



Comparison Between the Effect of Health Education Using Snakes and Ladders Game and Video on Handwashing with Soap Behavior of Elementary School Students

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Abstract

The high incidence of diarrhea in school-age children is often associated with poor hand hygiene; therefore, an effective intervention is needed to encourage good handwashing with soap behavior in school-age children. This study aims to compare the effect of health education using snakes and ladders game and video on handwashing with soap behavior in elementary school students. This is an experimental study using a pre-test and post-test

with a control group design. The study was conducted at SDN 2 and SDN 5 in the Bintang Sub-district, Central Aceh District, which have a high prevalence of diarrhea (37.84%) and poor handwashing behavior among students. The sample size was 30 people for each school, consisting of 10 students per intervention group selected by simple random sampling. Data analysis used the Wilcoxon and Kruskal-Wallis tests. The results showed that there was a significant increase in the mean post-test score of knowledge, attitude, and practice compared to the pre-test score in the snakes and ladders game group, video group and control group ($p < 0.05$). Among the interventions, only the use of the snakes and ladders game had a significant effect on knowledge in elementary school students compared to video (SDN 2, $p = 0.025$; SDN 5, $p = 0.040$). The health department should collaborate with schools to organize health education programs on handwashing with soap routinely for elementary school students. Schools are expected to strengthen the school health program and the role of little doctors to improve handwashing with soap behavior in elementary school students.

Keywords: Handwashing with soap, Health education, Snakes and ladders game, Video

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Introduction

Each year, there are nearly 1.7 billion cases of childhood diarrheal diseases, which account for approximately 443,832 deaths of children under 5 years of age and 50,851 deaths of children aged 5–9 years worldwide (WHO, 2024). An estimated 165,000 deaths caused by diarrhea each year could be prevented by good hand hygiene. Hand hygiene is one of the most important elements of personal hygiene, which can prevent the spread of infectious diseases. As people frequently touch their faces, food and surfaces, hands play an important role in spreading various pathogens that can transmit diseases (UNICEF & WHO, 2021). The simple act of washing hands with soap has been reported to reduce the incidence of diarrhea by 30% (Ejemot-Nwadiaro et al., 2021).

In Indonesia, reported cases of diarrhea are high, reaching an average of over 3.5 million cases per year during 2017–2021, with a mortality rate of around 525,000 children each year. The high number of diarrhea cases is associated with limited clean water, poor sanitation, poor food hygiene, and poor handwashing with soap behavior (Kemenkes RI, 2023a). Health survey data states that in Indonesia, the proportion of proper handwashing behavior is only 51.1%. Nationally, Aceh Province is among the five provinces with the highest prevalence of diarrhea in 2023 (2.5%) (Kemenkes RI, 2023b). Bintang Sub-district, located in Central Aceh District, which has the highest prevalence of diarrhea in Aceh province (11.86%), reported the second highest prevalence of diarrhea in 2023 at 38.74% among children aged 5–12 years. The health department report mentioned that poor environmental sanitation conditions and lack of hygiene behavior especially among elementary school children contributed to the high diarrhea cases in this sub-district (Dinas Kesehatan Provinsi Aceh, 2023).

Based on the results of a preliminary survey conducted at two elementary schools in Bintang Sub-district, SDN 2 and SDN 5, both schools are located close to lakes and open water sources. The community in this sub-district does not use septic tanks for the disposal of defecation waste so that it is disposed of carelessly into the lake and pollutes the water. Students in these two schools are at great risk of being exposed to water that could potentially be contaminated with



bacteria, viruses or other harmful substances that can cause disease and therefore, personal hygiene behavior is needed, such as handwashing with soap, especially after touching soil, water or dirty surfaces. However, when a preliminary survey was conducted on 43 students, it was found that quite a number of students did not know the correct steps to wash their hands (37%) and said that they only needed water to wash their hands (30.2%). Most students also disagreed with washing dirty hands with soap and running water (41.8%), even before and after eating (55.8%). The practice of handwashing with soap also shows that there are still many students who make the wrong handwashing movements with soap (48%), for example not doing the movement of placing the back of the fingers on the palm of the other hand with the fingers interlocking (48%), or not doing the right thumb movement rubbed around by the left palm or vice versa (53%). This indicates poor handwashing with soap behavior among elementary school students.

According to Skinner in Notoatmodjo (2014), behavior is an individual's response (reaction) to an external stimulus, which can be divided into covert and overt behavior. Covert behavior, which is a response that is limited to the perception of knowledge and attitudes towards the stimulus involved as yet cannot be clearly observed by others, while overt behavior is a response to a stimulus that is already apparent in the real form of practice. To encourage behavior change, such as handwashing with soap, effective interventions are needed to influence behavioral outcomes, including health promotion and education. Health promotion of handwashing with soap among school children should consider an innovative approach through effective and attractive educational media to make it easier to understand and able to influence students to adopt the behavior as part of their daily habits (Triana et al., 2024).

Videos, for example, combine visual and audio elements to present information through motion pictures accompanied by sound, which can help increase students' attention and enthusiasm for the information provided (Listiadesti et al., 2020). Other than that, various educational game related to handwashing with soap have also been developed, such as the use of snakes and ladders games. Through this media, the delivery of information can be done by learning and playing at the same time thereby attracting student interest and involving direct student participation because it



is interactive (Jannah & Djannah, 2020). This led researchers to compare the effect of health education using these two media on handwashing with soap behavior in elementary school students.

Methods

The type of research is experimental using a pre-test and post-test with a control group design. This study was conducted at SDN 2 and SDN 5 in the Bintang Sub-district, Central Aceh District. The selection of these two schools was based on the consideration that Bintang Sub-district has the second highest prevalence of diarrhea in Central Aceh District (37.8%) in the 5–12 years old age group. The buildings of these two schools are also located near lakes and open water sources that may be polluted by fecal waste. Therefore, it is very important to always have proper personal hygiene behavior, specifically handwashing with soap, especially when students play and touch the surface of lake water, in order to reduce the risk of diarrhea, but the preliminary survey results showed that students in these two schools still have poor handwashing with soap behavior.

The sample size in this study followed the recommendations of Roscoe (1975) who suggested that for experimental study using experimental and control groups, the sample size needed for each group is between 10–20 people. Thus, the researcher selected 30 students each by simple random sampling from each school consisting of 10 students for the snakes and ladders game intervention group, 10 students for the video intervention group, and 10 students for the control group so that the total sample in this study was 60 students. The samples taken were grade 6 elementary school students because they were considered more capable to cooperate and follow the directions given during the research.

The independent variables in this study are health education with snakes and ladders game and video, while the dependent variable is handwashing with soap behavior which includes knowledge, attitude, and practice domains. Knowledge, attitude, and practice variables were measured using a questionnaire consisting of 12 questions each that had been tested for validity ($r\text{-count} > 0.4227$) and reliability (Cronbach's $\alpha > 0.60$) by the researcher. Furthermore, the



variables of knowledge, attitude, and practice were each categorized into good (if the respondent's score was $\geq 76\%$ of the total score), moderate (if the respondent's score was 56–75% of the total score) and poor (if the respondent's score was $\leq 55\%$ of the total score). First, the selected samples from each school were given a questionnaire on knowledge, attitude, and handwashing with soap practice before intervention (pre-test). Next, students in each intervention group were given health education using snakes and ladders game, video, and without using any media (control). Finally, all samples were again given the same questionnaire (post-test) to assess knowledge, attitudes, and handwashing practices after intervention.

The collected data were then analyzed in univariate and bivariate. Univariate analysis aims to obtain a description of handwashing with soap behavior before and after intervention, while bivariate analysis aims to compare the mean scores of pre-test and post-test handwashing with soap behavior based on intervention groups in each school using the Wilcoxon signed rank test, and to compare the effect of health education on handwashing with soap behavior between the intervention groups in both schools using the Kruskal Wallis test with a 95% confidence level, or significant if the p -value < 0.05 .

Results

The results of the research based on the data that has been collected are described as follows:

Table 1. Overview of Handwashing with Soap Behavior Before and After Intervention at SDN 2 in the Bintang Sub-district

Handwashing with soap behavior	Snakes and ladders game group				Video group				Control group			
	Pre-test		Post-test		Pre-test		Post-test		Pre-test		Post-test	
	n=10	%	n=10	%	n=10	%	n=10	%	n=10	%	n=10	%
Knowledge												
Good	1	10	10	100	1	10	9	90	0	0	8	80
Moderate	3	30	0	0	5	50	1	10	8	80	2	20
Poor	6	60	0	0	4	40	0	0	2	20	0	0
Attitude												
Good	2	20	9	90	2	20	6	60	2	20	5	50



Moderate	5	50	1	10	4	40	4	40	2	20	5	50
Poor	3	30	0	0	4	40	0	0	6	60	0	0
Practice												
Good	4	40	10	100	2	20	10	100	8	80	10	100
Moderate	6	60	0	0	5	50	0	0	2	20	0	0
Poor	0	0	0	0	3	30	0	0	0	0	0	0

Based on the information in Table 1, it is known that at SDN 2 in the Bintang Sub-district, before being given intervention, there were still quite a lot of students who had poor knowledge (60%) and attitudes (30%), as well as handwashing with soap practices that were still moderately good (60%), but after being given health education using the snakes and ladders game, it was seen that all students (100%) eventually had good knowledge and handwashing with soap practices, while almost all students (90%) had a good attitude towards handwashing with soap.

Meanwhile, before being given intervention, there were still many students who had poor knowledge (40%), attitudes (40%), and practices (30%) regarding handwashing with soap, but after being given health education about handwashing with soap using video, all students (100%) eventually had good practices, and almost all students (90%) had improved knowledge to good. Based on the attitude domain, after being educated using video, the proportion of students who had a good attitude towards handwashing with soap also increased (60%).

The results also showed that in the control group before, most students (80%) had knowledge in the moderate category, while after being educated without using any media, the majority of students (80%) finally had good knowledge about handwashing with soap. Previously in the control group, more students (60%) had a poor attitude towards handwashing with soap, but after being given education without using any media, the proportion of students who had good (50%) and moderate (50%) attitudes increased. Meanwhile, in the practice domain before, only 80% of students had good practice, but after being educated without using any media, all students (100%) eventually showed good handwashing with soap practice.



Table 2. Overview of Handwashing with Soap Behavior Before and After Intervention at SDN 5 in the Bintang Sub-district

Handwashing with soap behavior	Snakes and ladders game group				Video group				Control group			
	Pre-test		Post-test		Pre-test		Post-test		Pre-test		Post-test	
	n=10	%	n=10	%	n=10	%	n=10	%	n=10	%	n=10	%
Knowledge												
Good	2	20	10	100	3	30	8	80	2	20	4	40
Moderate	7	70	0	0	7	70	1	10	3	30	4	40
Poor	1	10	0	0	0	0	1	10	5	50	2	20
Attitude												
Good	4	40	10	100	3	30	9	90	4	40	8	80
Moderate	6	60	0	0	4	40	1	10	3	30	2	20
Poor	0	0	0	0	3	30	0	0	3	30	0	0
Practice												
Good	5	50	10	100	9	90	10	100	5	50	8	80
Moderate	5	50	0	0	1	10	0	0	5	50	2	20
Poor	0	0	0	0	0	0	0	0	0	0	0	0

The overview of handwashing with soap behavior among students at SDN 5 in the Bintang Sub-district as seen shows that before being given intervention, most students had moderately good knowledge (70%), attitudes (60%), and practices (50%), but after being given health education using snakes and ladders game, eventually all students (100%) had good handwashing with soap behavior, from the domains of knowledge, attitudes, and practices.

Meanwhile, before being given intervention, the majority of students had moderately good knowledge (70%) and attitude (40%), and good practice (90%), but after being given handwashing with soap education using video, the proportion of students who had good knowledge (80%) and attitude (90%) increased, and all students (100%) showed good handwashing with soap practice. The results showed that in the control group, previously there were still many students who had poor knowledge (50%) and attitudes (30%), and the practice was only in the moderately good category (50%), but after being given education without using any media, the proportion of students who had good knowledge (40%), attitudes (80%), and practice (80%) increased although not as much as the group given education using snakes and ladders game or videos.



Table 3. Comparison between Pre-test and Post-test Mean Score of Handwashing Behavior with Soap Based on Intervention Group at SDN 2 and SDN 5 in the Bintang Sub-district

Handwashing with soap behavior		Snakes and ladders game group			Video group			Control group		
		Mean score		p	Mean score		p	Mean score		p
		Pre- test	Post- test		Pre- test	Post- test		Pre- test	Post- test	
SDN 2	Knowledge	6.2	11.4	0.005	7.1	10.3	0.004	7.3	10.4	0.007
	Attitude	7.7	11.1	0.004	6.7	10	0.004	7.3	9.4	0.011
	Practice	17.8	23.4	0.007	15.5	22.5	0.005	20.3	22.4	0.020
SDN 5	Knowledge	7.9	11.3	0.005	5.1	9.9	0.007	6.5	9.3	0.007
	Attitude	9.2	11.1	0.004	7.5	10.4	0.007	8.3	10.1	0.010
	Practice	18.5	22.8	0.005	16.7	21.2	0.008	18.2	21	0.007

Based on the information in Table 3 above, it is known that whether in the group given health education using snakes and ladders game, video, or the group given health education without using any media (control), there is a significant increase in the average post-test score in the knowledge, attitude, and practice domains compared to the pre-test score ($p < 0.05$) in both schools. This indicates that education using snakes and ladders game media, video media, or without using any media (control) has a significant effect on changing handwashing with soap behavior in elementary school students to become better.

Table 4. Comparison of Pre-test and Post-test Mean Rank Score of Handwashing with Soap Behavior Between the Intervention Groups at SDN 2 and SDN 5 in the Bintang Sub-district

Variables	Intervention groups	Mean rank		p-value
		Pre-test	Post-test	
SDN 2	Knowledge	Snakes and ladders game group	12.05	0.025
		Video group	16.10	
		Control group	18.35	
	Attitude	Snakes and ladders game group	13.90	0.152
		Video group	15.10	
		Control group	17.50	
	Practice	Snakes and ladders game group	15.10	0.078
		Video group	9.40	
		Control group	22.00	



SDN 5	Knowledge	Snakes and ladders game group	19.85	20.80	0.040
		Video group	11.05	13.65	
		Control group	15.60	12.05	
	Attitude	Snakes and ladders game group	13.20	14.00	0.342
		Video group	17.25	15.50	
		Control group	16.05	17.00	
	Practice	Snakes and ladders game group	17.50	20.20	0.106
		Video group	12.55	12.60	
		Control group	16.45	13.70	

The results of this study as presented in Table 4 show that there was a significant increase in the mean knowledge rank score after handwashing with soap education using snakes and ladders game (SDN 2, $p=0.025$; SDN 5, $p=0.040$). This indicates that handwashing with soap education using snakes and ladders game has a significant effect on knowledge about handwashing with soap in elementary school students, compared to the use of video and without using any media (control). Meanwhile, the results showed that handwashing with soap education using snakes and ladders game, video, or no media had no significant effect on the attitude (SDN 2, $p=0.152$; SDN 5, $p=0.342$) or practice (SDN 2, $p=0.078$; SDN 5, $p=0.106$) of handwashing with soap among elementary school students.

Discussion

Effect of Health Education Using Snakes and Ladders Game on Handwashing Behavior in Elementary School Students

The results showed that there was a significant difference between the mean scores of knowledge (SDN 2, $p=0.005$; SDN 5, $p=0.005$), attitude (SDN 2, $p=0.004$; SDN 5, $p=0.004$), and practice (SDN 2, $p=0.007$; SDN 5, $p=0.005$) before and after handwashing with soap education using snakes and ladders game, where the mean scores of post-test knowledge, attitude, and practice increased compared to the pre-test. Handwashing with soap education using snakes and ladders game also had a significant effect on knowledge, compared to the use of video and without using any media (control) (SDN 2, $p=0.025$; SDN 5, $p=0.040$).



This is consistent with research conducted by Nuranisah & Kurniasari (2020) which found that interventions using snakes and ladders game regarding handwashing with soap in preventing diarrhea were able to significantly improve the knowledge ($p=0.007$) and attitudes ($p=0.008$) of fourth grade students of SDN 003 Palaran, Samarinda City. Diapharina et al. (2023) in their research also showed that providing education using snakes and ladders game proved effective in increasing knowledge of handwashing with soap in students of SD Negeri 02 Lambu Kibang ($p<0.001$). Another study by Solekha (2022) also suggested that snakes and ladders game had a significant effect in improving the practice of handwashing with soap in elementary school children ($p<0.001$). Haiya & Ardian (2023) in their research also found that snakes and ladders game was effective in increasing school-age children's knowledge about handwashing with soap ($p<0.001$). Another study conducted by Sumasree & R (2018) also showed that snakes and ladders game can help students develop better knowledge and attitudes towards personal hygiene, including handwashing with soap practices.

The significant increase in the mean post-test scores of knowledge, attitudes, and practices compared to the pre-test scores in all groups indicates that health promotion and education is very important to do in order to shape good behavior from an early age, regardless of the type of method or approach used. On the other hand, the greater increase in the mean post-test scores of knowledge, attitudes, and practices in the snakes and ladders game and video group compared to those who did not use any media (control) indicates that the use of interesting as well as educational media can help the effectiveness of delivering information that is the target of health promotion and education itself, especially in school-age children.

The snakes and ladders game is one of the most effective health promotion media for school-age children, because it is designed with attractive images and colors, with fairly simple game rules so that all students can follow (Jannah & Djannah, 2020). This method of learning with games also involves students directly in the process thus it can help to improve concentration and encourage enthusiasm from students. Moreover, the snakes and ladders game can also help increase curiosity and hone problem-solving skills to make the content and information easier to



understand. Interactive snakes and ladders game also provides various other benefits, such as fostering a sense of humility to accept defeat, being able to be patient to wait for their turn to play, and train the ability to actively communicate with peers (Pukhraj et al., 2021).

The snakes and ladders game used in this study contains questions about handwashing with soap behavior, such as understanding, benefits, correct steps, and the right time to wash hands with soap, the adverse effects of not washing hands with soap, and hygiene and sanitation related to handwashing with soap behavior. This facilitates children to be able to learn while playing, so that the process of delivering information becomes more fun. Providing this interesting information can help build knowledge as an important basis for shaping attitudes and real handwashing practices so that eventually children are able to adopt handwashing with soap behavior as a habit in everyday life (Notoatmodjo, 2014).

Effect of Health Education Using Video on Handwashing Behavior in Elementary School Students

The results of this study indicate that there is a significant difference between the mean scores of knowledge (SDN 2, $p=0.004$; SDN 5, $p=0.007$), attitudes (SDN 2, $p=0.004$; SDN 5, $p=0.007$), and practices (SDN 2, $p=0.005$; SDN 5, $p=0.008$) before and after handwashing with soap education using video, where the mean score of post-test knowledge, attitudes, and practices increased compared to the pre-test. This is in line with research conducted by Hardianti & Yulianti (2021) which suggests that providing education about handwashing with soap can significantly improve the knowledge ($p=0.043$) and attitudes ($p=0.002$) of 5th grade students of SDN 158 Babakan Sari Kota Bandung towards the habit of washing hands with soap. Research conducted by Wilandika et al. (2023) also showed a significant increase in knowledge after being given handwashing education using animated videos in elementary school children ($p=0.001$). Handayani et al. (2021) also found that there was an effect of handwashing with soap education using audio-visual media on student behavior. The results of the study stated that handwashing with soap education with audio-visual media was able to significantly increase knowledge scores



($p < 0.001$), attitudes ($p < 0.001$), and practices ($p < 0.001$) in elementary school students. Another study conducted by Septiyani et al. (2023) also showed that health education using animated video media had a significant effect on handwashing with soap practice among elementary school children ($p < 0.001$).

Video is one of the media that can be used as a tool in the process of health promotion and education. Video media is also referred to as audio-visual media because it combines the display of motion pictures accompanied by sound that provides stimulus to the sense of sight as well as to the sense of hearing. This is very helpful to increase attention and concentration on the information presented, especially for children who like to imagine and like interesting pictures and colors. Displaying motion pictures that show the correct steps of washing hands with soap can also help children to follow and practice it directly so that it is easier to understand. In addition, the use of video media can also be shown repeatedly and is useful for delivering information to a larger target group so that it can capture more targets to be educated as part of health promotion and education (Antari et al., 2020; Kusbiantoro & Alamsah, 2021; Janah et al., 2022).

The video media in this study contains information about the benefits and the right time to wash hands with soap, diseases that can be prevented by washing hands with soap, and the correct steps of handwashing with soap, which are displayed as animated motion pictures and sounds that convey the explanation. This is expected to provide greater stimulus and new experiences for children that increase knowledge and understanding of handwashing with soap behavior so that it can further form a positive attitude, and encourage real handwashing with soap practiced in daily activities, both at school and at home (Razi et al., 2022).

Conclusion and Recommendation

There was a significant increase in the mean post-test scores of the knowledge, attitude, and practice domains of elementary school students compared to the mean pre-test scores, which were after handwashing with soap education using snakes and ladders game, video, and without using any media (control), but the greater increase in the mean post-test scores of knowledge,



attitude, and practice in the snakes and ladders game and video groups compared to the control group indicates that the use of interesting and educative media can help the effectiveness of delivering information about handwashing with soap to elementary school children. The results also showed that when the intervention groups were compared, only handwashing with soap education using snakes and ladders game had a significant effect on the knowledge domain in elementary school students compared to video and without using any media (control), but among the interventions, none had a significant effect on attitudes and practices of handwashing with soap in elementary school students.

We recommend that the health department in collaboration with schools develop a health education program on handwashing with soap for elementary school students that is held regularly to improve good handwashing with soap behavior and overall personal hygiene. For schools, we suggest to strengthen the school health effort program and the role of little doctors in disseminating information about handwashing with soap, as well as implementing activities that can improve handwashing with soap behavior in elementary school students.

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