targeted educational efforts for adolescents whose knowledge levels remain suboptimal.

Table 3. Crosstabs of Respondent Characteristics by Level of Knowledge

Respondent Characteristics	Level of Knowledge			Total
	Good	Enough	Less	
Age				
15 Years	58 (19,8 %)	3 (1,0 %)	0 (0,0 %)	61 (20,8 %)
16 Years	83 (28,3 %)	7 (2,4 %)	4 (1,4 %)	94 (32,1 %)
17 Years	105 (35,8 %)	8 (2,7 %)	6 (2,0 %)	119 (32,1 %)
18 Years	18 (6,1 %)	1 (0,3 %)	0 (0,0 %)	19 (6,5 %)
Total	264 (90,1 %)	19 (6,5 %)	10 (3,4 %)	293 (100,0 %)
Gender				
Female	157 (53,6 %)	7 (2,4 %)	0 (0,0 %)	164 (56,0 %)
Male	107 (36,5 %)	12 (4,1 %)	10 (3,4 %)	129 (44,0 %)
Total	264 (90,1 %)	19 (6,5 %)	10 (3,4 %)	293 (100,0 %)

Family History with Type 2 Diabetes				
There is	14 (4,8 %)	2 (0,7 %)	0 (0,0 %)	16 (5,5 %)
There isn't	250 (85,3 %)	17 (5,8 %)	10 (3,4 %)	277 (94,5 %)
Total	264 (90,1 %)	19 (6,5 %)	10 (3,4 %)	193 (100,0 %)
Health Information Sources				
Internet	128 (43,7 %)	3 (1,0 %)	1 (0,3 %)	132 (45,1 %)
Friend	9 (3,1 %)	2 (0,7 %)	1 (0,3 %)	12 (4,1 %)
Family	47 (16,0 %)	3 (1,0 %)	3 (1,0 %)	53 (18,1 %)
Health Worker	56 (19,1 %)	7 (2,4 %)	5 (1,7 %)	68 (23,2 %)
Not Yet Known	24 (8,2 %)	4 (1,4 %)	0 (0,0 %)	28 (9,6 %)
Total	264 (90,1 %)	19 (6,5 %)	10 (3,4 %)	293 (100,0 %)

Based on Table 3, it can be seen that most respondents had a good level of knowledge regarding the prevention of type 2 diabetes mellitus. Age characteristics show that the 17-year-old age group had the highest proportion of respondents with good knowledge, totaling 105 respondents (35.8%), while also representing the group with the highest number of respondents with poor knowledge, at 6 respondents (2.0%). Gender characteristics indicate that female respondents demonstrated a higher proportion of good knowledge compared to males, with 157 respondents (53.6%). Regarding family history of type 2 diabetes mellitus, respondents without a family history were predominantly categorized as having good knowledge, totaling 250 respondents (85.3%). The sources of health information accessed by respondents showed a similar pattern, with the internet being the medium most strongly associated with a good level of knowledge, involving 128 respondents (43.7%).

Discussion

Discussion of Results Based on Respondent Characteristics

When examined by age characteristics, the majority of respondents were 17 years old, totaling 119 respondents (40.6%), indicating that most participants were in the stage of middle adolescence. At this phase, logical and analytical thinking abilities, as well as the capacity to comprehend complex information, are more fully developed, enabling adolescents to more easily receive and understand health-related information (Suryana et al., 2022). This finding is consistent with the study by Prayogi et al. (2025), which reported that 17-year-old adolescents possess more mature cognitive abilities in understanding information related to the prevention of diabetes mellitus.

Based on the study results, the majority of respondents were female, with 164 respondents (56.0%), while 129 respondents (44.0%) were male. The predominance of female respondents aligns with the findings of Wulandari (2022), which reported a higher proportion of female respondents compared to males. During adolescence, individuals undergo a transitional developmental phase involving physical, cognitive, emotional, and social changes, including identity formation (Hurlock, 1980; Simamora et al., 2025). Within this context, female adolescents tend to be more responsive to health-related issues and more open to health information and education, a tendency that can be understood through the process of gender socialization (Rosdiana et al., 2023).

With regard to the next characteristic, the majority of respondents did not have a family history of type 2 diabetes mellitus, totaling 277 respondents (94.5%), while only 16 respondents (5.5%) reported a family history. Research by Nuraisyah et al. (2021) indicates that family history is not a single determining factor; not all individuals with a family history develop diabetes, and conversely,

many cases are found among individuals without such a history. Etiologically, type 2 diabetes mellitus is influenced by non-modifiable factors, including family history, as well as modifiable factors such as diet, physical activity, and body weight. The substantial contribution of environmental and lifestyle factors further explains this phenomenon. Diets high in sugar and fat, obesity, physical inactivity, and sedentary lifestyles have been shown to increase the risk of type 2 diabetes mellitus even in the absence of a hereditary background (Shawputri et al., 2024).

Based on the characteristics of information sources, the study results indicate that the majority of respondents obtained information regarding the prevention of type 2 diabetes mellitus through the internet, with 132 respondents (45.1%). This finding demonstrates that the internet is the most dominant medium used by adolescents to seek health-related information. The role of the internet as a source of health information is also emphasized by Notoatmodjo (2008) in health education theory, which highlights that access to accurate information is a crucial factor in improving knowledge, attitudes, and healthy behaviors in the community. Electronic media such as television, radio, and especially the internet facilitate wider dissemination of health information that is more accessible and easier to understand, thereby playing a strategic role in enhancing the effectiveness of health education (Prasanti et al., 2017). Among adolescents, the internet serves as the primary source of information due to its ease of access and the ability to search for information according to individual needs. The internet enables adolescents to obtain health information, including sensitive health issues that may rarely be discussed openly (Haryanti, 2018). This indicates that the internet functions not only as a medium of entertainment but also as an educational tool that broadens adolescents' knowledge and perspectives.

Discussion of Cross-Tabulation Results of Respondent Characteristics by Level of Knowledge

Based on the results of the study conducted at SMA Negeri 1 Semarang, it was found that the majority of respondents had a good level of knowledge regarding the prevention of type 2 diabetes mellitus, totaling 264 respondents (90.1%). Meanwhile, 19 respondents (6.5%) had a moderate level of knowledge, and 10 respondents (3.4%) were classified as having a poor level of knowledge. The high proportion of respondents with good knowledge indicates that efforts to improve adolescents' understanding of type 2 diabetes mellitus prevention have been relatively effective. These findings are consistent with the study by Fatmona et al. (2023) conducted at Puskesmas Perawatan Siko, which reported that 85% of respondents had good knowledge regarding the prevention of type 2 diabetes mellitus. That study emphasized that public understanding, including among younger age groups, is already relatively high in recognizing the importance of a healthy lifestyle as a preventive measure. Knowledge is the result of a sensory process that shapes individuals' understanding of an object and, in the context of health, serves as the foundation for decision-making and the formation of disease-prevention behaviors (Notoatmodjo, 2012). According to Notoatmodjo (2017), as cited in the study by Wijayanti et al. (2022), knowledge levels are influenced by both internal and external factors. Internal factors such as age, gender, educational level, experience, and motivation affect individuals' ability to receive and process health information. External factors, including family environment, school, culture, and ease of access to information through the internet and social media, also support the improvement of adolescents' knowledge regarding the prevention of type 2 diabetes mellitus.

Based on the study results, the majority of 17-year-old respondents demonstrated a good level of knowledge regarding the prevention of type 2 diabetes mellitus, amounting to 105 respondents (35.8%). This finding indicates that the age of 17 represents a stage of cognitive development that is sufficiently mature to receive and understand health-related information, including information on the prevention of non-communicable diseases such as type 2 diabetes mellitus. According to Notoatmodjo (2012), age is one of the predisposing factors that influence health behavior. As individuals grow older, they tend to develop greater cognitive maturity, enabling them to better understand and internalize health information. This explains why the age of 17 constitutes a critical point for educational interventions, particularly in shaping preventive behaviors toward non-communicable diseases such as type 2 diabetes mellitus.

Based on the cross-tabulation analysis between knowledge level and gender, it was found that female respondents constituted the largest group with good knowledge, totaling 157 respondents (53.6%) out of the 293 respondents. This phenomenon can be understood through the characteristics of adolescence as a period of identity exploration, during which individuals exhibit high curiosity and a strong drive to try new things as part of seeking social recognition, as described by Sarwono (2018) in the study by Izzani et al. (2024). In the context of health, female adolescents are generally more active in seeking information because they tend to be more responsive to social norms that emphasize body awareness and health. This is consistent with the findings of Nanda et al. (2021), which stated that females have greater interest and motivation in accessing and understanding health information, leading them to possess better knowledge and demonstrate more consistent preventive behaviors.

In addition to age and gender, a family history of type 2 diabetes mellitus may also influence knowledge levels. Based on the cross-tabulation results, it was found that the majority of respondents without a family history of type 2 diabetes mellitus had a good level of knowledge, totaling 250 respondents (85.3%). Although family history is often considered a factor influencing an individual's knowledge, the study by Adilia (2023) showed that respondents without a family history could still possess good knowledge levels. This finding aligns with the theory proposed by Notoatmodjo (2012), which explains that knowledge is acquired through sensory experiences and learning processes, both formal and informal, and is influenced by various factors such as education, environment, and access to information. With the availability of diverse and easily accessible health education and information sources, adolescents without a family history can still develop a good understanding of type 2 diabetes mellitus prevention.

Sources of information are among the factors that play a role in enhancing an individual's knowledge, as greater exposure to information broadens one's perspective. The study results showed that 128 respondents (43.7%) who accessed information via the internet had a good level of knowledge. This finding is supported by the study by Sanghati (2021), which demonstrated that the internet is one of the primary information sources playing a significant role in disseminating knowledge about diabetes prevention. In addition, both printed and digital educational media contribute substantially to improving adolescents' knowledge regarding type 2 diabetes mellitus. Priyatna et al. (2025) explained that providing information through leaflets and websites can significantly increase knowledge levels. Internet-based media are considered more effective because they are easily accessible, interactive, and aligned with the characteristics of younger age groups who are more familiar with digital technology.

CONCLUSIONS

Based on the results of a study of 293 students at Semarang 1 Public High School, the majority of respondents were 17-year-old females with no family history of type 2 diabetes mellitus, who obtained health information mainly through online media. These characteristics are in line with the findings that most respondents had a good level of knowledge about the prevention of type 2 diabetes mellitus, indicating that access to health information and relatively low risk conditions contributed to adolescents' understanding of efforts to prevent the disease, although there is still a need to improve the knowledge of a small number of respondents.

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