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Module-Based Health Literacy to Improve Mothers' Knowledge and Motivation in Preventing Tuberculosis in Children in Parepare City

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A B S T R A C T

Tuberculosis (TB) in children remains a public health problem in Indonesia, including in Parepare City. Mothers, as the primary caregivers, play a crucial role in TB prevention. Low maternal health literacy can lead to inadequate preventive actions. This study aims to analyze the effect of module-based health literacy on improving mothers' knowledge and motivation in preventing TB in children. The study employed a quasi-experimental design with a pre-post test control group approach. The sample consisted of 68 mothers aged 25–45 years who had children aged 0–14 years, divided equally into treatment and control groups (34 participants each). The treatment group received an intervention in the form of a health literacy module on childhood TB. Data analysis was conducted using univariate and bivariate methods. The results showed a significant increase in mothers' knowledge and motivation after the intervention in the treatment group compared to the control group ($p = 0.000$). In conclusion, module-based health literacy is effective in increasing mothers' knowledge and motivation in preventing childhood TB and can serve as an educational tool in public health programs.

INTRODUCTION

Tuberculosis (TB) is an infectious disease caused by the bacterium *Mycobacterium tuberculosis* and remains a significant global health problem. This disease can affect various parts of the body, primarily the lungs, but it can also impact other organs such as the kidneys, bones, and brain. Despite extensive efforts to control TB, it remains one of the leading causes of death worldwide (1)

Although often associated with adult populations, TB also poses a serious threat to children worldwide. Children are at a higher risk of developing more severe forms of the disease compared to adults, primarily due to their immature immune systems. After exposure to *Mycobacterium tuberculosis*, the infection can progress into latent tuberculosis, in which the bacteria remain dormant in the body without causing symptoms. However, in children with weakened immune systems, this infection can progress into active tuberculosis, which is more dangerous (2)

The World Health Organization (WHO) estimated that around 1,150,000 children under the age of 15 were infected with TB globally in 2021, with a 3.6% increase during the pandemic. In Indonesia, in 2022, a total of 110,881 TB cases were reported among children under the age of 15, accounting for approximately 15.3% of the total TB cases. Three provinces reported the highest number of TB cases: West Java, East Java, and Central Java. Children who have close contact with individuals who are smear-positive for TB (AFB-positive) are at high risk of contracting the disease. Children with TB infection today represent a potential source of TB transmission in the future (3)

In South Sulawesi, the number of TB cases in 2023 reached 23,058, with 1,605 cases occurring in children aged 0–14 years. In Parepare City, 1,305 adult TB cases were recorded in 2020. This number increased to 1,455 cases in 2021, and continued to rise to 2,810 cases in 2022. In 2023, TB cases further increased to 3,096. According to data from the Parepare City Family Planning Agency (BKKBN), there were 20 reported TB cases among children aged 0–14 years in 2023 (4) (5)

Prevention related to the level of maternal knowledge is an important factor in reducing the spread of TB in children. A study reported by Ernawati and Rahmawati in 2020 showed a correlation between mothers' knowledge about TB and their preventive behavior toward childhood TB. Low levels of maternal knowledge about TB were associated with an increased risk of TB infection in children (6)

Mothers' knowledge about tuberculosis is crucial in preventing TB in children. Mothers who have a good understanding of the causes, symptoms, and transmission of TB are more likely to take effective preventive measures. Knowledge about the importance of BCG vaccination, early signs of TB, and modes of transmission can help mothers identify risks and take preventive actions. According to a study conducted by Putri, children whose mothers had low levels of knowledge were 7,02 times more likely to contract TB (6)

In addition to knowledge, maternal motivation plays a crucial role in efforts to prevent tuberculosis (TB) in children. A highly motivated mother is more proactive in seeking information about TB, identifying risk factors, and implementing effective preventive measures. This awareness encourages mothers to ensure their children receive the BCG vaccination on time as an early form of protection against TB. Moreover, motivated mothers tend to be more disciplined in maintaining a clean environment—such as ensuring proper home ventilation, avoiding exposure to cigarette smoke, and teaching their children healthy and hygienic habits (PHBS)—to minimize the risk of TB transmission (7)

Health literacy is a set of social and cognitive skills that influence a person's motivation and ability to access, understand, and use health-related information to maintain and improve their health. Health literacy is essential for health empowerment; improving an individual's health literacy can help them better access and utilize health information (8)

According to Notoatmodjo (2012), media in health education serves to support the delivery of information, making it more effective and efficient, particularly in changing public health behavior. In Indonesia, the use of media in health education is still dominated by conventional methods such as leaflets, booklets, flipcharts, modules, and PowerPoint presentations. One of the commonly used media is the module. This medium is often the preferred choice due to several advantages, including relatively low production costs, simple development process, and ease of use. Additionally, its compact form and portability make it practical for both healthcare workers and the public as educational targets. Modules also allow for factual presentation of information through detailed descriptions and illustrations, making them easier to understand. This method is especially effective for adults, as it requires reading skills and presents clear, accessible explanations. A study by A'an Dwi Sentana, Lale Wisnu Andrayani, Moh. Arip, Muhammad Hasb, and Mardiatun (2021) in Mataram, West Nusa Tenggara, found that the use of modules significantly improved respondents' knowledge of TB and early detection of TB in children (9)(10)(11)

According to data from the Parepare City Health Office, there were 34 cases of TB in children in 2020, 5 cases in 2021, followed by an increase to 16 cases in 2022, and further rising to 20 cases in 2023. In 2023, Bacukiki Barat Subdistrict reported 5 cases, while Ujung Subdistrict reported 7 cases. Based on this background, the researcher is interested in studying the Effect of Module-Based Media on Improving Mothers' Knowledge and Motivation in the Prevention of Tuberculosis in Children.

RESEARCH METHODS

This study employed a quantitative approach using a quasi-experimental design with a pre-posttest control group design, aimed at measuring the effectiveness of a module-based health literacy model in improving mothers' knowledge and motivation in preventing childhood tuberculosis. The research was conducted in Parepare City, specifically in two subdistricts: Bacukiki Barat and Ujung, from May 28 to June 28, 2025. The study population consisted of mothers with children aged 0–14 years. A total of 68

participants were selected through purposive sampling and divided into two groups: 34 in the treatment group and 34 in the control group. The research instruments included validated questionnaires and an educational module used to assess respondents' knowledge and motivation. Data were collected through a pretest prior to the intervention, followed by distribution of the module to the treatment group, and two posttests conducted three weeks and one week after the intervention to evaluate changes in knowledge and motivation. Data collection techniques included both primary and secondary data. Data analysis was conducted using univariate and bivariate tests.

RESERCH RESULTS

Parepare City is located along the Makassar Strait coast and covers an area of 99,33 km². Geographically, it lies at the southern tip of Sulawesi Island, stretching from north to south, precisely at 4°01'0" North Latitude and 119°25'0" East Longitude. This research was conducted in two urban villages (kelurahan) within Parepare City: Lapadde (in Ujung Subdistrict) and Lumpue (in Bacukiki Barat Subdistrict). Lapadde is an urban village located in Ujung Subdistrict, Parepare City, South Sulawesi Province. It covers an area of approximately 52,219 hectares.

Table 1 Differences in Characteristics Between Treatment and Control Groups

Characteristics	Treatment	Control	p
Mother's Age (mean)	38,38	30,62	0,104*
Mother's Education	n(%)	n(%)	
High	26 (76,47)	27 (79,41)	1,000**
Low	8 (23,53)	7 (20,59)	

Based on Table 1, the average age in both the intervention group and the control group showed no statistically significant difference, as indicated by the Mann-Whitney test result with a p-value of 0,104 (p>0,05).

Regarding the highest level of education, the Chi-Square test showed a p-value of 1,000 (p> 0,05), indicating no statistically significant difference between the two groups based on educational background.

Table 2 Differences in Respondents' Knowledge and Motivation Before the Module Media Intervention

Variable	Intervention	Control	p
	Mean ±SD	Mean±SD	
Knowledge	8,21 ±2,012	8,41 ±1,579	0,640*
Motivation	46,65±4,947	43,03±3,597	0,001**

Based on Table 2, it is known that before the module media intervention was given, the average knowledge score of respondents in the intervention group was 8,21, while in the control group it was 8,41. The Mann-Whitney test showed a p-value of 0.640, indicating that there was no significant

difference between the intervention and control groups in terms of knowledge before the intervention (p>0,05).

Meanwhile, the average motivation score in the intervention group was 46,65, while in the control group it was 43,03. The independent test showed a p-value of 0,001, indicating a significant difference between the intervention and control groups in terms of motivation before the intervention (p<0,05).

Table 3 Differences in Knowledge and Motivation Between the Intervention and Control Groups After the Module Media Intervention (Posttest 1)

Variable	*Pre Test*		*Post Test 1*		P Prepost	Δ	p
	Mean±SD	Min-Max	Mean ±SD	Min-Max			
Knowledge							
Intervention	8,21 ±2,012	5-14	14,18 ±0,936	12-15	0,000*	↑5,97	0,000
Control	8,41±1,579	5-13	10,91 ±1,694	5-13	0,000*	↑2,5	
Motivation							
Intervention	46,65 ±4,947	37-60	49,62 ±3,473	42-60	0,001**	↑2,97	0,000
Control	43,03±3,597	23-40	43,65 ±2,073	40-48	0,203**	↑0,62	

Table 3 presents the analysis results of the differences in respondents' knowledge and motivation between the intervention and control groups after the module media intervention (posttest 1). Based on the Wilcoxon test, the intervention group showed a significant increase in knowledge scores from a pretest mean of 8,21 to 14,18 at posttest, with a p-value of 0,000 and a mean increase of 5,97. Meanwhile, the control group also experienced an increase in knowledge scores from 8,41 to 10,91, with a p-value of 0,000, although the improvement was smaller, with a mean difference of 2,5. The Mann-Whitney test results for the posttest between both groups showed a p-value of 0,000, indicating a significant difference between the intervention and control groups after the intervention. This suggests that the module media was effective in improving respondents' knowledge.

Regarding the motivation variable, the intervention group experienced an increase from 46,65 to 49,62, with a p-value of 0,001 based on the paired test, indicating a significant difference in motivation before and after the intervention. Meanwhile, in the control group, the motivation score increased slightly from 43,03 to 43,65, but the difference was not statistically significant, with a p-value of 0,203. The independent test also showed a p-value of 0,000, indicating a significant difference in motivation between the intervention and control groups after the intervention.

Table 4 Differences in Knowledge and Motivation Between the Intervention and Control Groups After the Module Media Intervention (Posttest 2)

Variable	*Pre Test*		*Post Test 2*				
	Mean±SD	**Min-Max**	**Mean ±SD**	**Min-Max**	**P Prepost**	**Δ**	**p**
Knowledge							
Intervention	8,21 ±2,012	5-14	14,15 ±0,925	12-15	0,000*	↑5,94	0,000
control	8,41±1,579	5-13	9,74 ±1,912	4-12	0,005*	↑1,33	
Motivation							
Intervention	46,65 ±4,947	37-60	49,94 ±3,237	42-60	0,001**	↑3,92	0,000
Control	43,03±3,597	23-40	41,88 ±1,647	38-45	0,073*	↓1,15	

Table 4 shows the differences in the knowledge variable, where the intervention group demonstrated a significant increase. The average pretest score of 8,21 increased to 14,15 in posttest 2. p-value of 0,000 (p<0,05), based on the Wilcoxon test, indicates that this increase was statistically significant, with a difference (Δ) of 5,94 points. The control group also showed an increase, from 8,41 to 9,74, with a p-value of 0,005 and a mean increase of 1,33 points. The Mann-Whitney test result for posttest 2 showed a p-value of 0,000, indicating a significant difference between the intervention and control groups.

For the motivation variable, the intervention group had an average pretest motivation score of 46,65, which increased to 49.34 after the intervention, with a p-value of 0,001 (p<0,05) based on the paired test, reflecting a mean increase of 3,92 points. In contrast, the control group experienced a decrease in motivation. The average motivation score decreased from 43,03 at pretest to 41,88 at posttest 2. Although this decrease was not statistically significant (p=0.073, p>0,05), it still showed a numerical decline of 1,15 points. The Mann-Whitney test for posttest 2 showed a p-value of 0,000, indicating a significant difference in motivation between the two groups.

DISCUSSION

In this study, the respondents selected as research samples were mothers aged 25–45 years. Mothers within this age range generally possess greater emotional maturity and social responsibility compared to younger mothers (<25 years), making them more capable of understanding and applying information provided through health interventions, including health education. Furthermore, at this age,

their receptiveness to new information, learning capacity, and self-motivation in parenting are still at an optimal level.

In addition to age, educational level also influences a person's knowledge. Education plays a crucial role in determining how well respondents understand the importance of maintaining health, including in efforts to prevent tuberculosis. Individuals with higher levels of education are generally considered more capable of understanding information. A study by Prihadi in Temanggung showed a significant relationship between education level and TB prevention behavior. The higher the level of education, the greater its influence on a person's perception and ability to absorb new knowledge. Generally, individuals with higher education tend to have better knowledge, and vice versa. Knowledge, in turn, fosters awareness and can generate motivation to take preventive actions against disease (12)(13)

Providing health education through appropriate media is an important strategy in improving public knowledge, particularly in the prevention of infectious diseases such as tuberculosis (TB). Children are considered a vulnerable group to TB transmission due to their underdeveloped immune systems. Therefore, it is necessary to educate mothers using educational media-in this case, module-based media. The results of the study showed a difference in posttest mean scores between the two groups, indicating that educational interventions using module media had an effect on mothers' knowledge regarding TB prevention in children.

Before the intervention, 79,4% of respondents believed that TB only affects the lungs and cannot attack other organs. After the intervention, 100% of respondents correctly stated that TB can affect not only the lungs but also other organs. Similarly, when asked whether TB only affects adults, 73,5% of respondents initially answered "true." After the intervention, 100% of respondents correctly answered that this statement is false.

The majority of respondents were unaware that tuberculosis can affect organs other than the lungs and that children can also transmit the disease. However, parents with good knowledge are more capable of supporting their children to avoid contracting TB. This is supported by a study by Sugion et al. (2022), which found a relationship between the level of family knowledge and efforts to prevent pulmonary tuberculosis transmission-namely, the better the knowledge, the greater the efforts to prevent TB transmission (14)

Providing education through module-based media is effective in increasing mothers' knowledge regarding the prevention of tuberculosis in children. This is because the module contains explanations about the causes, symptoms, risk factors, diagnostic procedures, modes of transmission, and prevention strategies for tuberculosis. The module is also enhanced with written content, animations, and bright colors to attract mothers' interest in reading, along with quizzes to broaden their understanding of childhood TB.

The researcher assumes that the significant increase in knowledge in the intervention group after receiving the module media intervention occurred because the media used was engaging, and the material presented was new information for the respondents, particularly regarding tuberculosis in children. This novelty likely captured the respondents' interest and attention toward the material provided. Similarly, the control group, although not given a specific intervention in the form of module media, still received general information about childhood tuberculosis. This information was delivered directly without the aid of structured visual media. Nonetheless, the delivery of general information may have contributed to a modest increase in knowledge within the control group. Therefore, although the control group did show an increase in knowledge, it was not as significant as the increase observed in the intervention group, which received the module-based intervention.

Regarding respondents' motivation prior to the module media intervention, 35,3% of respondents agreed and 17,6% strongly agreed with the statement that the BCG vaccine cannot prevent TB. After the intervention using the module media, there was a shift in motivation, with 79,4% of respondents disagreeing and 5,9% strongly disagreeing with the same statement.

The increase in scores in the intervention group indicates that the respondents had understood the information presented in the module. This is attributed to the use of simple and easily understood language, along with engaging visual animations and color combinations that effectively captured attention. According to the theory proposed by Pratama in Sentana et al. (2021), information obtained from mass media or print media influences a person's cognitive and affective functions. This aligns with previous research, which emphasized that educational interventions using modules are effective in improving both knowledge and motivation (15)

These findings indicate that respondents comprehended the content within the module. The increase in scores in the intervention group reflects their understanding of the material, facilitated by the module's user-friendly language, attractive illustrations, and visually appealing design.

The data analysis results showed that, for the motivation variable, both groups demonstrated an increase in scores between the pretest and posttest 1. However, the increase observed in the control group was not as significant as that in the intervention group, indicating that the intervention using module-based media had a greater impact on improving respondents' motivation.

The researcher assumes that the increase in motivation in the control group was due to direct intervention that occurred after the pretest was administered. This may have prompted respondents to start thinking and realizing the importance of their role in TB prevention, thereby indirectly fostering motivation during the study period. Although they did not receive module-based media interventions like the intervention group, the questions in the pretest may have served as an initial stimulus that triggered respondents' awareness.

Additionally, the less-than-optimal improvement in motivation within the intervention group may be attributed to the relatively short duration of the study, which lasted less than four weeks. This limited time frame may have been insufficient to fully strengthen the internal drive of individuals regarding TB prevention. Motivation development is a process that requires time for individuals to build awareness, develop concern, and align their intentions with personal values and experiences. Moreover, delivering educational content through modules also requires time to be fully absorbed, understood, and translated into a strong drive to take action. Therefore, the short duration of the intervention may have been one of the limitations in achieving a more optimal increase in motivation.

CONCLUSION

Based on the results of the study, it can be concluded that module-based health literacy has a significant effect on improving mothers' knowledge and motivation in preventing tuberculosis in children ($p=0,000<\alpha=0,05$). Therefore, this proven-effective health literacy module is recommended for continuous use in community education programs. Public health centers (Puskesmas) and health cadres are encouraged to integrate the use of the module into routine counseling activities, particularly for mothers with children, through collaboration with the author or module developer. Furthermore, it is recommended that future studies extend the duration of the intervention so that the educational media can be more thoroughly understood and provide an optimal impact on respondents' knowledge and motivation.

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