Research Article

EFFECTIVENESS OF ANIMATION MEDIA IN ENHANCING KNOWLEDGE OF DIABETES PREVENTION

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Abstract

Background: Diabetes mellitus (DM) is a global public health problem with rising prevalence, particularly in low- and middle-income countries. Preventive education is essential to mitigate the burden of DM, yet traditional media often fail to effectively reach populations with varying literacy levels. Animation media offers a dynamic and accessible approach to health promotion. This study aimed to examine the effect of health promotion using animation media on increasing knowledge of diabetes prevention among adults. **Methods**: This quasi-experimental study employed a pretest–posttest non-equivalent control group design. A total of 50 respondents were purposively selected and divided equally into intervention (n = 25) and control (n = 25) groups. The intervention group received a 12-minute animation-based educational session on diabetes prevention, followed by a brief discussion. Knowledge was assessed using a validated questionnaire administered before and seven days after the intervention. Data were analyzed using paired and independent t-tests with a significance level of $p < 0.05$. **Results**: In the intervention group, the mean knowledge score increased significantly from 62.4 (±10.5) to 84.8 (±7.3) ($p < 0.001$). The control group showed a minimal increase from 64.0 (±9.8) to 68.2 (±9.6) ($p = 0.072$). Posttest comparisons revealed a significant difference between the intervention and control groups ($p < 0.001$), indicating the effectiveness of the animation media. **Conclusion:** Health promotion using animation media significantly improved respondents' knowledge of diabetes prevention. Animation is a promising tool for delivering preventive health education in community settings.

Keywords: Animation Media, Diabetes Prevention, Health Promotion

Background

Diabetes mellitus (DM) is a major public health issue affecting millions globally. According to the International Diabetes Federation (IDF), approximately 537 million adults aged 20–79 years were living with diabetes in 2021, and this number is expected to rise to 643 million by 2030 and 783 million by 2045 if no significant interventions are taken (IDF, 2021). In Indonesia, the prevalence of diabetes is also increasing significantly. Based on Riskesdas 2018, the national prevalence of diagnosed diabetes in adults over 15 years old reached 10.9%, and it is projected to grow due to lifestyle changes, urbanization, and aging population (Ministry of Health Indonesia, 2019).

Type 2 diabetes mellitus (T2DM), which accounts for about 90–95% of all diabetes cases, is largely preventable through lifestyle modifications such as healthy eating, regular physical activity, and weight management (American Diabetes Association [ADA], 2023). However, public awareness and knowledge regarding diabetes prevention remain inadequate, particularly in low-resource settings and rural populations.

Health promotion is a crucial strategy in preventing diabetes and managing its progression. Effective health promotion not only disseminates information but also motivates behavior change. It is increasingly recognized that the choice of media plays a significant role in the success of health education. Traditional media such as leaflets and posters have limitations in engagement, especially among populations with low literacy levels. In contrast, animation media—combining visuals, narration, and motion—offers a more dynamic and engaging educational tool that can simplify complex health information (Barros et al., 2022).

The use of animated video content in health

promotion has gained popularity in recent years. Studies have demonstrated that animation can enhance comprehension and recall, particularly among individuals with lower educational backgrounds or limited health literacy (Lee et al., 2020). Animation leverages multisensory learning by integrating visual and auditory cues, which can reinforce memory retention and increase emotional engagement. In a systematic review by Wilson et al. (2019), digital media interventions—including animation—were shown to significantly improve knowledge and preventive behaviors related to chronic diseases, including diabetes.

In the context of diabetes prevention, health education interventions utilizing animation have shown promising results. For instance, a randomized controlled trial in Iran found that animation-based education significantly improved knowledge and attitude toward diabetes prevention compared to traditional lecture-based methods (Heidari et al., 2021). Similarly, in a study by Al-Qahtani et al. (2020), the use of culturally appropriate animated videos led to a significant increase in knowledge about lifestyle-related risk factors for T2DM among adolescents in Saudi Arabia.

In Indonesia, few studies have explored the impact of animation media for diabetes prevention. A study conducted by Nugroho and Widyaningsih (2021) revealed that animation videos increased knowledge and self-efficacy among adolescents regarding healthy eating habits, suggesting the potential of this medium for broader health promotion purposes. Despite these findings, the integration of animation in public health education, especially within community health centers (Puskesmas), remains limited and underutilized.

Given the increasing burden of diabetes and the need for more effective educational strategies, this study aims to evaluate the effect of health promotion using animation media on increasing knowledge of diabetes prevention. This intervention is expected to offer a more engaging and accessible approach, particularly for individuals with varying levels of literacy and digital familiarity.

This research is based on the premise that knowledge is a prerequisite for behavior change. According to Notoatmodjo's theory of health behavior (2014), knowledge is the first and fundamental domain in shaping health behavior. Without adequate knowledge, individuals may not recognize their risk or understand the importance of preventive measures. Therefore, enhancing public knowledge through innovative media is essential for strengthening diabetes prevention efforts at the community level.

Furthermore, this study aligns with the Sustainable Development Goals (SDGs), particularly Goal 3: Ensure healthy lives and promote well-being for all at all ages. Preventing non-communicable diseases (NCDs), including diabetes, is a critical component of this goal. Health education interventions tailored to local contexts and supported by appropriate technology, such as animation, are instrumental in achieving health equity.

In summary, animation-based health promotion presents a novel and potentially powerful approach to increase diabetes prevention knowledge. By leveraging engaging visuals and storytelling, animation can transcend literacy barriers and foster better understanding among diverse populations. This study seeks to contribute empirical evidence to support the integration of animation media in diabetes education programs, ultimately aiming to enhance public awareness and promote preventive behaviors.

Method

This study employed a quasi-experimental design with a pretest-posttest non-equivalent control group approach to evaluate the effect of health promotion using animation media on increasing knowledge of diabetes prevention. A total of 50 respondents were selected using purposive sampling technique based on inclusion criteria, including adults aged 18–59 years who had never received formal diabetes education and were willing to participate. Respondents were then divided into two groups: 25 individuals in the intervention group and 25 individuals in the control group.

Prior to the intervention, all participants completed a structured knowledge questionnaire related to diabetes prevention. The questionnaire, developed based on the

American Diabetes Association (ADA) prevention guidelines and validated by public health experts, consisted of 20 multiple-choice items covering topics such as risk factors, early signs of diabetes, dietary recommendations, and physical activity. A pilot test on 15 individuals yielded a Cronbach's alpha value of 0.812, indicating good internal consistency.

The intervention group received health promotion through an animated educational video developed specifically for this study. The animation lasted approximately 12 minutes and was designed using simple language and culturally appropriate visuals. The content was reviewed by a panel of health education experts to ensure accuracy and relevance. The video covered four main themes: (1) understanding diabetes and its risk factors, (2) signs and symptoms of early-stage diabetes, (3) principles of a balanced diet and healthy lifestyle, and (4) tips for preventing diabetes through daily habits.

The animation was shown in a group setting using a projector and speaker in a quiet room within the health center. After watching the video, participants had the opportunity to ask questions and discuss the content with a health educator for 10–15 minutes to reinforce their understanding. This session was conducted once for the intervention group, and no additional educational materials were provided afterward. In contrast, the control group did not receive any health education intervention during the study period.

Seven days after the initial intervention, a posttest using the same knowledge questionnaire was administered to both groups. Data were collected and analyzed using SPSS version 26. Descriptive statistics were used to summarize demographic characteristics and knowledge scores. The effectiveness of the intervention was assessed by comparing pretest and posttest scores within and between groups using paired t-tests and independent t-tests with a significance level set at $p < 0.05$.

Results and Discussion

Based on Table 1, it shows that The majority of respondents were in the 45–59 years age group (44.0%), followed by the 30–44 years group (36.0%), indicating that most participants were in the middle adult age range, which aligns with the target population for diabetes prevention efforts. In terms of gender, females made up the majority (58.0%), suggesting a higher level of participation or availability among women. Regarding educational background, most respondents had a senior high school education (36.0%), followed by primary school (24.0%). These findings reflect a diverse demographic profile, which is important in assessing the effectiveness of animation-based health education across different age and education levels.

Table 1. Frequency Distribution of Respondent Characteristics (n = 50)

Characteristic	f	%
Age		
18-29 years	10	20.0
30-44 years	18	36.0
45-59 years	22	44.0
Gender		
Male	21	42.0
Female	29	58.0
Level of Education		
Primary school	12	24.0
Junior high school	10	20.0
Senior high school	18	36.0
College/University	10	20.0

Based on Table 2, the knowledge level of respondents in the intervention group improved significantly after the health promotion using animation media. Prior to the intervention, only 32.0% of participants had good knowledge, which increased to 84.0% after the intervention. Meanwhile, the proportion with poor knowledge decreased from 20.0% to 0%. This indicates that the animated health education was effective in enhancing participants'

Table 2. Frequency Distribution of Knowledge Level of Respondents in the Pretest–Posttest Intervention Group (n = 25)

Knowledge Level	f	%
Pretest		
Good (76-100%)	8	32.0
Sufficient (56–75%)	12	48.0
Poor (<56%)	5	20.0
Posttest		
Good (76-100%)	21	84.0
Sufficient (56-75%)	4	16.0
Poor (<56%)	0	0.0

understanding of diabetes prevention.

Based on Table 3, the knowledge level in the control group showed minimal change between the pretest and posttest. The proportion of respondents with good knowledge slightly increased from 28.0% to 32.0%, while those with poor knowledge decreased from 28.0% to 20.0%. This suggests that without health promotion intervention, knowledge improvement was limited.

Table 3. Frequency Distribution of Respondents' Knowledge Level in Control Group Pretest–Posttest (n = 25)

Knowledge Level	f	%
Pretest		
Good (76-100%)	7	28.0
Sufficient (56–75%)	11	44.0
Poor (<56%)	7	28.0
Posttest		
Good (76-100%)	8	32.0
Sufficient (56-75%)	12	48.0
Poor (<56%)	5	20.0

Based on Table 4, there was a statistically significant increase in the mean knowledge score of respondents in the intervention group after receiving health promotion using animation media. The average score increased from 62.4 (±10.5) to 84.8 (±7.3), with a p-value < 0.001. This indicates that the intervention had a significant positive effect on respondents' knowledge about diabetes prevention.

Table 4. Differences in Knowledge in the Intervention Group Before and After Health Promotion

Test Type	Mean	SD	p-value
Pretest	62.4	10.5	<0.001*
Posttest	84.8	7.3	

*Paired t-test, significance level at p < 0.05

Based on Table 5, there was a statistically significant difference in the posttest knowledge scores between the intervention and control groups. The intervention group had a higher mean score (84.8) compared to the control group (68.2), with a p-value < 0.001. This indicates that health promotion using animation media was significantly more effective in increasing knowledge about diabetes prevention than no intervention.

Table 5. Differences in Knowledge Between Intervention and Control Groups After Health Promotion (n = 50)

Group	Mean Posttest	SD	p-value
Intervention (n=25)	84.8	7.3	<0.001*
Control (n=25)	68.2	9.6	

*Independent t-test, significance level at p < 0.05

Discussion

Respondent Demographics and Implications for Health Education

The demographic profile of the respondents showed that most participants were in the 45–59 age group (44.0%), predominantly female (58.0%), and with a senior high school level of education (36.0%). These demographic characteristics are commonly observed in community health education settings, particularly in Indonesia and other Southeast Asian countries, where women are more likely to participate in community-based health interventions and have a higher perceived need for health information (Nugroho et al., 2021).

Age is a significant determinant in the success of health education. Middle-aged adults, particularly those nearing the risk threshold for chronic diseases, tend to be more receptive to preventive messages. Studies have shown that individuals aged 40 and above are more willing to adopt lifestyle changes after receiving relevant health education (Rahman et al., 2022). In this study, the predominance of middle-aged participants likely contributed to the observed responsiveness to the health promotion intervention.

In terms of gender, female participants are often found to be more proactive in seeking health services and information, which aligns with previous findings by Marthoenis et al. (2021), who reported higher attendance and compliance in health promotion programs among women. This gender difference may be influenced by women's roles in managing family health and their generally greater engagement with health care services.

Educational level is another essential factor.

Participants with secondary education likely had sufficient baseline literacy to benefit from the educational material, especially when it was delivered through animation, which is known to reduce cognitive load and enhance comprehension (Mayer, 2021). Furthermore, visual and auditory reinforcement provided by animation can help bridge understanding even among those with limited formal education (Barros et al., 2022; Susanto et al., 2023).

Baseline Knowledge Prior to Intervention

The pre-intervention assessment showed that the majority of participants had moderate or insufficient knowledge regarding diabetes prevention. This is consistent with global and regional trends that indicate suboptimal public awareness about diabetes risk factors, early symptoms, and preventive measures, especially in developing countries (IDF, 2021; Alotaibi et al., 2021). In Indonesia, knowledge deficits related to diabetes are well documented, particularly among individuals who have not previously participated in structured health education (Putri et al., 2022).

Without targeted health promotion efforts, individuals are unlikely to possess comprehensive knowledge about disease prevention, even when they are at high risk. This lack of awareness can lead to delayed diagnosis and poor disease outcomes, which further highlights the need for innovative and accessible educational strategies (Widyastuti et al., 2022).

Improvement in Knowledge Following the Intervention

The posttest results demonstrated a marked improvement in the intervention group's knowledge, with the proportion of participants scoring in the "good" category increasing from 32.0% to 84.0%, and the mean knowledge score rising from 62.4 to 84.8. The statistical analysis confirmed that this change was significant ($p < 0.001$). These findings underscore the effectiveness of animation-based health education in improving knowledge on diabetes prevention.

This result is consistent with previous studies that have examined the impact of audiovisual learning methods. Heidari et al. (2021) demonstrated that animation-based instruction significantly increased knowledge and engagement in adult learners. Similarly, Al-Qahtani et al. (2022) found that animated videos were effective in improving adolescents' understanding of chronic disease risk factors.

The theoretical foundation of multimedia learning supports these outcomes. According to Mayer's cognitive theory, combining visual and auditory information facilitates deeper cognitive processing and enhances information retention (Mayer, 2021). When health messages are conveyed through animation, they are often easier to remember, especially for individuals with varying literacy levels.

Other studies conducted in Indonesia have reported similar results. In a study by Rizki et al. (2023), diabetic patients who received animated health education through social media platforms exhibited significant improvements in both knowledge and self-care behaviors. Likewise, the study by Virda Nita et al. (2024) demonstrated that the use of animated videos significantly improved elderly individuals' understanding of diabetes self-care practices.

Comparative Effectiveness Between Intervention and Control Groups

The comparison of posttest results between the intervention and control groups revealed a statistically significant difference, with the intervention group achieving a mean score of 84.8 compared to 68.2 in the control group ($p < 0.001$). These findings confirm that the educational intervention using animation media had a substantial effect on knowledge improvement beyond what could be expected from test-retest learning alone.

This aligns with the findings of Azmii and Ruhmawati (2024), who noted a significant improvement in knowledge among adolescents after receiving diabetes prevention education via animated videos, while control groups who received no intervention showed little to no change. Moreover, a study conducted by Sumekar et al. (2022) comparing different education methods for promoting balanced nutrition concluded that while both demonstration and animation were effective, animation offered a more engaging and memorable learning experience.

The stronger performance of the intervention group supports the assertion that active,

visually driven learning methods can outperform traditional or passive approaches, especially in community-based settings. Furthermore, animation allows for standardization of content delivery, ensuring that all viewers receive consistent and accurate health messages—a key advantage over live education which may vary depending on the educator (Barros et al., 2022).

A similar conclusion was drawn by Fitriani and Rahayu (2023), who emphasized that health education materials incorporating motion, narration, and visual metaphors are more likely to be understood and retained than static media such as leaflets or posters.

Conclusion

This study demonstrated that health promotion using animation media significantly improved knowledge about diabetes prevention among adult participants. The intervention group showed a substantial increase in knowledge levels after receiving the animated educational material, both when compared to their pretest scores and relative to the control group. These findings support the effectiveness of animated media as a powerful and engaging tool for delivering health education, particularly in community settings with diverse educational backgrounds.

Given its ability to simplify complex information and accommodate varying literacy levels, animation represents a promising medium for large-scale health promotion initiatives. The results of this study suggest that integrating culturally appropriate animation into diabetes education programs can contribute meaningfully to increasing public awareness and empowering individuals to adopt preventive behaviors. Future research should explore the long-term impact of such interventions on behavior change and clinical outcomes across broader populations.

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