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Effectiveness of infographic video-based health education in promoting diarrhea prevention behaviors among elementary school children

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ABSTRACT

Diarrheal diseases remain a major cause of morbidity and mortality among children worldwide, particularly in developing countries such as Indonesia. Inadequate hygiene practices and limited health education contribute to the high incidence of diarrhea among school-aged children. Innovative and engaging educational approaches are needed to improve children's preventive behaviors. This study aimed to assess the effectiveness of health education using video infographics in improving knowledge, attitudes, and practices (KAP) related to diarrhea prevention among elementary school children in Palembang, Indonesia. A pre-experimental study with a one-group pretest-posttest design was conducted among 104 students at Negeri 145 elementary school in Palembang. Participants received health education through video infographics covering proper handwashing, healthy eating habits, maintaining clean toilets, and appropriate waste disposal. Data on KAP related to diarrhea prevention were collected using structured questionnaires before and after the intervention. Data were analyzed to compare pretest and posttest scores. The intervention resulted in significant improvements across all measured outcomes. Mean knowledge scores increased from 6.07 to 14.13, attitudes from 28.16 to 61.36, and practices from 31.28 to 64.98 ($p < 0.05$ for all variables). These findings indicate that video-infographic-based education effectively enhanced children's awareness and adoption of diarrhea-prevention behaviors. Health education using video infographics is an effective tool for improving knowledge, attitudes, and preventive practices related to diarrhea among elementary school children. However, sustaining healthy behaviors beyond the school environment remains challenging and requires continued support from parents and communities, as well as improvements in sanitation and environmental conditions.

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1. Introduction

Diarrheal disease remains a major global health issue, especially among children in developing countries. An estimated 1.7 billion cases occur annually worldwide, contributing to substantial child mortality [1]. In 2020, diarrhea caused 36,224 deaths among children aged 5 to 14 years, and although mortality declined in 2021, diarrhea-related deaths remain considerable [2]. In Indonesia, diarrhea

remains a significant public health challenge. National data indicate a 6.2% prevalence among school-aged children (ages 5-14 years), corresponding to approximately 182,338 cases [3]. The total number of diarrhea cases across all age groups increased from 2.47 million in 2021 to 3.1 million in 2023, highlighting a persistent upward trend [4–6]. In South Sumatra Province, reported cases fluctuated but remained high, increasing from 86,487 in 2022 [5] to 95,955 cases in 2023 [6]. Similarly, Palembang City recorded a steady rise in cases, from 24,804 in 2021 to 30,535 cases, indicating ongoing local transmission [7,8].

The Gandus Health Center consistently reported high diarrhea incidence, peaking at 2,914 cases in 2023 [9]. A preliminary survey at SD Negeri 145 Palembang revealed multiple risk factors, including limited handwashing facilities, poor toilet and sanitation facilities, and frequent consumption of unsafe snacks purchased outside the home. Diarrhea among school-aged children is strongly associated with unhealthy behaviors such as inadequate hand hygiene, consumption of contaminated food, and improper waste disposal [10–12]. Evidence suggests that targeted health education can improve children's knowledge and promote preventive behaviors related to diarrhea [13].

Infographic-based educational videos are an effective and engaging medium for delivering health information to children. Videos that demonstrate proper handwashing with soap, healthy snack selection, and toilet cleanliness can improve students' understanding of diarrhea prevention and reinforce learning in an enjoyable and interactive way [14]. Such videos are particularly effective for children, as they tend to imitate behaviors modeled by characters, which can positively influence attitudes and practices related to hygiene [15,16].

Although the effectiveness of infographic videos in health education is well documented, most studies focus on general health topics rather than specific preventive behaviors related to diarrheal disease among school-aged children. Existing research shows that video-based education can enhance children's knowledge and attitudes toward hygiene and infectious disease prevention [17,18]. However, evidence on the use of infographic videos to directly support diarrhea prevention, especially in elementary school settings in Indonesia, remains limited [19–21].

Key behaviors for preventing diarrhea include proper handwashing before eating and after using the toilet, consuming hygienic snacks, and maintaining clean school sanitation facilities. The World Health Organization emphasizes handwashing with soap as a critical measure to prevent diarrhea. In school settings, children must be taught not only when but also how to wash their hands correctly. In addition, educating children to choose clean snacks, bring their own food, and avoid unhygienic street food is essential. School sanitation, including clean toilets and proper waste disposal, also plays a vital role, as poor sanitation facilitates the spread of diarrhea-causing pathogens.

The novelty of this study lies in its integrated use of infographic-based video education to address multiple diarrhea-prevention behaviors simultaneously among elementary school students. Conducted in Palembang, Indonesia, an area with consistently high diarrhea incidence, this study aims to determine the effect of infographic video-based health education on students' knowledge, attitudes, and practices (KAP) related to diarrhea prevention at State Elementary School 145 Palembang in 2025. The findings are expected to contribute evidence on the effectiveness of targeted multimedia interventions in promoting healthy behaviors among school-aged children.

2. Method

2.1. Study Design

This study utilized a pre-experimental design with a one-group pretest-posttest approach. This design was chosen to evaluate the impact of infographic video-based health education on changes in

KAP related to diarrhea prevention among elementary school students at SD Negeri 145 Palembang. The study focused on observing changes in KAP before and after the intervention.

2.2. Population and Sample

The study population comprised all students in grades II, III, IV, and V at SD Negeri 145 Palembang, amounting to 104 children. The sample included students who fulfilled the inclusion criteria: children aged 8 to 11 years, willing to participate in the educational sessions, and capable of completing the questionnaire. This study utilizes a pre-experimental design, lacking random assignment of participants, which is generally a limitation in establishing cause-and-effect relationships. The total student population at SD Negeri 145 Palembang was selected as the sample using a total population sampling technique, including all students in the specified grades in the study. This sampling method, despite the absence of randomization, contributes to the generalizability of the findings within the particular context of this school. The study's exclusion criteria comprised students who were ill during the study or absent throughout the data collection phase. This method facilitates a thorough analysis of the entire group, enhancing the representativeness of the sample relative to the school population and increasing the potential for significant conclusions within the constraints of a pre-experimental design.

2.3. Study Variables

The primary variables in this study were KAP related to diarrhea prevention. Data was collected using a structured questionnaire, which consisted of 15 knowledge questions on proper handwashing, healthy snack consumption, clean toilet usage, and proper waste disposal, with multiple-choice options (a-d). Attitudes were measured using 14 Likert scale statements (1-5: strongly agree, agree, undecided, disagree, strongly disagree) regarding students' perceptions of the importance of handwashing, healthy eating, using clean toilets, and maintaining environmental cleanliness. Practices were assessed using 15 Likert-scale items (1-5: always, often, sometimes, rarely, never) focusing on preventive behaviors such as handwashing, bringing meals from home, properly disposing of waste, and using clean toilets. All questionnaires on KAP were pretested with 30 students from a different school and validated for reliability, with all Cronbach’s alphas exceeding 0.9.

2.4. Education Procedure

Education was delivered using an infographic video created by the researchers. The video covered four essential indicators for diarrhea prevention: handwashing with soap, healthy snack consumption, toilet cleanliness, and proper waste disposal. The educational procedure involved several stages, beginning with obtaining permission from the school authorities and preparing the research instruments. The educational sessions were conducted in grades II, III, IV, and V from May 23 to June 13, 2025.

2.5. Data Collection

Data for this study were collected through questionnaires distributed to the students. The questionnaires included questions to assess KAP related to diarrhea prevention, as well as questions about the incidence of diarrhea among students in the three months prior to the education and the three weeks following the intervention. In addition, direct observations of students' hygiene behaviors at school were conducted. Data collection was performed by the researchers with assistance from school staff. The questionnaires were completed by students who met the inclusion criteria during the pretest and posttest.

2.6. Data Analysis

Data analysis was conducted using both univariate and bivariate methods. The univariate analysis was used to describe the demographic characteristics of the respondents and the students' KAP scores before and after the educational intervention using infographics and video media. A bivariate analysis was conducted using the Wilcoxon test to evaluate the impact of infographic video-based education on changes in KAP related to diarrhea prevention.

3. Results and Discussion

3.1. Results

The results of this study were obtained through frequency distributions and descriptive statistics of variables, including diarrhea incidence, respondent characteristics, and diarrhea prevention behaviors among children at SD Negeri 145 Palembang. Data gathered from questionnaires and observations showed significant changes in children's KAP regarding diarrhea prevention following the education intervention.

Table 1. Frequency Distribution of Diarrhea Incidence Among Children Before and After Educational Intervention

Diarrhea Status		Frequency	Percentage (%)
3 Months Before Education	No Diarrhea	69	66.3
	Diarrhea	35	33.7
3 Weeks After Education	No Diarrhea	94	90.4
	Diarrhea	10	9.6
Total		104	100

As shown in Table 1, the frequency distribution of diarrhea incidence among students at SD Negeri 145 Palembang indicated a notable improvement after the education intervention. Prior to the intervention, 33.7% of students reported experiencing diarrhea in the last three months. However, only 9.6% of students reported experiencing diarrhea in the last three weeks after receiving the education. This significant reduction suggests that the educational intervention, which included video infographics, successfully reduced the incidence of diarrhea among students. After the intervention, 90.4% of students did not report diarrhea, indicating the program's effectiveness in reducing its incidence.

Table 2. Demographic Characteristics of Study Participants

Respondent Characteristics		Frequency	Percentage (%)
Age	8 Years old	37	35.6
	9 Years old	24	23.1
	10 Years old	22	21.2
	11 Years old	21	20.2
Gender	Male	46	44.2
	Female	58	55.8
Parents Education	Higher Education (High School or Above)	36	34.6
	Lower Education (Elementary/Middle School)	68	65.4
Parents' Job	Parents with Formal Employment	3	2.9
	Parents with Informal Employment	101	97.1
Parents' Income	Parents' Income ≥ Minimum Wage	3	2.9
	Parents' Income < Minimum Wage	101	97.1
Total		104	100

The characteristics of the respondents, including age, gender, parents' education level, occupation, and income, were analyzed to understand potential demographic factors influencing diarrhea prevention behaviors. Based on Table 2, the majority of students were aged 8 to 9 years (35.6% and 23.1%, respectively). Additionally, most respondents were female (55.8%), and their

parents had low levels of education (65.4%). The majority of parents worked in the informal sector (97.1%) and had income below the minimum wage (97.1%).

Table 3 shows significant changes in students' KAP regarding diarrhea prevention before and after education. Prior to education, the mean knowledge score was 6.07 (out of a possible 10), while after the intervention, it increased to 14.13 (out of 15). Similarly, students' attitudes improved from a mean score of 28.16 to 61.36, and their practices increased from 31.28 to 64.98. These improvements were statistically significant, suggesting that the education intervention effectively increased students' understanding, positive attitudes, and prevention behaviors related to diarrhea.

Table 3. Changes in Knowledge, Attitudes, and Practices Regarding Diarrhea Prevention Before and After Education

Variable	Before Education (Min-Max)	After Education (Min-Max)	Mean±SD Before	Mean±SD After
Knowledge	4-10	11-15	6.07±1.05	14.13±1.12
Attitude	17-43	52-70	28.16±7.28	61.36±6.31
Practice	19-42	47-75	31.28±6.71	64.98±7.64

SD: Standard Deviation

The normality test for the KAP data, including pre- and post-education, indicated that the data were not normally distributed. Therefore, the non-parametric Wilcoxon test was used to analyze changes in each variable.

Table 4. Comparison of Diarrhea Prevention Behaviors Before and After Educational Intervention

Variable	Z value	P-value
Knowledge (Before vs After)*	-9.004	0.000
Attitude (Before vs After)*	-8.874	0.000
Action (Before vs After)*	-8.864	0.000

*Significant

The Wilcoxon test results showed that all variables KAP had significant differences before and after the educational intervention. The mean knowledge score increased significantly from 6.07 before the education to 14.13 after the education, indicating that the infographic video education significantly enhanced students' understanding of diarrhea prevention. Similarly, attitudes and practices improved significantly, with mean scores increasing from 28.16 to 61.36 for attitudes and from 31.28 to 64.98 for practices, further supporting the effectiveness of the educational intervention.

3.2. Discussion

This study demonstrated that education provided significantly increased awareness and clean-living behaviors, resulting in a marked decrease in diarrhea incidence. Diarrhea in children can be effectively prevented by promoting healthy hygiene practices, including choosing safe snacks, using clean toilets, and disposing of waste properly [22]. Improved preventive behaviors are directly linked to a reduction in diarrhea occurrence [23,24]. The higher the preventive behavior, the lower the incidence of diarrhea.

Studies indicate that individuals with higher levels of education tend to accept and process information more effectively, particularly health-related information, thereby increasing their awareness of diseases such as diarrhea [25,26]. The more information received, the more extensive the knowledge about diarrhea prevention becomes. Efforts to reduce diarrhea incidence involve utilizing available resources, especially human resources, through early detection and treatment, which can be supported by educational interventions. One of the main causes of diarrhea in children is the lack of awareness and knowledge about prevention among both children and their parents [27]. Therefore, health education in elementary schools should be prioritized because primary education is foundational in shaping habits and laying the groundwork for future development. Providing

quality health education at this level is essential for nurturing positive, active habits that children can carry into adulthood [28].

Preventive behaviors for diarrhea can be influenced by an individual's knowledge. Knowledge is derived from information about healthy living practices, disease prevention, and general health maintenance [29]. As children gain this knowledge, they begin to understand the significance of healthy behaviors, which then translates into behavioral changes that align with what they have learned [30]. Other studies have shown that respondents who apply healthy behaviors after receiving educational interventions exhibit significant improvements in their diarrhea prevention practices in elementary school settings [31]. This research aligns with Lawrence Green's behavior change model, which posits that behaviors are shaped by three key factors: predisposing, enabling, and reinforcing factors. Knowledge acquisition forms the foundation for implementing healthy behaviors [32]. The findings of this study also support behavior change theories, which assert that habit formation requires consistent and structured interventions over a period of time, such as 21 days, to effect lasting change [33].

Increasing awareness and knowledge of diarrhea-prevention behaviors is key to reducing the burden of the disease. According to this study, education prevents diarrhea in children and promotes healthy habits early on. Studies show that teaching youngsters about health topics, such as diarrhea prevention, improves their hygiene knowledge. Infographic videos have been useful in engaging children. These visually interactive videos appeal to children and make health information easier to understand and remember [34]. Furthermore, video-based education is effective in improving students' knowledge, attitudes, and practices concerning various health behaviors [35].

This study demonstrates that video infographics significantly improve students' attitudes toward preventing diarrhea. As evidenced by improvements in attitudes and behaviors following the intervention, children are more likely to engage with instructional content in a fun, visually appealing way. Videos use audio, visual, and narrative aspects to help kids grasp and retain concepts like handwashing and bathroom cleanliness, which prevent diarrhea [36]. Additionally, visualizing abstract concepts, such as the transmission of germs and viruses or the correct way to wash hands, through engaging infographics makes the information more relatable and memorable for children [37].

Moreover, studies support the notion that video-based learning not only enhances students' knowledge but also influences their attitudes toward adopting better hygiene practices. After the intervention, there was a noticeable shift in the students' attitudes towards cleanliness and hygiene, making them more conscious of the importance of proper handwashing, eating hygienic snacks, and using clean toilets [38]. These behavioral changes are essential for preventing diarrhea, as adopting healthy habits at a young age is vital for reducing long-term transmission of disease.

This study indicated a beneficial shift in KAP, although the observed reduction in diarrhea incidence is likely due to multiple interacting factors rather than the educational intervention alone. The graphic film helped pupils' KAP scores. Other factors, such as children's home settings, school sanitation, and public health efforts, also reduced the incidence of diarrhea. Thus, the video is not the single cause of the drop, but rather a significant component of a bigger health promotion system [19] [39]. This study employs total enumeration, allowing the findings on KAP scores to apply to the entire student population. The observed improvements indicate a favorable change in students' KAP regarding diarrhea prevention, directly resulting from the educational intervention. The findings indicate that video-based education effectively improves these essential health behaviors.

Furthermore, the use of infographic videos as a health education tool offers a sustainable, scalable way to disseminate important health messages to children. The engaging nature of these videos, combined with their ability to convey information in an easily digestible format, makes them

a powerful tool for schools and public health initiatives aiming to reduce the burden of diarrhea among children [40]. Other studies have also indicated that education on diarrhea prevention at the elementary school level provides a strong foundation for lifelong understanding and practice of good health. Such education not only impacts students' individual health but also contributes to the development of a healthier society overall [41].

Overall, this study confirms that health education using infographic videos significantly improves students' KAP regarding diarrhea prevention. However, for these positive changes to be sustained, continued educational efforts involving parents, teachers, and the community are necessary to reinforce these behaviors outside the school setting. The findings of this study highlight the importance of integrating interactive and engaging media into health education programs, as this approach has proven effective in fostering lasting behavioral change.

4. Conclusion

This study demonstrates that health education using infographic video media significantly improved students' KAP related to diarrhea at SD Negeri 145 Palembang. The intervention effectively strengthened students' understanding of essential hygiene practices, including proper handwashing, healthy snack selection, and the importance of maintaining clean sanitation facilities, leading to meaningful improvements in KAP outcomes. Although a reduction in diarrhea incidence was observed, this change cannot be attributed solely to the video-based intervention, as environmental conditions and sanitation improvements likely also contributed. To sustain and expand these positive behavioral changes, ongoing health education and active involvement of parents and the broader community are essential to reinforce preventive practices beyond the school environment.

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Author Contributions

The authors contributed equally to the research process. RY was responsible for the study's design, data collection, and analysis. FY contributed to the conceptualization of the study, the interpretation of results, and the writing of the manuscript. Both authors reviewed and approved the final manuscript.

Conflict of Interest

The authors declare that there are no conflicts of interest in relation to this manuscript. No funding or financial support was received for this research, and the authors have no financial relationships or interests to disclose.

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