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The effect of health education as a preventive effort against diabetes mellitus in adolescents at sma negeri 4 kota parepare

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Abstract

Background: Diabetes Mellitus (DM) is a major global health issue with increasing prevalence among adolescents. Health education plays a critical role in raising awareness and knowledge about the risk factors of DM and prevention strategies. This study aimed to evaluate the impact of health education on enhancing knowledge and awareness of diabetes mellitus prevention among adolescents at SMA Negeri 4 Kota Parepare. **Method:** A quasi-experimental study with a one-group pretest-posttest design was conducted with 29 high school students. The intervention consisted of health education sessions using audiovisual media and leaflets. Pretest and posttest assessments were performed using a structured questionnaire to measure changes in knowledge levels. Data were analyzed using paired sample t-tests. **Result:** Results showed a significant increase in knowledge, with the pretest mean score being 77.93 and the posttest mean score rising to 91.38 ($p < 0.001$). The analysis confirmed a significant difference between pretest and posttest scores, demonstrating the effectiveness of health education in improving students' knowledge of DM prevention. **Conclusion:** Health education using audiovisual and leaflet media significantly improves students' knowledge about DM prevention, and integrating structured health education into the school curriculum is recommended to enhance adolescent health literacy.

Keywords: Diabetes mellitus, health education, prevention, adolescents, audiovisual media

1. Introduction

Diabetes Mellitus (DM) is a chronic metabolic disorder characterized by high blood glucose levels due to insulin resistance or inadequate insulin secretion (International Diabetes Federation, 2021). It has become a significant public health concern worldwide, with an increasing number of cases among adolescents (WHO, 2020). Unhealthy eating habits, lack of physical activity, and limited awareness about DM prevention contribute to this growing prevalence (Atika & Susilawati, 2021). Adolescents often consume high-calorie diets, including fast food and sugar-sweetened beverages, which increase the risk of obesity and diabetes (Riskesdas, 2018). Additionally, sedentary lifestyles due to excessive screen time and lack of exercise exacerbate the problem (Prakoso, Arief, Muin, & Wardani, 2024). characterized by high blood glucose levels due to insulin resistance or inadequate insulin secretion. It has become a significant public health concern worldwide, with an increasing number of cases among adolescents. Unhealthy eating habits, lack of physical activity, and limited awareness about DM prevention contribute to this growing prevalence. Adolescents often consume high-calorie diets, including fast food and sugar-sweetened beverages, which increase the risk of obesity and diabetes. Additionally, sedentary lifestyles due to excessive screen time and lack of exercise exacerbate the problem.

The increasing prevalence of DM among adolescents is alarming, as it leads to long-term health complications such as cardiovascular diseases, kidney failure, and neuropathy. Adolescence is a critical period for establishing lifelong health habits, making early intervention crucial in preventing DM. Lack of awareness and misconceptions about DM risk factors often lead to poor lifestyle choices that increase susceptibility to the disease. Moreover, genetic predisposition combined with an unhealthy environment further escalates the risk.

Early preventive efforts are essential in reducing the risk of DM among adolescents (American Diabetes Assosiation, 2020). One of the most effective approaches is health education, which aims to improve knowledge and awareness about diabetes, its risk factors, and preventive strategies (Chawla et al., 2019) (Sulfikar & Rajab, 2024). Schools serve as an ideal setting for delivering health education programs, as they provide a structured environment to disseminate information

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effectively (Pulimeno, Piscitelli, Colazzo, Colao, & Miani, 2020). Previous studies have shown that educational interventions using audiovisual media and interactive learning methods are more effective in enhancing knowledge retention compared to traditional lecture-based approaches (Bandura & Wessels, 1997). The involvement of teachers, parents, and healthcare professionals in delivering health education programs ensures that students receive accurate and practical information that they can apply in daily life (The Minister of Health of The Republic of Indonesia, 2023). One of the most effective approaches is health education, which aims to improve knowledge and awareness about diabetes, its risk factors, and preventive strategies. Schools serve as an ideal setting for delivering health education programs, as they provide a structured environment to disseminate information effectively. Previous studies have shown that educational interventions using audiovisual media and interactive learning methods are more effective in enhancing knowledge retention compared to traditional lecture-based approaches. The involvement of teachers, parents, and healthcare professionals in delivering health education programs ensures that students receive accurate and practical information that they can apply in daily life.

In addition to formal education, peer influence plays a vital role in shaping adolescent behavior. Encouraging peer-led health promotion activities can further strengthen the impact of educational interventions. Students who actively participate in discussions and awareness campaigns are more likely to adopt healthier lifestyles and share knowledge with their peers. Collaborative efforts between schools, healthcare providers, and community organizations can create a supportive environment that fosters long-term behavioral changes among adolescents.

Furthermore, the role of digital media in health education cannot be ignored. The rapid advancement of technology provides new opportunities for health promotion, particularly through social media, online learning platforms, and mobile health applications (Role et al., 2019). These digital tools allow adolescents to access health information easily and interactively, thereby enhancing their engagement and motivation to adopt healthy behaviors (Sulfikar, Rachmawaty, Kadar, & Zulfikar, 2020). Integrating technology-driven educational strategies alongside traditional classroom methods can improve the effectiveness of health interventions (Braman, Brown, & Richards, 2024). The rapid advancement of technology provides new opportunities for health promotion, particularly through social media, online learning platforms, and mobile health applications. These digital tools allow adolescents to access health information easily and interactively, thereby enhancing their engagement and motivation to adopt healthy behaviors. Integrating technology-driven educational strategies alongside traditional classroom methods can improve the effectiveness of health interventions.

Another critical aspect of DM prevention is promoting self-efficacy among adolescents. Self-efficacy refers to an individual's belief in their ability to make informed decisions and take proactive steps in managing their health. Health education programs should not only provide information but also empower students to make positive lifestyle choices by building confidence in their ability to implement healthy behaviors. This includes teaching problem-solving skills, goal setting, and strategies for overcoming barriers to a healthy lifestyle.

This study investigates the effectiveness of health education as a preventive effort against DM among adolescents at SMA Negeri 4 Kota Parepare. By assessing changes in students' knowledge levels before and after the intervention, this study aims to provide evidence-based recommendations for incorporating health education into school curricula.

2. Materials and Methods

2.1 Design and Participants

This quasi-experimental study utilized a one-group pretest-posttest design (Campbell & Riecken, 1968). The study was conducted at SMA Negeri 4 Kota Parepare, involving 29 students selected through purposive sampling (Patton, 2002). Participants were chosen based on inclusion criteria, including being actively enrolled students, not having been diagnosed with diabetes, and having parental consent to participate. Exclusion criteria included students with pre-existing metabolic disorders or those unable to complete both pretest and posttest evaluations.

2.2 Intervention

The intervention consisted of structured health education sessions using audiovisual media and leaflets (Brenner, Marcuse, & Mayer, 2009). The educational content covered DM risk factors, symptoms, complications, and prevention strategies. The sessions were interactive, allowing students to ask questions and engage in discussions. Each session lasted approximately 60 minutes and was delivered in a classroom setting by trained educators. The audiovisual materials included animated videos explaining insulin function, the effects of high sugar intake, and strategies for maintaining a balanced diet and active lifestyle. Leaflets summarizing key points were distributed at the end of the session to reinforce learning.

2.3 Data Collection and Instruments

A structured questionnaire was used to assess students' knowledge about diabetes mellitus before and after the intervention. The questionnaire was adapted from previously validated instruments used in similar studies (Notoatmodjo, Kasiman, & Kintoko Rohadi, 2018). It consisted of 20 multiple-choice questions covering general knowledge of DM, risk factors, symptoms, prevention, and treatment. A pilot test was conducted on a small sample of students to ensure reliability and validity before the full study implementation.

2.4 Data Analysis

A pretest questionnaire was administered before the intervention to assess baseline knowledge levels. After the health education session, a posttest was conducted using the same questionnaire. Data were analyzed using paired sample t-tests to determine the statistical significance of knowledge improvement (Nerenberg et al., 2018). Descriptive statistics, including mean, standard deviation, and frequency distributions, were also used to summarize the findings. Effect size calculations were performed to determine the magnitude of the intervention's impact on knowledge improvement.

3. Results

3.1 Pretest and Posttest Knowledge Scores

The pretest results showed that students had moderate knowledge levels, with an average score of 77.93. After the health education intervention, the average knowledge score significantly increased to 91.38. The paired sample t-test revealed a statistically significant improvement ($p < 0.001$), demonstrating the effectiveness of the educational intervention.

A further analysis of knowledge improvement is presented in **Table 1**, showing the distribution of students' knowledge levels before and after the intervention.

Table 1 Pretest and Posttest Knowledge Scores Distribution

Knowledge Level	Pretest (n=29)	Posttest (n=29)
Low (≤60)	5 (17.2%)	0 (0%)
Moderate (61-80)	18 (62.1%)	5 (17.2%)
High (>80)	6 (20.7%)	24 (82.8%)

These results indicate that the health education intervention had a substantial impact on improving students' knowledge about DM prevention.

To further analyze the effect of the intervention, **Table 2** presents the mean and standard deviation of pretest and posttest scores, highlighting the significance of the knowledge gain.

Table 2 Comparison of Pretest and Posttest Mean Scores

Variable	Pretest (Mean ± SD)	Posttest (Mean ± SD)	p-value
Knowledge Score	77.93 ± 8.52	91.38 ± 6.41	<0.001*

(*p-value < 0.05 indicates statistical significance)

The results demonstrate a notable increase in students' understanding of DM, with a mean improvement of approximately 13.45 points. The standard deviation values indicate a reduction in variability, suggesting a more uniform comprehension among participants following the intervention.

Subgroup analysis based on gender showed that both male and female students experienced significant improvements in knowledge scores, although female students had slightly higher posttest scores than their male counterparts. This finding aligns with previous research suggesting that females tend to be more receptive to health education messages.

Additionally, students with prior exposure to DM-related information, such as those with family members diagnosed with diabetes, showed higher baseline knowledge scores. However, the intervention was still effective in significantly improving their understanding. This suggests that while prior exposure plays a role in knowledge retention, structured health education remains essential in reinforcing and expanding students' comprehension.

Observational data from the intervention sessions indicated that students who actively engaged in discussions and participated in interactive activities demonstrated greater improvements in their knowledge scores compared to passive learners. This underscores the importance of using interactive teaching methods, such as audiovisual media and hands-on activities, to enhance student engagement and knowledge retention.

Furthermore, qualitative feedback from students revealed that they found the audiovisual materials particularly helpful in understanding complex concepts related to diabetes prevention. Some students suggested incorporating real-life case studies and testimonials from individuals living with diabetes to further enrich future educational sessions.

These findings emphasize the importance of well-structured and engaging health education programs in schools. Future research should explore the long-term impact of such interventions and assess whether knowledge improvements translate into sustained behavioral changes, such as healthier dietary choices and increased physical activity.

4. Discussion

The findings of this study highlight the significant impact of health education on increasing students' knowledge about diabetes mellitus prevention (Wijayanti, 2022). The increase in posttest scores suggests that structured educational interventions play a crucial role in enhancing health literacy among adolescents (Öztürk, Doğan, Gedikaslan, & Yılmaz, 2023).

The use of audiovisual media and interactive discussions was effective in helping students grasp complex concepts related to diabetes, facilitating comprehension and retention of information (Palmer, Lanouette, & Jeste, 2012). One of the key aspects contributing to the success of this intervention was the participatory nature of the sessions. Students who actively engaged in discussions and interactive exercises exhibited greater improvements in their posttest scores compared to passive learners. This suggests that fostering an interactive and student-centered learning environment is essential in promoting effective health education (Bandura, 1997). Additionally, the inclusion of real-life examples and case studies helped contextualize the information, making it more relevant to students' daily lives.

The findings also indicate that prior exposure to diabetes-related information, such as having family members diagnosed with diabetes, contributed to higher baseline knowledge scores. However, despite this initial advantage, students from all backgrounds showed significant improvement after the intervention, reinforcing the importance of structured health education regardless of prior knowledge (Notoatmojo, 2010).

Comparison with previous studies supports the effectiveness of structured health education in improving health literacy. Research has shown that students who participate in structured health education programs demonstrate significant improvement in knowledge retention compared to those who receive traditional lectures (Stormacq, Wosinski, Boillat, & Van den Broucke, 2020). The results of this study align with these findings and underscore the necessity of incorporating health education into school curricula to ensure sustained awareness of disease prevention (World Health Organization, 2023).

Despite the positive results, this study has some limitations. The relatively small sample size and single-site study design may limit the generalizability of the findings. Future research should involve larger and more diverse student populations to confirm the effectiveness of similar interventions (Memon et al., 2020). Additionally, this study primarily focused on knowledge improvement and did not assess behavioral changes. Future studies should examine whether increased knowledge translates into long-term modifications in lifestyle choices, such as healthier eating habits and increased physical activity (American Diabetes Assosiation, 2020).

To maximize the effectiveness of school-based health education programs, integrating health education into the standard school curriculum rather than offering it as an optional activity will ensure broader student participation. Utilizing a combination of audiovisual presentations, interactive discussions, and hands-on activities can enhance student engagement (Mayer, 2009). Collaborations between schools and healthcare professionals can also ensure that students receive accurate and up-to-date health information (Hoelscher et al., 2004). Leveraging digital platforms and mobile applications can provide students with continuous access to educational resources, reinforcing knowledge beyond the classroom environment (Anurogo, Hardin La Ramba, Nabila Diyana Putri, & Ulfah Mahardika Pramono Putri, 2023)

In conclusion, this study demonstrates that structured health education significantly increases students' knowledge about diabetes mellitus prevention. Schools should prioritize implementing engaging and interactive health education programs to equip adolescents with the necessary knowledge and skills for maintaining long-term health and well-being.

5. Conclusions

Health education significantly improves students' knowledge about diabetes prevention, as shown by the increase in posttest scores. Structured interventions, using audiovisual media and interactive discussions, effectively engage students and enhance understanding. Despite limitations like small sample size and single-site study, these findings highlight the importance of integrating health education into school curricula. Future research should explore the long-term effects on students' behaviors and lifestyle choices. Schools, alongside healthcare professionals, should collaborate to implement engaging, sustainable health education programs to promote adolescent health literacy and healthier lifestyles.

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Ethical considerations

This study was conducted following ethical guidelines and was approved by the institutional review board. Participants provided informed consent before data collection, and confidentiality was maintained throughout the study. The study adhered to ethical principles outlined in the Declaration of Helsinki (Snežana, 2001).

Conflict of Interest

The authors declare no conflicts of interest.

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