

THE EFFECT OF HEALTH EDUCATION USING ANIMATED VIDEO ON KNOWLEDGE OF DIABETES MELLITUS PREVENTION IN SCHOOL-AGE CHILDREN

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ABSTRACT

Background: Diabetes mellitus (DM) among school-age children demonstrates a concerning upward trend in Indonesia. The limited understanding of adolescents regarding DM prevention necessitates effective educational strategies tailored to their developmental characteristics.

Purpose: This study aims to evaluate the effectiveness of animated video-based education on school students' knowledge of diabetes mellitus.

Methods: A quasi-experimental design with a pretest–posttest control group approach was employed at SMPN 10, Gorontalo City. A total of 58 students were recruited through purposive sampling (intervention group n = 29; control group n = 29). The intervention group received health education consisting of a lecture combined with a ± 15-minute animated video, while the control group received only a conventional lecture. Knowledge was assessed using a validated 15-item multiple-choice questionnaire. Data were analyzed using the Wilcoxon signed-rank test, and the Mann Whitney test.

Results: A statistically significant difference in knowledge gain was observed between the intervention group (5.10 ± 1.398) and the control group (0.52 ± 0.509) ($p < 0.001$).

Conclusion: Health education delivered via animated video was more effective than conventional lectures in improving knowledge of DM prevention among school-age adolescents.

Keywords: Animated Video, Diabetes Mellitus, Health Education, Knowledge, School-Age Children

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BACKGROUND

Diabetes mellitus is a chronic disease characterized by persistent hyperglycemia resulting from impaired insulin production, insulin resistance, or a combination of both. This condition is no longer a health concern exclusive to adults; it has increasingly become a serious threat to younger age groups, including school-age children. The Indonesian Endocrinology Association (2021) projects that the global prevalence of DM will triple by 2030, reaching 21.3 million cases, while the International Diabetes Federation (IDF, 2022) estimates that the figure will reach 16.7 million by 2045.

Indonesia currently ranks fifth worldwide in the total number of individuals living with diabetes. Data from the Indonesian Ministry of Health (2024) reveal that the incidence of Type 1 DM in children has risen dramatically, from 0.0038 per 100,000 in 2000 to 2 per 100,000 in 2023, a seventy-fold increase over two decades. At present, more than 1,400 children have been identified with Type 1 DM, with 13,311 patients younger than 20 years of age (IDF, 2022). This situation places early-onset diabetes prevention at the forefront of the national public health agenda.

At the regional level, data from the Gorontalo Provincial Health Office (2024) recorded a DM prevalence of 4% (10,735 individuals). Blood glucose screening conducted among children aged 6–17 years in Gorontalo Province in 2024 identified 62 children (0.3% of screening participants) with blood glucose levels exceeding normal reference values; an additional 6 comparable cases were identified in the first half of 2025. These findings indicate that DM among school-age children in Gorontalo is not merely a theoretical concern but a tangible and pressing public health issue requiring immediate intervention.

School-age children, particularly junior high school students, constitute a strategically important target group for health educational interventions. During this developmental period, lifestyle habits, dietary behaviors, and physical activity patterns are actively being shaped. Effective health education at this stage can establish health-promoting behaviors as a foundation for preventing chronic diseases in later life. Preventive and promotive efforts through evidence-based school education are among the most widely recommended strategies for this purpose (Marpaung et al., 2022).

A growing body of research has documented the advantages of audiovisual media over conventional educational methods. Hasanica et al. (2021) demonstrated that although leaflets and posters can improve knowledge, their effectiveness depends heavily on audience literacy levels and visual appeal. By contrast, animated video offers a multimodal approach that simultaneously engages both visual and auditory channels, thereby facilitating attention, cognitive processing, and information retention in a manner consistent with the principles of multimedia learning. Riadi et al. (2024) confirmed that a lecture combined with an animated video was statistically superior to a non-animated video in enhancing adolescents' knowledge and attitudes toward non-communicable diseases.

Against this backdrop, the present study aimed to analyze the effect of health education using animated video on adolescents' knowledge of DM prevention, while simultaneously comparing its effectiveness with that of conventional lecture. The findings are intended to

provide an empirical basis for developing more innovative, evidence-based school health promotion programs in the region.

OBJECTIVE

This study aims to evaluate the effectiveness of animated video–based education on school students’ knowledge of diabetes mellitus.

METHODS

Study Design

This study employed a quasi-experimental design with a pretest–posttest control group approach. This design was selected to compare the effectiveness of two educational methods, animated video and conventional lecture, under conditions that simultaneously controlled for baseline characteristics through pretest measurement.

Setting and Participants

The study was conducted at SMPN 10 in Gorontalo City in January 2026. The sample size was calculated using the Slovin formula with a 10% margin of error, yielding 58 respondents. Participants were recruited through purposive sampling with proportional allocation across class levels, resulting in 29 respondents in the intervention group and 29 in the control group. Class-level matching was applied to ensure proportional balance between groups. Inclusion criteria comprised students in grades VII and VIII who were willing to participate. Exclusion criteria included students who had previously attended a formal DM educational session, students who were absent during the intervention, and students who had not obtained written parental or guardian consent. Students who did not complete the full research process were excluded from data analysis.

Intervention

The intervention group received health education consisting of a lecture combined with a $\pm$ 15-minute animated video covering the following content areas: (1) definition and classification of DM, (2) risk factors, clinical signs and symptoms, (3) complications of DM in children, and (4) steps for preventing DM through a healthy lifestyle. The control group received only a conventional lecture for an equivalent duration, without any animated video component. Both groups participated in the intervention simultaneously in separate, spatially distant rooms to prevent cross-group information contamination. Participants were not permitted to leave the room before completing the posttest, and no smartphones were allowed during the session.

Instrument

Data were collected using a sociodemographic questionnaire and a validated DM knowledge questionnaire developed by Teslatu (2022). It consisted of 15 multiple-choice items, each with three response options. Respondents were instructed to select the answer that best reflected their knowledge. The questionnaire included both positively worded (favorable) and negatively worded (unfavorable) items. Each item was scored dichotomously, with a score of 1 assigned for a correct answer and a score of 0 assigned for an incorrect answer.

Data Analysis

Data were analyzed using SPSS version 22. Univariate analysis was conducted to describe the frequency distribution and percentage of each variable. Data normality was tested using the Shapiro–Wilk test. Within-group comparisons were performed using the Wilcoxon signed-rank test. Between-group comparison of effectiveness was assessed using an Mann Whitney test on gain scores (posttest minus pretest). A significance level of $p < 0.05$ was adopted for all analyses.

RESULTS

Of the 58 enrolled respondents, the age distribution showed that the majority in both groups were aged 10–13 years (79.3% intervention; 82.8% control), with the remainder aged 14–16 years (20.7% intervention; 17.2% control). In terms of sex, the intervention group comprised 51.7% males and 48.3% females, while the control group comprised 48.3% males and 51.7% females. Regarding grade level, the intervention group was predominantly drawn from Grade VII (58.6%), whereas the control group was primarily from Grade VIII (55.2%). A detailed summary is presented in Table 1.

Table 1. Respondent Characteristics

Characteristics	Intervention (n=29)		Control (n=29)	
	n	%	n	%
Age (years)				
10 – 13	23	79.3	24	82.8
14 – 16	6	20,7	5	17.2
Sex				
Male	15	51.7	14	48.3
Female	14	48.3	15	51.7
Grade				
VII	17	58.6	13	44.8
VIII	12	41.4	16	55.2

Table 2 shows statistically significant improvements in knowledge scores in both groups from pretest to posttest ($p < 0.001$). Comparison using the Mann Whitney test revealed a statistically significant difference between the two groups, with the mean knowledge score gain markedly higher in the intervention group 5.10 ± 1.398 than in the control group 0.52 ± 0.509 ($p < 0.001$).

Table 2. Between-Group Differences in Knowledge Scores

Knowledge	Intervention	Control	p-value
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Pretest	7.45 ± 1.021	7.72 ± 1.192	<0.001 ^a
Posttest	12.48 ± 0.911	8.48 ± 1.526	<0.001 ^a
Gain score (between-group comparison)	5.10 ± 1.398	0.52 ± 0.509	<0.001 ^b

^aWilcoxon signed-rank test; ^bMann Whitney test

DISCUSSION

Effect of Animated Video–Based Health Education on Knowledge of Diabetes Mellitus Prevention

The findings of this study indicate that health education delivered through animated video significantly improves students' knowledge of diabetes mellitus (DM) prevention, as evidenced by the increase in the mean knowledge score from 7.45 to 12.48. This effect may be explained by Paivio's Dual Coding Theory (1991) and Mayer's Cognitive Theory of Multimedia Learning (2014), which suggest that learning is enhanced when verbal and visual information are presented together. By integrating narration and visual animation, animated videos facilitate information processing and improve knowledge retention. These findings are consistent with those of Utami and Kowiyah (2022), who reported that animated video is more effective than static media in enhancing conceptual understanding.

These findings are consistent with several prior studies. Riadi et al. (2024) reported that a lecture method combined with an animated video was significantly more effective in improving adolescents' knowledge and attitudes toward obesity than a lecture delivered without visual media. Similarly, Azmii & Ruhmawati (2024), conducted at SMAN 15 Bandung, found significant improvements in knowledge among adolescents following animated video–based health education on diabetes prevention and in a comparative study involving three media formats: poster, animated video, and podcast. Sapitri & Kurniasari (2024) also found that animated video yielded the highest knowledge-gain score among the three formats.

Contextual factors also contributed to the observed outcomes. The respondents in this study belonged to Generation Z, a cohort raised within a digital ecosystem and accustomed to processing information rapidly through visual platforms. Animated video is inherently congruent with their cognitive preferences, which in turn elevates their attention, learning motivation, and receptivity to health messages. Setyawan et al. (2024) affirm that digital media, such as video, are highly relevant and effective health promotion tools for adolescents in the context of non-communicable disease prevention.

Comparative Effectiveness of Animated Video and Conventional Lecture on Knowledge Improvement

A direct comparison using the Mann Whitney test applied to the gain scores revealed a highly substantial difference between the two groups: 5.10 ± 1.398 in the intervention group versus 0.52 ± 0.509 in the control group. This difference is not only statistically significant but

also carries meaningful clinical and educational implications. The magnitude of the disparity in mean score gains indicates a consistent and robust superiority of animated video as a health education medium.

This superiority is consistent with the principles of multimodal learning theory, which holds that integrating dynamic visual elements, audio narration, and contextually relevant content synergistically enhances the encoding of information into long-term memory. Hasanica et al. (2021) specifically noted that media capable of simultaneously stimulating multiple sensory channels have been shown to produce significantly higher health information retention than text-based media or a lecture alone. The characteristics of Generation Z as digital natives who are cognitively more responsive to interactive visual formats further reinforce the superiority of this approach for this particular age group (Risnajayanti et al., 2023).

These findings carry important practical implications for the development of school health promotion programs. At a time when DM prevalence among young age groups continues to rise, the selection of an appropriate educational method is not merely a matter of pedagogical preference, but a public health decision with tangible, long-term consequences. The integration of animated video into school-based health programs and community health center outreach activities at schools represents a strategically sound step, now firmly supported by scientific evidence.

LIMITATIONS

This study has several limitations that should be considered when interpreting the findings. These include the relatively small total sample size across both groups (58 students), the inclusion of participants from a single school, the short intervention period, and the absence of a follow-up assessment to evaluate long-term knowledge retention.

CONCLUSION

Health education delivered via an animated video was significantly more effective at improving school students' knowledge of DM prevention than a conventional lecture. These findings underscore the importance of adopting innovative, technology-based educational media within school health promotion programs, particularly when targeting Generation Z adolescents. The study recommends that schools and school health units incorporate animated video into routine health promotion activities, and that primary healthcare providers supplement conventional lecture approaches with more interactive audiovisual media. Furthermore, future research is encouraged to assess long-term knowledge retention and to develop locally contextualized video content to further facilitate changes in attitude, behavior, and educational uptake.

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CONFLICTS OF INTEREST

There are no conflicts of interest in this study.

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