

The Influence of Snakes and Ladders Edugames on Tuberculosis Literacy of Students at Elementary School

Andi Asmiati Nurdin¹, Ardiansah Hasin^{2*}, Zulfidayani Syafruddin³,
Andi Auliyah Warsyidah⁴

¹⁻⁴ D-III Health Analyst Study Program, Faculty of Public Health, East Indonesia University

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ABSTRACT

Introduction: This study addresses tuberculosis as a global health issue requiring early education, targeting elementary students during a key stage of behavior development. It explores the use of Snakes and Ladders as an engaging educational tool to improve tuberculosis literacy. The research aims to: 1) assess the impact of the game on students' tuberculosis literacy at SDN No. 234 Inpres Takalar Kota, 2) evaluate literacy levels before the game's implementation, and 3) assess literacy levels after its use. **Method:** This type of research is pre-experimental, namely one-group pretest-posttest design. The population in this study were all students at SDN No. 234 Inpres Takalar city numbered 314 people from 6 classes, while the sample in this study was 50 class V students who were selected using class randomization techniques. The instrument used in this research was a multiple choice tuberculosis literacy test instrument. The data in the research were analyzed descriptively and inferentially. **Results:** Descriptive analysis showed an increase in students' average tuberculosis literacy scores from 54.80 (pre-test) to 76.42 (post-test). Inferential analysis using the Wilcoxon signed-rank test confirmed a significant positive effect of Snakes and Ladders Edugames on tuberculosis literacy. **Conclusion:** the Snakes and Ladders educational game was successful in increasing students' tuberculosis literacy

Corresponding Authors: (*)

Prodi D-III Analisis Kesehatan, Fakultas Kesehatan Masyarakat, Universitas Indonesia Timur, Makassar, Jl. Rappocini Raya No. 171-206 dan Jl. Abdul Kadir No. 70, Makassar, Sulawesi Selatan 90221-9022, Indonesia.

Email: ardiansah.hasin@gmail.com

INTRODUCTION

Tuberculosis (TB) is a significant global health problem (Chakaya et al. 2021), especially in Indonesia (Hafez, Harimurti, and Martin-Hughes 2020). This disease has serious impacts, especially on vulnerable groups such as children (Atkins et al. 2022; Goyal-Honavar et al. 2020). Recognizing the importance of early literacy, especially among elementary school students, studying new approaches to learning about TB becomes relevant (Mikušová and Ekins 2017).

The importance of TB literacy in children is not only limited to understanding the disease itself (Mason et al. 2016), but also on understanding how disease spreads (Bäckdahl and Sharma 2021; Preston and Haines 2014), how to prevent transmission

(Mubarokah et al. 2021), and how to identify early symptoms and seek medical help if necessary (Organization 2014, 2022). With a good understanding of TB, children can become agents of change in preventing the spread of this disease in their communities (Lewinsohn et al. 2017). The right approach to teaching children TB literacy involves delivering information appropriate to their level of understanding (Cabrera, Morisky, and Chin 2002). Simple language (Levetown and Bioethics 2008), story (Davidson 2017), picture (Arbuckle 2014), or educational games (Baranowski et al. 2008) is often an effective method of conveying information about TB to children. Providing real-life examples of the symptoms, spread, and steps of TB transmission in everyday life can help children better understand.

Engaging children in interactive learning that builds awareness about health is key to improving TB literacy. Educational programs that involve educational games, drama, or social activities can strengthen their understanding of TB while making learning fun (Behnamnia et al. 2020).

TB literacy in children influences their knowledge about the disease and their behaviour towards health (Novita et al. 2020). Children who have good TB literacy tend to be more aware of hygiene practices (Paul et al. 2015), are more likely to adhere to precautions, and are quick to recognize symptoms that require medical attention (Zarcadoolas, Pleasant, and Greer 2006).

SDN No. 234 Inpres Takalar City was chosen as the research centre because of the diversity of students and their representation in the elementary school population in the area. The educational game of snakes and ladders was chosen as one of the interesting tools (Solekha 2022) uses to improve students' understanding of Tuberculosis. The game's interactive and engaging characteristics are believed to strengthen students' engagement. (Fitriana 2018), so they can understand this disease's information.

Previous studies have highlighted the effectiveness of educational games in strengthening understanding of subject matter. The results of the study showed that the edutainment approach at the Audifa Lab School made the learning process more enjoyable and increased children's participation, thereby fostering a love of the learning process (Zulkarnain, Mumtadzah, and Asiyah 2023). The snakes and ladders game was chosen because it has several advantages that are in accordance with the learning characteristics of elementary school children. First, this game is easy to understand and is familiar to children, with an acceptance rate of 92% in its implementation as a learning medium (Vega Vitianingsih 2016). Second, snakes and ladders allows the integration of educational content through informative question cards and game boards, which have been shown to improve student learning outcomes by up to 89.5% compared to conventional methods (Afandi 2015). Third, the competitive and collaborative nature of the game encourages active student engagement while facilitating peer learning which is essential in understanding concepts. (Asiah et al. 2021). However, there are not many studies that specifically focus on the use of snakes and ladders games as an instrument to improve tuberculosis literacy in children, especially in South Sulawesi. Therefore, this study aims to fill this knowledge gap and provide deeper insight into the effectiveness of using snakes and ladders games in the context of TB literacy in elementary school environments.

This research is also directed at contributing to the field of children's health education. By understanding the extent to which the Snakes and Ladders game can affect students' TB literacy, schools and teachers can adapt more effective and interesting learning methods to disseminate health information.

This study's formulation of the problem is 1) Does snake and ladder games influence students' tuberculosis literacy at SDN No. 234 Inpres Takalar City? 2) What was the students' tuberculosis literacy level before the snake and ladder games were implemented? 3) What is students' tuberculosis literacy level after the snake and ladder games are implemented? Based on the formulation of the problem, the purpose of this study is to 1) determine whether or not there is an influence of snake and ladder games on students' tuberculosis literacy at SDN No. 234 Inpres Takalar City, 2) determine the level

of students' tuberculosis literacy before the snake and ladder games are implemented, 2) determine the level of students' tuberculosis literacy after the snake and ladder games are implemented.

LITERATURE REVIEW

Several recent studies have shown developments in the use of learning media to improve health literacy, especially in elementary school children. Damaševičius, Maskeliūnas, and Blažauskas (2023) in his research on serious games in the health sector, he found that a game-based approach has great potential in increasing understanding and changing health behavior in children. Educational games are proven to be effective because they create a fun learning environment while maintaining structured learning objectives. Damayanti, Widayati, and Prasetyo (2024) stated that edugames are very effective in improving first aid skills for traffic accident victims. This is very much in line with the use of educational games in the health sector because they can help students understand and master lessons in an interactive, in-depth, and motivating way when designed well.

In the context of TB health education, a study conducted by Chakaya et al. (2021) underlines the importance of an age-appropriate approach in providing TB education, especially in countries with a high TB burden such as Indonesia. This finding is reinforced by research by Atkins et al. (2022) which shows that the socio-economic impact of TB in children can be reduced through effective and age-appropriate education programs.

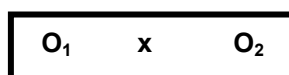
Regarding the use of traditional games for health education, Solekha (2022) has proven the effectiveness of the snakes and ladders game in improving clean and healthy living behavior in elementary school children. The results of the study showed a significant increase in understanding and practice of proper hand washing after intervention using the snakes and ladders game. In line with this, Mujiastuti et al. (2023) in his research on game-based TB education applications found that an interactive approach can significantly improve students' understanding of TB transmission prevention.

Based on the mapping of the latest literature, it can be seen that there is an opportunity for development in the use of snakes and ladders games as a TB education medium for elementary school children. Although several studies have proven the effectiveness of educational games in health learning, there is still a gap in the specific use of snakes and ladders games to improve TB literacy in children. This study seeks to fill this gap by developing and testing the effectiveness of snakes and ladders edugames that are specifically designed to improve TB literacy in elementary school students.

METHOD

This type of research is a pre-experimental design, namely a One-Group Pretest-Posttest. In this study, one group is selected through a random class technique. The group was given a test at the beginning (pre-test) to determine their TB literacy level. Furthermore, they were given treatment through snake and ladder games, then a re-test (posttest) (Elpira and Ghufroon 2015; Thahir and Rizkiyani 2017). The results of the two tests were compared to determine the effect of the snake and ladder games on the group's TB literacy. The design of this study is as follows (Knapp 2016). The design of this research is as follows.

Information: O_1 = Pretest
 O_2 = Posttest
X = Treatment



This research will be conducted at SDN No. 234 Inpres Takalar City. The population in this study were all students at SDN No. 234 Inpres Takalar City, which is 314 people from 6 classes. The sample in this study was 50 students in grade V (five). The sample was selected through class randomization. In this study, there are two variables that are operationally defined. First, the snake and ladder edugames referred to is a learning media in the form of a game printed on a 3x3 meter banner consisting of 100 numbered boxes and equipped with question cards about tuberculosis. This game is designed to be played by 3-5 students with a duration of 30 minutes per session, and is carried out as many as 3 sessions in a week. Second, tuberculosis literacy is defined as students' ability to understand and apply knowledge about TB which includes five aspects: knowledge about the causes of TB, understanding the symptoms of TB, knowledge of how TB is transmitted, understanding how to prevent TB, and knowledge about TB treatment.

The instrument used in this study was a multiple-choice test instrument consisting of 20 questions to determine students' TB literacy. The analysis was carried out descriptively and inferentially using the R Program.

The stages of the research include preparation and administration of research permits, making snake and ladder game designs, compiling instruments and validation, giving pretests, implementing snake and ladder games, and giving posttests.

RESULT AND DISCUSSION

Table 1 presents the results of the descriptive analysis of research data reflecting students' tuberculosis literacy in detail.

Table 1. Description of the Results of the Pretest and Posttest of Tuberculosis Literacy of Students at SDN No. 234 Inpres Takalar City

Tes	Min	1st Qu.	Median	Mean	3rd Qu	Max	SD
Pre-test	10	46.2	55	54.80	65	90	17.6
Pos-test	35	70.0	80	76.42	85	100	14.3

The results of the Shapiro-Wilk normality test with the R Program for pretest and posttest data show that both data sets are not normally distributed. For the pretest data, $W = 0.95091$ with a $p\text{-value} = 0.03719$ is obtained, while for the posttest data, $W = 0.93872$ with a $p\text{-value} = 0.01199$. Both $p\text{-values}$ are smaller than the 0.05 significance level, indicating the rejection of the null hypothesis stating that the data is normally distributed (Mishra et al. 2019). This distribution abnormality can be caused by factors such as limited sample size or outliers in the data (Kim 2013). However, this result does not reduce the study's validity but rather directs the selection of a more appropriate analysis method. Given that the assumption of normality is not met, using non-parametric statistical tests such as the Wilcoxon signed-rank test is more appropriate for comparing paired pretest and posttest data (Jiang et al. 2020).

Table 2. Interval of Pretest and Posttest Values of Tuberculosis Literacy of Students at SDN No. 234 Inpres Takalar City

Category	Value Interval	Frequency		Percentage (%)	
		Pretest	Posttest	Pretest	Posttest
Low	0.00 – 33,33	3	0	6	0
Medium	33,34 – 66,67	15	10	30	20
High	66,68 – 100	32	40	64	80

The results of the hypothesis test using the Wilcoxon signed rank test showed a significant difference between the pretest and posttest values of tuberculosis literacy students at SDN No. 234 Inpres Takalar City. With a test statistic value of $V = 1275$ and a very small $p\text{-value}$ ($6.256e-10$), far below the level of significance ($\alpha = 0.05$ or even 0.01), we can reject the null hypothesis and accept the alternative hypothesis stating that there is

a significant shift in location between the two measurements. This finding indicates that the snake and ladder games intervention substantially and statistically significantly improved students' tuberculosis literacy.

The study entitled "The Effect of Snake and Ladder Edugames on Tuberculosis Literacy of Students at SDN No. 234 Inpres Takalar City" involved 50 fifth-grade students as samples. This study consisted of three main stages: first, a pretest was conducted to measure students' initial tuberculosis literacy levels. Second, implementing the snake and ladder tuberculosis games as a learning intervention. Third, a posttest was conducted to evaluate changes in students' literacy levels. The effectiveness of the snake and ladder games intervention was assessed by comparing each student's pretest and posttest scores. Furthermore, this study's pretest and post-test data were analyzed descriptively and inferentially using the R Program.

Table 1 shows the results of the descriptive analysis of tuberculosis literacy data of students at SDN No. 234 Inpres Takalar City before and after the intervention. From the data, there is a significant increase in all statistical indicators. The minimum score increased from 10.00 in the pre-test to 35.00 in the post-test, indicating an improvement in students' basic knowledge. The first quartile also increased from 46.25 to 70.00, indicating an increase in understanding in the group of students with lower scores. The median score increased from 55.00 to 80.00, indicating an improvement in tuberculosis literacy in general in all students. The average (mean) score increased from 54.80 in the pre-test to 76.42 in the post-test, indicating an increase in overall understanding. The third quartile also showed an increase from 65.00 to 85.00, indicating that improvements also occurred in students with higher scores. The maximum value increased from 90.00 to a perfect value of 100. The standard deviation also decreased from 17.6 in the pre-test to 14.3 in the post-test, indicating a denser or more homogeneous data distribution after the intervention was given. The increase in all these statistical parameters indicates that the snake and ladder games that were conducted successfully increased tuberculosis literacy among students. The significant increase in the minimum value and the increase in the average and median indicate that students' understanding of tuberculosis in general has experienced substantial improvement.

The data in Table 2 shows a significant increase in tuberculosis literacy of students at SDN No. 234 Inpres Takalar City after the implementation of the snake and ladder edugames intervention. There was a positive change in distribution, where the percentage of students with low literacy categories decreased from 6% to 0%, the medium category decreased from 30% to 20%, while the high category increased sharply from 64% to 80%. This increase indicates the effectiveness of the intervention program in improving students' understanding of tuberculosis. The achievement of 80% of students with high literacy categories post-intervention illustrates the success of the program in achieving the target of increasing knowledge. However, there are still 20% of students with medium literacy categories, indicating the need for further efforts to ensure comprehensive understanding in all students. The tuberculosis literacy of students at SDN No. 234 Inpres Takalar City before the implementation of the snake and ladder games was in the moderate category, while the tuberculosis literacy of students at SDN No. 234 Inpres Takalar City after the implementation of the snake and ladder games was in the high category.

This finding is in line with research that proves the effectiveness of school-based education programs in improving the health literacy of elementary school students, especially related to infectious diseases such as tuberculosis. The study confirms that educational interventions in the school environment can effectively improve students' knowledge and awareness of tuberculosis prevention and control (Mujiastuti et al. 2023).

In the inferential analysis test in this study, the aim was to test the hypothesis and answer the research problem formulation by generalizing the results from the sample to the population (Taherdoost 2016). Before conducting an inferential test, it is important to conduct an assumption test, especially a normality test, to ensure that the data meets the

requirements of parametric statistics. The normality test evaluates whether the sample data comes from a normally distributed population, a basic assumption for many statistical tests (Kim 2013).

The results of this analysis are in line with previous research that proves the effectiveness of school-based health education programs in increasing tuberculosis literacy in elementary school students in (Mujiastuti et al. 2023). The study showed that structured educational interventions can significantly improve students' knowledge and understanding of tuberculosis, supporting the conclusion that a similar program implemented at SDN No.234 Inpres Takalar City successfully improved students' tuberculosis literacy.

CONCLUSION

The study "The Effect of Snakes and Ladders Edugames on Tuberculosis Literacy of Students at SDN No. 234 Inpres Takalar City" resulted in three main conclusions. First, there is a significant positive effect of Snakes and Ladders Edugames on tuberculosis literacy at SDN No. 234 Inpres Takalar City. Second, students' tuberculosis literacy at SDN No. 234 Inpres Takalar City was in the moderate category before the implementation of Snakes and Ladders Edugames. Third, students' tuberculosis literacy at SDN No. 234 Inpres Takalar City was in the high category after the implementation of Snakes and Ladders Edugames.

Based on the results of this study, several aspects need to be developed for the sustainability and improvement of the program's effectiveness. At the institutional level, cooperation is required between the Health Office and the Education Office of Takalar Regency in integrating Edugames ular tangga into the Tuberculosis control program in schools. Regarding technology, Edugames ular tangga can be developed in an Android-based digital format with offline features to expand accessibility. Further research is also needed to test long-term effectiveness and develop more comprehensive content variations, as well as measure its impact on changes in health behavior in a broader context. With this ongoing development, Edugames ular tangga is hoped to become a more effective tool in improving tuberculosis literacy in the community.

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