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The Influence of Snakes and Ladders Game Media on Handwashing with Soap (HWWS) Behavior among Elementary School Students in Central Aceh District

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ABSTRACT

Diarrhea remains a leading health issue among school-aged children in Indonesia. In central Aceh District, particularly in Bies Subdistrict, the incidence of diarrhea has increased, with one the primary contributing factors being poor handwashing with soap (HWWS) practices. Health education using engaging methods, such as the Snakes and Ladders game, may improve children's behavior related to HWWS. This study aimed to determine the effect of the Snakes and Ladders educational game on HWWS behavior, including knowledge, attitude, and practice, among fourth- and fifth-grade students in the Central Aceh District. A quasi-experimental design with a nonequivalent control group was employed, involving 80 respondents divided into an intervention and a control group. The intervention group received HWWS education through the Snakes and Ladders game, while the control group received no special treatment. Data were collected using structured questionnaires and analyzed using the Mann-Whitney U Test and Wilcoxon Signed-Rank Test. Based on the results of the Mann Whitney test, it showed that there was no significant difference in knowledge between the intervention and control groups during the pretest ($p = 0.649$), but there was a significant difference in the posttest ($p = 0.002$). Attitudes showed differences both before ($p = 0.000$) and after the intervention ($p = 0.000$). Likewise, actions, there were significant differences in the pretest ($p = 0.019$) and posttest ($p = 0.000$). Meanwhile, the Wilcoxon test showed that there was a significant increase between the pretest and posttest in the intervention group, both in knowledge ($p = 0.004$), attitudes ($p = 0.000$), and actions ($p = 0.000$). The snakes and ladders educational game is effective in improving HWWS behavior among elementary school children. It is recommended as an enjoyable and innovative method for health education in school-bassed health programs.

Keywords: handwashing with soap, schoolchildren, snakes and ladders media, health behavior, health education

1. INTRODUCTION

The prevalence of diarrhea shows significant variation among provinces, with West Java recording the highest number of 186,809 cases, while North Kalimantan recorded the lowest at 2,733 cases. Aceh ranks twelfth with a total of 20,244 cases [1]. School-age children are a vulnerable group to various diseases, such as diarrhea, typhoid, and worm infections. One of the main factors causing diarrhea is poor handwashing practices with soap, especially if children do not wash their hands before eating [2].

The importance of cultivating the practice of Handwashing with Soap (HWWS) is strongly supported by the World Health Organization (WHO), which commemorates Global Handwashing Day every October 15 [3]. WHO states that proper and correct implementation of Handwashing with Soap (HWWS) can reduce the incidence

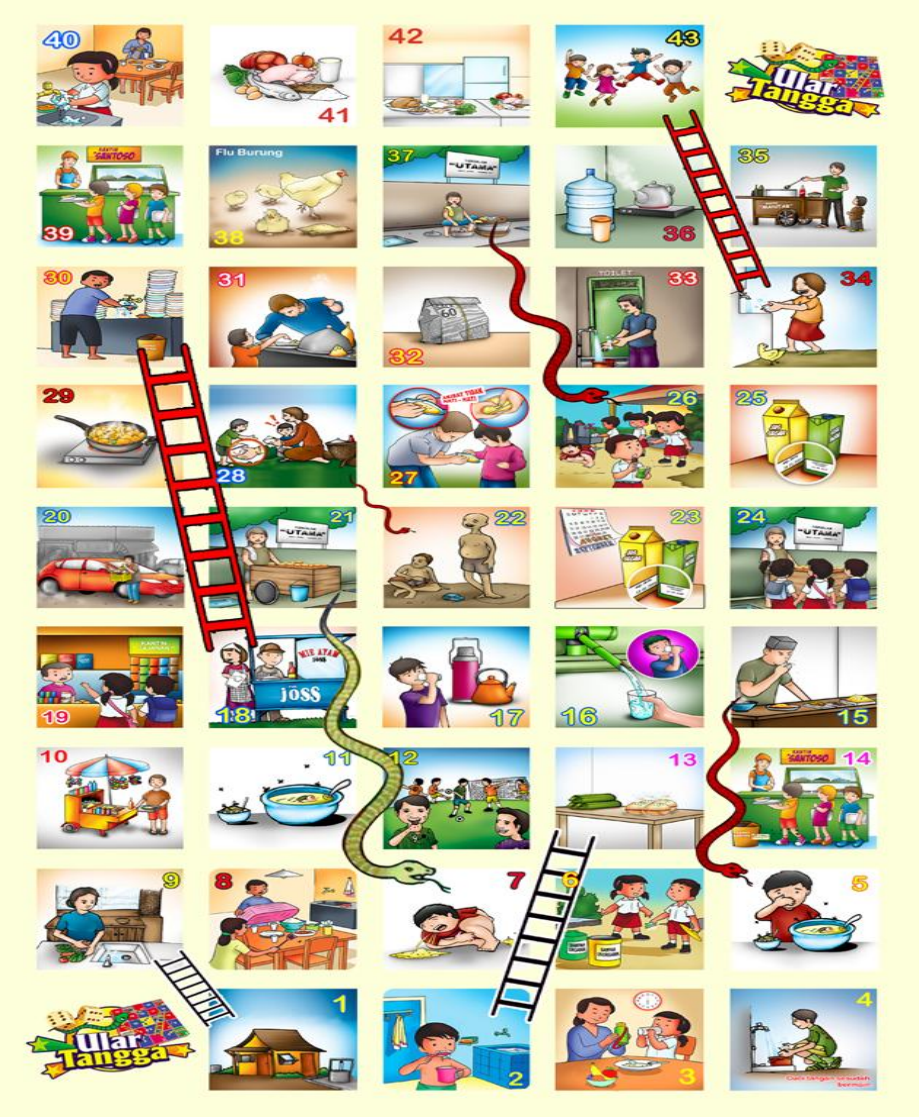
of diarrhea by up to 45%. Therefore, the habit of Handwashing with Soap (HWWS) should start from an early age [4].

Knowledge about Handwashing with Soap (HWWS) can be enhanced by using engaging media, such as the snakes and ladders game. By utilizing this game, it is hoped that students can better understand the definition, steps, benefits, and the right time to perform Handwashing with Soap (HWWS) [5, 6] . Health education through the snakes and ladders game is one form of innovation and creativity aimed at making students more interested in learning about Handwashing with Soap (HWWS). This method combines education with enjoyable play, while also training children's concentration and patience. This game involves more than two people and is designed to convey information about HWWS in an interactive and engaging way[7].

According to data from the Aceh Provincial Health Office in 2023, Central Aceh Regency ranks sixth among Aceh Province with the highest number of diarrhea cases, reaching 2,369 cases. According to reports from the Central Aceh Health Office, there has been an increase in the number of diarrhea cases in Bies District, reaching 177 cases. This figure indicates the need for attention to the handling of diarrhea in Bies District, Central Aceh Regency. Therefore, this study aims to improve the practice of Handwashing with Soap (HWWS) using the snakes and ladders game media among fourth and fifth-grade students at SDN 1 Bies, SDN 2 Bies, and SDN 4 Bies. The research results are expected to reduce the number of diarrhea cases in Central Aceh Regency.

2. METHOD

This study uses a quantitative method aimed at examining the influence among the variables of knowledge, attitudes, and actions of sixth and fifth-grade students at SDN 1 Bies, SDN 2 Bies, and SDN 4 Bies regarding Handwashing with Soap (HWWS) before and after the implementation of the snakes and ladders game media in Central Aceh Regency. In this study, the snakes and ladders and dice game media were obtained from the Lut Tawar Health Center, Takengon, Central Aceh Regency and were media from the Indonesian Ministry of Health [8]



The way or rules of playing snakes and ladders are 1) The number of players in each group is 5 people. 2) Before playing snakes and ladders begins, the respondents will be numbered, number 1-5 becomes the first player, number 6-10 becomes the second player, number 11-15 becomes the third player, and 16-20 becomes the fourth player, number 21-25 becomes the fifth player, number 26-30 becomes the sixth player, number 31-35 becomes the seventh player and number 36-40 becomes the eighth player. 3) Each player who will play stands in sequence at the box that says "Start". 4) The first player starts the game, then continues with the player with number 2 and so on. 5) Each player walks according to the number of the dice that comes out when thrown. 6) Each player who stops at the box containing the picture will take a question according to the stop number, then the player must read and explain/answer the question in a clear and loud voice, what is meant by the picture and writing. If the player stops at the box with the picture of a snake's tail, then the player must move back to the position of the snake's head and explain/answer questions based on the picture or writing in the box. Conversely, if the player stops at the box with stairs, the player will go up following the direction of the stairs and explain/answer questions based on the picture or writing in the box. If the player answers incorrectly or the answer is incomplete, the correct answer has been provided by the researcher, and 7) The student who reaches the "Finish" box first is the winner of the game

This research employs a quasi-experimental approach. The study was conducted over a period of 5 (four) months, starting from November 2024 to March 2025. The population in this study consists of students from SDN 1 Bies, SDN 2 Bies, and SDN 4 Bies in Central Aceh Regency. The total population based on registration data for the 2024/2025 academic year is 108 individuals. Data collection was obtained through direct observation of the research subjects. Data were obtained through a questionnaire given to the respondents.

The questionnaire consisted of questions that explored the knowledge variable consisted of 6 questions related to everything respondents know about Handwashing with Soap (CTPS) in running water measured using the Guttman scale. Respondents will answer questions with two answer choices. In the Favorable (Positive) answer, if the respondent chooses "True", the respondent will get a score of 1, while if the respondent chooses "Wrong", the respondent will get a score of 0. In the Unfavorable (Negative) answer, if the respondent chooses "True", the respondent will get a score of 0, while if the respondent chooses "Wrong" the respondent will get a score of 1. Then the values are totaled with a ratio measurement scale.

The attitude variable consists of 6 questions related to the condition of awareness, experience and views of respondents towards Handwashing with Soap (CTPS) in running water measured using a Likert scale consisting of 5 answers, namely "Strongly Agree", "Agree", "Undecided", "Disagree" and "Strongly Disagree". In the Favorable (Positive) answer, if the respondent chooses "Strongly Agree", the respondent will get a score of 5, if the respondent chooses "Agree", the respondent will get a score of 4, if the respondent chooses "Undecided", the respondent will get a score of 3, if the respondent chooses "Disagree", the respondent will get a score of 2, and if the respondent chooses "Strongly Disagree", the respondent will get a score of 1. In the Unfavorable (Negative) answer, if the respondent chooses "Strongly Agree", the respondent will get a score of 1, if the respondent chooses "Agree", the respondent will get a score of 2, if the respondent chooses "Undecided", the respondent will get a score of 3, if the respondent chooses "Disagree", the respondent will get a score of 4, and if the respondent chooses "Strongly Disagree", the respondent will get a score of 5.

The action variable consists of 6 questions related to individual responses or a respondent's action regarding Handwashing with Soap (CTPS) in running water using the Guttman scale. Respondents will answer questions with two answer choices. In the Favorable (Positive) answer, if the respondent chooses “Yes”, the respondent will get a score of 1, while if the respondent chooses “No” the respondent will get a score of 0. In the Unfavorable (Negative) answer, if the respondent chooses “Yes”, the respondent will get a score of 0, while if the respondent chooses “No”, the respondent will get a score of 1.

. Analysis was conducted using the paired Sample T-Test if the data were normally distributed. However, if the data are not normally distributed, a non-parametric equivalent test, namely the Wilcoxon Signed Ranks Test, will be used.

3. RESULTS AND DISCUSSION

3.1 Results

1) Normality Test

The Wilcoxon Signed Rank Test, also known as the Wilcoxon Matched Pairs Test, is a test used to analyze the significance of differences between two paired data that are not normally distributed (Sugiyono, 2019). In this study, the results of the normality test indicate that the data are not normally distributed, as shown in Table 1. Therefore, the test used to analyze the differences between the pretest and posttest is the Wilcoxon Signed Rank Test.

Table 1 Results of Normality Test

Group	Variable	Test Statistic	Sig. (p-value)	Distribution
Intervention	Pretest Knowledge	0,858	0,000	Abnormal
	Posttest Knowledge	0,756	0,000	Abnormal
	Pretest Attitude	0,900	0,002	Abnormal
	Posttest Attitude	0,814	0,000	Abnormal
	Pretest Action	0,901	0,002	Abnormal

	Posttest Action	0,768	0,000	Abnormal
Control	Pretest Knowledge	0,909	0,004	Abnormal
	Posttest Knowledge	0,892	0,001	Abnormal
	Pretest Attitude	0,960	0,165	Normal
	Posttest Attitude	0,911	0,004	Abnormal
	Pretest Action	0,847	0,000	Abnormal
	Posttest Action	0,794	0,000	Abnormal

Based on the table above, the normality test in this study was conducted using the Shapiro-Wilk because the sample size was 40 respondents. The results of the normality test indicated that most of the data were not normally distributed. In the intervention group, all variables, including knowledge, attitudes, and actions, both in the pretest and posttest, had significance values (p-values) less than 0.05. This indicates that all six variables were not normally distributed. Meanwhile, in the control group, only one variable, namely the pretest attitude, had a significance value greater than 0.05 (p = 0.165), which means that this data was normally distributed. The other five variables in the control group, including pretest and posttest knowledge, posttest attitude, and pretest and posttest actions, had p-values below 0.05, thus were not normally distributed. Overall, out of the twelve normality tests conducted, only one variable was normally distributed, while the other eleven were not normally distributed.Based on these findings, it can be concluded that the data in this study do not meet the normality assumption, so the subsequent data analysis was conducted using non-parametric statistical tests, namely the Wilcoxon Signed Rank Test for paired data, and the Mann-Whitney U Test to compare two independent groups.

2) Results of The Independent Test (Mann-Whitney U Test) between The Intervention Group and The Control Group

Table 2 Results of Mann-Whitney U Test

Variable	Time	Group	N	Mean Rank	U-Value	Z-Value	P-Value	Explanation
Knowledge	Pretest	Intervention	40	41,65	754,000	-0,455	0,649	Not Significant
		Control	40	39,35				
	Posttest	Intervention	40	48,38	485,000	-3,172	0,002	Significant
		Control	40	32,63				
Attitude	Pretest	Intervention	40	28,89	335,500	-4,497	0,000	Significant
		Control	40	52,11				
	Posttest	Intervention	40	55,03	219,000	-5,652	0,000	Significant
		Control	40	25,98				
Action	Pretest	Intervention	40	34,76	570,500	-2,343	0,019	Significant
		Control	40	46,24				
	Posttest	Intervention	40	50,88	385,000	-4,413	0,000	Significant
		Control	40	30,13				

Based on the results of the Mann-Whitney test, it is known that for the knowledge variable, the mean rank of the intervention group during the pretest is 41.65 and the control group is 39.35 with U = 754.000, Z = -0.455, and p = 0.649, indicating no significant difference between the two groups before the intervention. However, in the posttest, the mean rank of the intervention group increased to 48.38 while the control decreased to 32.63, with U = 485.000, Z = -3.172, and p = 0.002, which means there is a significant difference after the snakes and ladders media were provided.

In the attitude variable, during the pretest, the intervention group had a lower mean rank (28.89) compared to the control (52.11), with U = 335.500, Z = -4.497; and p = 0.000, indicating an initial difference. After the intervention, the mean rank of the intervention group significantly increased to 55.03, while the control group decreased to 25.98 (U = 219.000, Z = -5.652, p = 0.000). Meanwhile, in the action variable, the intervention group had a mean rank of 34.76 in the pretest and the control group 46.24, with U = 570.500, Z = -2.343, and p = 0.019 indicating a significant initial difference. However, in the posttest, there was an increase in the mean rank of the intervention group to 50.88 and a decrease in the control group to 30.13, with U = 385.000, Z = -4.413, p = 0.000. Overall, these results indicate that the snakes and ladders media has a significant effect on improving knowledge, attitudes, and actions regarding handwashing with soap among elementary school students.

3) Results of the Dependent Test (Wilcoxon Signed Rank Test) within the Intervention Group

Table 3 Results of the Wilcoxon Signed Rank Test for the Intervention Group and Control Group

Group	Variable	Z-Value	p-Value	Mean Rank (+)	Mean Rank (-)	Explanation
Intervention	Knowledge	-2,903	0,004	16,86	11,75	Significant
	Attitude	-5,394	0,000	20,42	4,00	Significant
	Action	-4,301	0,000	16,55	10,83	Significant
Control	Knowledge	-0,919	0,358	12,16	14,50	Not Significant
	Attitude	-1,420	0,156	11,93	11,30	Not Significant
	Action	-1,634	0,102	3,00	6,00	Not Significant

In the intervention group, the Wilcoxon test results showed significant changes in the three measured variables, namely knowledge, attitudes, and actions of students regarding Handwashing with Soap (HWWS) after being provided with educational media in the form of a snakes and ladders game. For the knowledge variable, a Z value of -2.903 was obtained with a p-value of 0.004, indicating a significant increase in knowledge after the intervention. This is reinforced by a positive mean rank (16.86) that is higher than the negative mean rank (11.75), indicating that the majority of students experienced an increase in knowledge scores. Furthermore, for the attitude variable, a Z value of -5.394 with a p-value of 0.000 was obtained, indicating a very significant improvement in attitudes. The positive mean rank reached 20.42, which is much higher than the negative mean rank of 4.00, indicating a shift in attitudes towards a more positive direction for most students after the intervention. Meanwhile, for the action variable, a Z value of -4.301 with a p-value of 0.000 also showed a very significant change.The positive mean rank (16.55) is higher than the negative mean rank (10.83), indicating that students showed an improvement in behavior in performing HWWS. Overall, these results indicate that the snakes and ladders game media is effective in increasing knowledge, shaping positive attitudes, and encouraging changes in the actions of elementary school students towards clean and healthy living behaviors.

In contrast to the intervention group, the control group that did not receive the intervention showed insignificant results in all three variables. For the knowledge variable, a Z value of -0.919 with a p-Value of 0.358 indicates no significant change. In fact, the negative mean rank (14.50) is higher than the positive (12.16), which may indicate a decrease in knowledge among some students. For the attitude variable, a Z value of -1.420 with a p-Value of 0.156 was also not significant, with the positive mean rank (11.93) almost balanced with the negative (11.30). This indicates that there was no meaningful change in attitudes. Meanwhile, for the action variable, a Z value of -1.634 with a p-value of 0.102 also showed insignificant results. The negative mean rank (6.00) is even higher than the positive (3.00), indicating a possible decrease in students' HWWS actions. Thus, it can be concluded that without the intervention of educational media in the form of a snakes and ladders game, students did not experience meaningful improvements in knowledge, attitudes, or actions regarding HWWS behavior

DISCUSSION

1. Students' Knowledge Before and After the Snakes and Ladders Media Intervention on Handwashing with Soap

Based on the analysis results, there was a significant increase in students' knowledge level regarding Handwashing with Soap (HWWS) after the snakes and ladders media intervention. The average knowledge score increased from 4.35 in the pretest to 5.20 in the posttest. The Wilcoxon Signed Rank test showed a Z value of -2.903 with a p-value of 0.004, a positive mean rank of 16.86, and a negative mean rank of 11.75. A p value smaller than 0.05 indicates that the increase in knowledge scores is statistically significant.

Knowledge is the result of the process of knowing that occurs after a person senses a particular object. In the context of learning, teaching activities accompanied by the use of learning media have been proven to have a better impact compared to learning without media [8]. Based on the results of this study, the snakes and ladders game has been shown to influence the increase in knowledge of students at SDN 2 Bies. This game has a positive impact because it presents visual displays in the form of interesting variations of images and colors [9]. One effective strategy for increasing children's knowledge is through the use of educational media such as the snakes and ladders game, which has been proven to convey health material interactively and enjoyably [10].

The results of this study are in line with previous findings that indicate that education on Handwashing with Soap (HWWS) through the snakes and ladders game media can significantly improve students' knowledge in efforts to prevent diarrhea [7].. This finding is supported by other research that also proves that the snakes and ladders game has an impact on increasing students' knowledge regarding Handwashing with Soap (HWWS) [11].

The habit of washing hands with soap should be instilled from an early age to become a sustainable clean living behavior. The use of snakes and ladders game media is expected to have a positive impact on increasing students' knowledge, particularly in understanding the definition, steps, benefits, and important times for Handwashing with Soap (HWWS). Health education through game media such as snakes and ladders is one form of creativity and innovation in learning that can make students more interested and motivated in learning about clean and healthy living [12].

2. Students' Attitudes Before and After the Snakes and Ladders Media Intervention on Handwashing with Soap

Based on the analysis results, there was a significant increase in students' attitudes regarding Handwashing with Soap (HWWS) after the snakes and ladders media intervention. The average attitude score increased from 21.50 in the pretest to 27.63 in the posttest. The Wilcoxon Signed Rank Test showed a Z value of -5.394 with a p-Value of 0.000, a positive mean rank of 20.42, and a negative mean rank of 4.00. A p-value smaller than 0.05 indicates that the increase in attitude scores is statistically significant.

Previous research has shown that the snakes and ladders game effectively improves attitudes [13, 14]. Research conducted by Kusumawardani stated that the snakes and ladders game significantly improves knowledge, attitudes, and skills related to Clean and Healthy Living Behavior (PHBS) in school children [15]. Other research indicates that providing education through snakes and ladders game media, PowerPoint, and x-banners can enhance knowledge, attitudes, and behaviors [16]. The snakes and ladders game can help children focus better, train teamwork skills, and remember and adhere to existing rules. As an interactive game, snakes and ladders also has various educational benefits, such as teaching how to accept victory and defeat, training patience in waiting for turns, stimulating imagination, and strengthening cooperation among players pemain [17]

Attitudes reflect emotional reactions that can be positive or negative depending on how the stimulus is received, such as agree-disagree, happy-unhappy, or good-bad. In other words, attitudes are emotional responses formed based on observations and experiences regarding an object or event in the surroundings [18]. In health education, forming positive attitudes is very important because good attitudes will facilitate behavioral changes towards healthier and more constructive directions. Therefore, interactive learning media, such as the snakes and ladders game, is very beneficial in helping instill positive attitudes in children regarding the importance of clean and healthy living behaviors.

This significant increase in knowledge can positively influence individuals' attitudes, ultimately encouraging the formation of better behaviors. The snakes and ladders game has proven to attract students' attention, making them more enthusiastic about participating in learning. Additionally, this media facilitates students' understanding of the material presented. Thus, it can be concluded that the snakes and ladders game has a positive impact on increasing students' knowledge and attitudes. In the context of health education, the increase in knowledge plays an important role in shaping students' attitudes and behaviors, particularly in handwashing practices. The higher the level of knowledge a person has, the better the attitude they tend to show towards clean and healthy living behaviors.

3. Students' Actions Before and After the Snakes and Ladders Media Intervention on Handwashing with Soap

Based on the analysis results, there was a significant increase in students' actions regarding Handwashing with Soap (HWWS) after the snakes and ladders media intervention. The average action score increased from 4.00 in the pretest to 5.23 in the posttest. The Wilcoxon Signed Rank Test showed a Z value of -4.301 with a p-value of 0.000, a positive mean rank of 16.55, and a negative mean rank of 10.83. A p-value smaller than 0.05 indicates that the increase in action scores is statistically significant.

The results of this study align with research comparing the effectiveness of snakes and ladders game media and illustrated storybooks in improving Handwashing with Soap (HWWS) practices [19]. Other research also revealed that a specially adapted snakes and ladders game can contribute to improving clean living behaviors, including the ability to wash hands with soap properly to prevent the transmission of worm infections in elementary school students [20].. Delivering health information through educational game approaches like snakes and ladders has proven effective in fostering habits of personal hygiene while improving proper handwashing practices among school-aged children, thereby potentially reducing the prevalence of soil-transmitted worm infections.

Research in India shows that a modified snakes and ladders game as an educational media has been effective in improving knowledge, attitudes, and personal hygiene practices, including handwashing with soap among elementary school children [21]. In this study, 300 students were divided into intervention and control groups, where the intervention group was provided with an educational snakes and ladders game containing ten important aspects related to clean and healthy living behaviors. Statistical analysis results showed a significant increase ($p < 0.05$) in knowledge, attitudes, and actions after the intervention compared to the control group. This research reinforces the evidence that simple game media, when designed educationally, can foster awareness and hygiene skills in children in a fun and effective manner.

4. CONCLUSION

There are significant changes in the knowledge, attitudes and practices of washing hands with soap (HWWS) in elementary school students in Bies District, Central Aceh Regency after the snakes and ladders media intervention.

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