
Health Promotion Strategy On Increasing Public Knowledge Regarding Early Detection Of Tuberculosis At The Fransisco Borja Da Costa Fatuberliu State High School, Manufahi Regency

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Abstract

This study was conducted in the context of Fatuberliu District, Manufahi Regency, Timor Leste, as a rural area with limited health access, high unemployment rates, and a significant incidence of tuberculosis, necessitating effective health promotion strategies to improve early detection of TB among adolescents. The purpose of this study was to evaluate the effect of health education based on the Extension Program Unit on increasing public knowledge regarding early detection of tuberculosis at the Francisco Borja da Costa Filial Public High School. This study used a quantitative approach with a quasi-experimental one-group pretest-posttest design on 25 adolescent participants aged 17–25 years, with a knowledge questionnaire instrument that was tested for content validity and reliability, then analyzed using paired samples t-test and descriptive analysis. The results showed an increase in the average knowledge score from 45.40 in the pretest stage to 78.60 in the posttest, with a decrease in the proportion of respondents with less knowledge from 92.0% to 12.0% and an increase in the good category from 8.0% to 88.0%. This study concludes that structured and interactive health education in the school environment significantly improves adolescents' knowledge about early detection of tuberculosis, making it worthy of being adopted as a community health intervention model in remote areas with limited access to health facilities.

Keywords: *Community Health, Health Education, Lifestyle, Public Health, Tuberculosis.*

INTRODUCTION

Tuberculosis (TB) remains a significant global public health threat, with over 10.6 million new cases and 1.6 million deaths in 2022 according to the latest WHO report (World Health Organization, 2023). Recent trends indicate an increase in TB incidence in developing countries due to the COVID-19 pandemic, which disrupted early detection services, where over 95% of cases and deaths occurred (Nurmawati & Hendro, 2023). Scientifically, TB not only burdens health systems but also hinders economic development through productivity losses in productive age groups. Practically, community-based interventions such as counseling have been shown to be effective in reducing mortality rates by 20–30% in similar contexts (Chaisson et al., 2022). The relevance of this topic is even more pressing in the post-pandemic era, where unequal access to health care exacerbates socioeconomic disparities.

In Timor-Leste, particularly Manufahi Regency, the TB phenomenon is increasingly complex due to unique socioeconomic and geographic factors. The 2022 population census data shows that Fatuberliu District, with a population of 8,490, experienced low economic growth of only 2%, unemployment of 26% (2,179 people), and an illiteracy rate of 26.5% (2,250 people), with the majority of the population relying on traditional agriculture (63%) and fishing (1.4%) (Central Statistics Agency, 2022). Limited infrastructure access, such as impassable mountain roads during the rainy season in two villages, worsens access to community health centers, with only 75.4% of households having clean water and 82.4% having family latrines. The Fatuberliu Community Health Center (2025) report recorded low TB positive BTA cases (6 cases in 2022, rising to 14 in 2023, then dropping to 4 in 2025), triggered by strong customary beliefs that hinder early detection, even though TB dominates the top 10 diseases along with hypertension and stunting (Nurmawati & Hendro, 2023).

Previous research confirms that community-based outreach is effective in increasing early TB detection. For example, a study in Indonesia by Sari et al. (2022) found that educational interventions through health cadres increased TB screening rates by 35% in rural areas. Similarly, research in Timor-Leste by da Silva and Lopes (2024) demonstrated that university-based outreach programs successfully changed the behavior of indigenous communities in preventing drug-resistant TB. These findings are supported by a global meta-analysis that concluded that health education is effective in reducing the TB burden by up to 25% through improved knowledge and treatment adherence (Arinaminpathy et al., 2023).

However, previous research has shown inconsistencies, particularly in multifactorial contexts. While Sari et al. (2022) highlighted the success of a single extension program, da Silva and Lopes (2024) found failure in mountainous areas due to poor infrastructure access, with only 15% of participants cooperating due to traditional beliefs. Another study in Southeast Asia by Nguyen et al. (2023) reported that high unemployment and lack of clean water contributed 40% to the failure of TB interventions, but neglected cultural variables. The main limitations of these studies are their methodological approach, which focused on urban (rather than rural) mountain areas, homogenous samples without integration of economic data, and the lack of longitudinal measurement of post-extension behavior.

A clear research gap lies in the lack of comprehensive studies integrating multifactorial factors—such as infrastructure access, unemployment, sanitation, and traditional beliefs—in TB education interventions in rural indigenous communities in Timor-Leste. Unlike previous, fragmented studies, this study explicitly formulates the question: Does Tri Dharma-based TB education influence early detection amidst challenges of road access, poor sanitation, and high unemployment in Fatuberliu District? This formulation is compelling because it addresses the contradictions in the literature with a holistic approach.

This study aims to examine the impact of TB education on early detection and community behavioral change, while analyzing the impact of lack of clean water, sanitation, unemployment, knowledge, and road access on health in Fatuberliu. The urgency is pressing considering the increase in global TB cases post-2023 and the commitment of the 2002 Timor Leste Constitution, Article 57 paragraph (1) on the right to health (Fatuberliu Health Center, 2025). The novelty lies in the Tri Dharma intervention model that integrates local solutions (e.g., mutual cooperation for road repairs), differing from conventional approaches. The theoretical contribution enriches the multidimensional TB literature in developing countries, while the practical one improves the welfare of partners through economic independence and TB prevention.

RESEARCH METHODS

This research uses a quantitative approach with a quasi-inquiry design type.-one-group pretest experiment-posttest to measure the effectiveness of counseling interventions on tuberculosis and hypertension in adolescents at Francisco Borja Dacosta State Senior High School, Fatucahi Village, Fatuberliu District, Manufahi Regency, TimorLeste. This design was chosen because it was able to describe changes in knowledge before and after the intervention without a control group, in accordance with the characteristics of remote locations and logistical limitations, in line with Sugiyono's (2022) principle which emphasizes that a single-group design with a pretest-The posttest is suitable for application in the context of education and community health services. This design is also relevant to school-based health education intervention studies that show that pretest-posttests can capture significant improvements in adolescent knowledge (Sari et al., 2022; Sitorus et al., 2023).

The study population consisted of all students of Francisco Borja Dacosta State High School in Fatucahi Village aged 17–25, considering this age group to be a productive age group vulnerable to

infectious diseases and responsive to health education. The study sample consisted of 25 participants selected through purposive sampling based on inclusion criteria of age, availability to participate in activities, and absence of acute illnesses that interfere with concentration. Exclusion criteria included serious medical conditions that hinder participation. This sampling technique aligns with the logic of quantitative research that prioritizes the representation of subgroups relevant to the problem, as recommended by Emzir (2021) and Sudaryono (2023) in the context of education and public health research. This approach allows for a focus on the characteristics of the target group most vulnerable and responsive to TB education interventions.

The research instrument used was a closed-ended, knowledge-based questionnaire designed with key indicators in mind: definition, signs and symptoms, risk factors, prevention, treatment, early detection, and complications of tuberculosis. The questionnaire consisted of 10 multiple-choice questions with one correct answer. It was designed based on public health concepts and Timor-Leste's national TB guidelines, and adapted to the local context regarding customary beliefs and access to healthcare. The instrument pilot phase involved content validity testing through expert assessment by the chief implementer and field supervisor. Internal reliability testing was conducted using a pilot approach on a small subgroup not included in the sample. This was then measured using Cronbach's alpha coefficient using SPSS software. Reliability results above 0.7 indicated adequate internal consistency, in line with psychometric standards for health questionnaires (Polit & Beck, 2021; Sari et al., 2022).

The research procedure was carried out through three main stages: preparation, implementation of counseling, and evaluation. During the preparation stage, the researcher coordinated with the school principal to arrange the setting of the place, time, and number of participants, as well as to test the readiness of the media (laptop, projector, and mobile phone camera) to support the presentation of the material according to the Counseling Event Unit (SAP). The core activity took place on March 16, 2026, with 25 participants under the auspices of the Fatuberliu Community Health Center, which included an opening, pretest, presentation of tuberculosis and hypertension material for 60 minutes, a 40-minute interactive discussion, a posttest, and a closing, with a total time allocation of approximately 120 minutes. This stage was closely monitored by residency students and field supervisors to ensure consistency in material delivery and participatory interactions, an approach that aligns with recommendations for health education-based community service methods (Nurmawati & Hendro, 2023; Sitorus et al., 2023).

Data analysis was conducted using a simple descriptive and inferential statistical approach using SPSS version 26 software. Knowledge data were obtained from pretest and posttest results in the form of quantitative scores, then converted to a categorical scale (e.g., low, medium, high) for ease of interpretation. Data normality was checked using the Shapiro-Wilk test, and appropriate statistical tests were used to test for mean differences between the pretest and posttest (paired t-test if data were normal or the Wilcoxon signed-rank test if not). Furthermore, descriptive frequency and percentage analyses were conducted to illustrate the distribution of responses and changes in knowledge for each item, so that they could be linked to the goal of improving adolescents' understanding of early detection, prevention, and treatment of TB. This approach aligns with health education research practices that combine descriptive analysis and before-after difference tests to measure the impact of interventions (Polit & Beck, 2021; Sari et al., 2022).

The ethical aspects of the research were strictly adhered to by obtaining informed consent from the school principal, participants, and the Fatuberliu Community Health Center, including an explanation of the purpose, benefits, and the right to withdraw at any time without consequence. Knowledge data was collected anonymously, with no names included on the questionnaire, only respondent codes, to maintain confidentiality. All data was stored encrypted and accessed only by the research team, and used solely for academic purposes. This research also adhered to the principles of

justice and concern for the context of indigenous communities that still hold strong traditional beliefs. Therefore, the counseling materials were formulated in a culturally sensitive manner and did not force participants to abandon their traditional beliefs, but rather integrated them with modern health services. This ethical approach aligns with guidelines for public health research in developing countries, which emphasize community involvement, respect for local values, and protection of participants' rights (World Health Organization, 2021; da Silva & Lopes, 2024).

RESULTS AND DISCUSSION

Output

Fatuberliu Community Health Center, located in the eastern sector of Manufahi Regency, has a health service area in five villages, namely Clacuc, Fatucahi, Caicasa, Fahinehan, and Bubususu, with a population of 8,490 people. This community health center is the main health facility in Fatuberliu District, providing health services such as delivery rooms, immunization services, infectious disease services (TB, STI), non-communicable diseases such as chronic diseases, dental health, mental health, emergency services, laboratory analysis services, pharmacy, nutrition, and environmental health, and does not provide inpatient care. Telephone contact +670 75180326

Vision and mission

Vision and Mission Vision of the Fatuberliu Community Health Center, Fatuberliu District, Manufahi Regency: to become a Community Health Center with excellent, high-quality and trusted health services in the Fatuberliu District and surrounding areas, and to play an active role in improving public health.

Human Resources

Human Resources at the Fatuberliu Community Health Center, Manufahi Regency are as follows:

Table 1. Classification of Health Workers Based on Health Professions at Fatuberliu Community Health Center

Health Professions	Total	Percentage (%)
Doctor	3	7.1
Nurse	11	26.2
Midwife	10	23.8
Lab and Dental Techniques	2	4.8
Public Health	4	9.5
Administration and Finance	9	21.4
Pharmacy	3	7.1
Total	42	100.0

Source: SPSS version 23

Based on this table, it shows that the number of health workers who carry out health services at the Fatuberliu Health Center, Manufahi Regency is 42 people and can be explained as follows: 3 Doctors (7.1%), 11 Nurses (26.2%), 10 Midwives (23.8%), Laboratory Engineering and Dental Engineering 2 people (4.8%), Public Health 4 people (9.5%), Administration and Finance 9 people (21.4%) and Pharmacy 3 people (7.1%).

Table 2. Classification of Health Workers Based on Education Level Working at the Fatuberliu Community Health Center, Manufahi Regency

Level of education	Total	Percent %
Bachelor	17	40.5
3-year diploma	15	35.7
Diploma-1	3	7.1
High School	7	16.7
Total	42	100.0

Source: SPSS version 23

Based on the table above, it shows that the number of health workers working at the Fatuberliu Health Center in Manufahi Regency is 42 people and can be explained as follows: Health workers with a Bachelor's degree are 17 people (40.5%), Diploma-III are 15 people (35.7%), Diploma-I are 3 people (7.1%), and health workers with a high school education are 7 people (16.7%).

Table 3. Classification of Health Workers Based on Health Skills who work at the Fatuberliu Community Health Center, Manufahi Regency

Categorical Skills	Amount	Percent %
Health Engineering	29	69.0
Non-Technical	13	31.0
Total	42	100.0

Source SPSS version 23

Based on the table above, it shows that the number of health workers who carry out health services at the Fatuberliu Health Center, Manufahi Regency is 42 people and can be explained as follows: Health technicians number 29 people (69.0%), and non-technicians number 13 people (31.0%).

Table 4. Summary Data of Pre-Test and Post-Test Results Regarding the Level of Public Knowledge Regarding Tuberculosis at the Fatuberliu Community Health Center

RESPONDENTS	PRE-TEST	POST TEST
1	30	70
2	40	80
3	50	95
4	60	90
5	70	95
6	40	70
7	30	85
8	20	65
9	65	85
10	55	70
11	45	85
12	30	75
13	20	60
14	30	80
15	50	75
16	20	65
17	40	80
18	60	80
19	40	75
20	60	80
21	70	85
22	30	70
23	65	75
24	55	85
25	60	90

Evaluation

The evaluation was conducted to identify errors or deficiencies in the creation of PowerPoint and leaflet materials for self-directed acupressure education. Revisions were then made based on suggestions and feedback. One method of evaluation was the paired sample t-test.

Table 5. Test of Narmality

	Kolmogorov-Smirnova			Shapiro-Wilk		
	Statistics	df	Sig.	Statistics	df	Sig.
Pre-Test Score Results	.149	25	.156	.929	25	.082
Test Post	.120	25	.200*	.967	25	.577

*. This is a lower bound of the true significance.

a. Lilliefors Significance Correction

Analysis of data normality test on 25 respondents using Shapiro Wilk

Basic Concepts of Analysis

The Shapiro-Wilk normality test determines whether research data is normally distributed. It is typically used as a criterion in independent sample t-tests, paired sample t-tests, and ANOVA tests. This statistical test is typically used for small samples (<30).

Basis for Decision Making

1. If the Sig value > 0.05 then the research data is normally distributed
2. If the Sig value is < 0.05, the research data is not normally distributed.

Interpretation of Statistical Age Results

- A. Based on the statistical test table above, it shows that the number of samples is less than 30 respondents, so we analyze the data using the Shapiro Wilk test to determine whether the data is normally distributed or not.
- B. Based on the results of the Shapiro Wilk statistical test on the community knowledge variable at the Francisco Borja Dacosta State Senior High School in Fatuberliu sub-district, Manufahi district, at the Pre-test stage, it shows that the significance value is $0.082 > 0.05$, so it can be concluded that the Knowledge variable before providing counseling about tuberculosis (Pre-Test) can be stated as having normal distribution data.
- C. In the community knowledge variable at Borja State Senior High School in Fatuberliu District, Manufahi Regency (Post Test) shows that the significance value is $0.577 > 0.05$ so it can be concluded that the knowledge variable (Post Test) has normal distribution data.

Table 6. Paired Samples Statistics

		Paired Samples Statistics			
		Mean	N	Standard Deviation	Std. Error Mean
Pair 1	Pre-Test	45.40	25	16,197	3,239
	Test Post	78.60	25	9,301	1,860

Source SPSS version 23

The Paired Samples Statistics table shows the descriptive value of each variable in the paired sample. 1. The pre-test value has a mean value of 45.40 from 25 data. 2. The post-test value has a mean value of 78.60 from 25 data. This shows that the post-test value is higher than the pre-test. The Std. Deviation data is getting smaller and the Std. Error is getting lower.

Table 7. Paired Samples Test

		Paired Samples Test							
		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Standard Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
Pair 1	Pretest - Posttest	-33,200	12,066	2,413	-38,181	-28,219	-13,758	24	.000

Source SPSS version 23

The significance value (2-tailed) of the data shows 0.000 ($p < 0.05$), so the results of the pre-test and post-test values experienced significant changes (meaningful). Based on descriptive statistics of the pre-test and post-test values, it is proven that the post-test value is higher, it is concluded that the post-test value has increased from the pre-test, which means there is an increase in knowledge about early detection of tuberculosis after education using power point media, leaflets, and demonstrations.

Table 8. Frequency Distribution of Respondents' Knowledge About Tuberculosis (Pre and Post Test)

No	Categorization	Pretest (%)	Posttest (%)
1	Good	8.0	88.0
2	Not enough	92.0	12.0
Total		25	100

Source SPSS version 23

Based on the table above, it can be seen that the difference in respondents' knowledge before and after being given education about tuberculosis increased. During the pretest, the knowledge of students in the category of lacking knowledge about tuberculosis was 23 people (92.0%) and increased after being given education about tuberculosis knowledge to students in the good category as many as 22 people (88.0%).

Outcome

Based on the frequency distribution table, it shows that respondents' knowledge before and after being given education about tuberculosis increased. During the pretest, students' knowledge in the category of lacking knowledge about tuberculosis was 23 people (92.0%), and increased after being given education about tuberculosis knowledge to students in the good category as many as 22 people (88.0%). This shows that there is a difference before and after the implementation of counseling. As the results of community service from (Saputra et al., 2020), there was a difference before and after health counseling on tuberculosis prevention at the Sabilunnajat Islamic Boarding School.

And Based on the results of the Paired Samples Statistics evaluation, the descriptive value of each variable in the paired sample is shown as follows: 1. The pre-test value has an average value (mean) of 45.40 from 25 data 2. The post-test value has an average value (mean) of 78.60 from 25 data. This shows that the post-test value is higher than the pre-test so that the students' knowledge has increased by an average of 78.60 from 25 students so that students are able to recognize the importance of early detection of tuberculosis. This shows that during the counseling of residency students, direct observation during the activity, the students felt happy and interested in following each session presented. Many of them said that it was their first time getting knowledge about the high risk that will occur if there is a delay in carrying out early detection of tuberculosis. In addition, methods such as quiz games, group discussions, interactive stories, and role plays helped them understand the material without feeling bored. The results of this activity are in line with research by (Notoatmodjo, 2018), knowledge is everything that is known, understood, or realized by a person. Knowledge can be in the form of facts, concepts, theories, or skills. Knowledge that emphasizes observation and sensory experience is called empirical knowledge or a posteriori knowledge. Discussion approaches, interactive presentations, and educational games have proven effective in helping students understand relatively new material.

The results of this community service activity demonstrated the enthusiasm and active participation of all students. The activity began with a socialization and provision of educational materials on tuberculosis, starting from the definition of the disease, signs and symptoms, epidemiology of the disease, diagnosis, treatment, and prevention through a presentation using PowerPoint instruments and laptops. After the presentation, the material continued with a discussion stage. The students actively followed this material interactively. They were enthusiastic in paying attention to the presentation and discussion which was interactive and easy to understand, students showed high enthusiasm and involvement in participation. Next, students were invited to brainstorm, and educational Q&A sessions related to the treatment and prevention of tuberculosis and hypertension. This encouraged and encouraged students to ask more open questions and share their

personal experiences regarding the positive and negative impacts in the treatment process of tuberculosis and hypertension. In general, this activity produced several main achievements. First, there was an increase in students' understanding of tuberculosis, especially the early diagnosis, treatment, and prevention of tuberculosis and hypertension, demonstrated by students' ability to distinguish between appropriate and inappropriate behavior in the early detection of both diseases. Second, students were able to identify personal information that should not be shared online, such as home addresses and telephone numbers. Third, students begin to be able to demonstrate a critical attitude after attending counseling by considering the impact on themselves and others.

Obstacle

Obstacles encountered during the outreach included a lack of transportation to support the implementation of health education for the community. The outreach material used medical terminology, making it difficult for some students to understand until the question-and-answer session. There were no speakers to explain the outreach material, and television was unavailable to present tuberculosis patients participating in the treatment program..

Obstacles faced by the Fatuberliu Community Health Center include a shortage of medical personnel and limited transportation, particularly multi-purpose vehicles for evacuating emergency patients and for healthcare workers conducting visits to rural areas. Laboratory facilities are inadequate, particularly in terms of comfort and safety for healthcare workers. Infrastructure is inadequate, particularly with increased healthcare staff but inadequate facilities for adequate patient care. Detection of new tuberculosis cases remains low. Child and maternal mortality rates remain high, with malnutrition a major issue.

Follow-up Recommendations

After community service was carried out at the Fatuberliu Health Center, there are still types of activities that need to be followed up in the future, as follows:

- A. There is a need for additional medical staff at the Fatuberliu Community Health Center
- B. It is necessary to expand the Community Health Center building to accommodate all health service programs.
- C. It is necessary to add car transportation units to facilitate health center activities.
- D. It is necessary to carry out extension services periodically and in a varied manner to facilitate the public's understanding of the extension materials.
- E. Counseling is carried out focusing on the level of urgency in the community.
- F. Cross-sectoral coordination is needed to improve road access to two isolated villages in mountainous areas.

CONCLUSION

This study shows that a health promotion strategy through outreach based on the Extension Program Unit (SAP) is able to improve the knowledge of adolescents at the Francisco Borja da Costa Filial Public High School, Fatuberliu, regarding the early detection of tuberculosis. The analysis results before and after the intervention showed a significant increase in the average knowledge score, accompanied by a shift in the knowledge category from the majority of respondents being in the low category to the majority being in the good category. The interactive outreach, supported by presentation media, discussions, and question and answer sessions, was proven to make the material easier to understand and increase student interest and active participation, so that they were able to recognize the signs and symptoms of TB, the importance of early detection, and methods of prevention and treatment.

Overall, the findings of this study suggest that structured health education interventions in schools can be an effective strategy for increasing adolescent awareness about infectious diseases,

particularly in remote areas with limited access to healthcare. However, this study has limitations, including the lack of a comparison group, a relatively small sample size, and a focus on knowledge that does not fully reflect long-term behavioral changes. Future research is recommended to employ a more robust design, include a qualitative component to understand cultural perspectives and community beliefs, and evaluate the impact of the intervention on TB case detection in health facilities. Practical implications include the need for regular outreach, strengthening the capacity of community health centers, and cross-sectoral engagement to improve infrastructure and service access, so that increased knowledge can translate into reduced TB incidence in the region.

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