

## **SURAT KETERANGAN**

Nomor: 150-UNUSA-LPPM/Adm-I/II/2024

Lembaga Penelitian dan Pengabdian Kepada Masyarakat (LPPM) Universitas Nahdlatul Ulama Surabaya menerangkan telah selesai melakukan pemeriksaan duplikasi dengan membandingkan artikel-artikel lain menggunakan perangkat lunak **Turnitin** pada tanggal 05 Februari 2024

Judul : Preventive behaviors toward transmission of pulmonary tuberculosis

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No. Pemeriksaan : 2024.02.06.089

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# Preventive behaviors toward transmission of pulmonary tuberculosis

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**Submission date:** 05-Feb-2024 12:16PM (UTC+0700)

**Submission ID:** 2286655582

**File name:** tive\_behaviors\_toward\_transmission\_of\_pulmonary\_tuberculosis.pdf (304.32K)

**Word count:** 5063

**Character count:** 26591

## Preventive behaviors toward transmission of pulmonary tuberculosis



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### ABSTRACT

**Introduction:** Indonesia was ranked as the second largest country in the world as a person with pulmonary Tuberculosis (TB) after India. This shows that there needs to be action to reduce the transmission of pulmonary TB, especially in family members who are in the same house. The purpose of this study was to identify factors related to preventive measures for the transmission of pulmonary tb in the city of Surabaya.

**Methods:** Quantitative research design with a cross-sectional approach, respondents were pulmonary TB sufferers aged > 15 years old for treatment at the East Perak Health Center and Jagir Health Center was totaling 262 respondents. Research variables include gender, age, education, patient category, drug ingestion supervisor, regularity of drug ingestion, search for treatment, knowledge, attitudes, and behaviors towards TB disease are obtained through the dissemination of questionnaires. Furthermore, data processing and statistical tests through ( $X^2$ ) chi square and linear regression.

**Results:** The results showed that gender, age, education, patient category, drug ingestion supervisor, regularity of drug ingestion, search for treatment, knowledge, attitudes, and behaviors towards TB disease significantly affect the prevention of pulmonary Tb transmission.

**Conclusion:** Pulmonary TB patients and family members need to remind each other to behave clean and healthy to prevent the transmission of pulmonary TB. It is very necessary to visit regularly from health services or health workers, to provide education about clean and healthy living behaviors.

**Keywords:** behavior, preventive, pulmonary, transmission, tuberculosis.

**Cite This Article:** Setiyowati, E., Khamidah., Khamariyah, N., Setianto, B., Hatmanti, N.M., Bistara, D.N., Wardani, E.M. 2023. Preventive behaviors toward transmission of pulmonary tuberculosis. *Bali Medical Journal* 12(3): 3376-3381. DOI: 10.15562/bmj.v12i3.4429

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Received: 2023-05-27

Accepted: 2023-10-29

Published: 2023-11-30

### INTRODUCTION

Tuberculosis (TB) was an infectious disease caused by infection with mycobacterium tuberculosis.<sup>1</sup> Tuberculosis was the 9<sup>th</sup> leading cause of death in the world and the leading cause of a single infectious agent ranked above HIV/AIDS.<sup>2</sup> Indonesia is ranked 2nd largest country in the world as a contributor to pulmonary TB sufferers after India, with an estimated incidence of 845,000 cases or 312 per 100,000 population and mortality of 92,000 or 34 per 100,000 population (other than HIV TB).<sup>3</sup>

The achievement of tb program performance indicators, namely the discovery and treatment of TB cases and the success of tb case treatment.<sup>4</sup> In 2020, the discovery and treatment rate of all TB cases in East Java ranked eighth in Indonesia with 42,922 cases with Treatment Coverage (TC) of 44.7%.

The target treatment coverage (TC) set is at least 80%.<sup>5</sup> The next achievement of performance indicators is the success rate of treatment of TB cases.<sup>6,7</sup> In 2020, the number of all TB cases that recovered and completed complete treatment was 57,606 cases from 64,764 cases treated so that the success rate or Treatment Success Rate (TSR) of East Java Province reached 88.9% with the target set by the Indonesian Ministry of Health of  $\geq 90\%$ .<sup>5</sup>

Based on the achievement of the success rate of TB treatment in each Regency/City, as many as 18 regencies/cities have achieved the target of treatment success above 90%. The success rate of pulmonary tb treatment in the city of Surabaya has reached 90.62%, it has reached a very good treatment target.<sup>8</sup> As many as 82% of TB sufferers are of productive age, so that with the recovery and completion of community treatment

from TB disease, productivity can increase and live normally in the community.<sup>9</sup> Meanwhile, this study is more revealing in people with pulmonary TB who have an advanced age, where they are susceptible to other infectious diseases.<sup>10</sup> Some cases of the elderly suffering from pulmonary TB disease were found with comorbidities of other diseases.<sup>11</sup>

Breaking the chain of transmission and preventing recurrence is the main goal in handling TB.<sup>12</sup> Behaviors to prevent the transmission of pulmonary TB are carried out to prevent an increase in pulmonary TB transmission in people in the surrounding environment, especially transmission to families living in the same house.<sup>12</sup> Family members who live in the same house are one of the subjects that are easily transmitted.<sup>13,14</sup>

Understanding and individual knowledge about pulmonary TB

disease including ways of transmission, dangers, ways of treatment will affect a person in carrying out preventive measures.<sup>15</sup> Therefore, it is important to understand further the factors related to tb transmission prevention measures to reduce infection transmission to the surrounding community.<sup>16</sup> The general purpose of this study is to explore preventive behaviors against transmission in people with pulmonary TB.

## METHODS

### Study Design

This study is a cross-sectional study. The population of all pulmonary TB sufferers in the work area of the East Perak Health Center and Jagir Health Center as many as 298 respondents, however, the questionnaire returned 262 respondents. The criteria in the study were all pulmonary Tb patients who were disabled in the hospitals and health centers of the study locations with the age of > 15 years.

### Data Collection

Patients were interviewed using questionnaires that included variables of

gender, age, education, patient categories, drug ingestion supervisors, drug ingestion regularity, search for treatment, knowledge, attitudes, and behavior towards TB disease. The education category is divided into two categories, namely low education (not going to school, graduating from elementary school, and graduating from junior high school) and higher education (graduating from high school, diplomas, and undergraduates).<sup>17</sup> Behavioral variables including the wearing of masks, sputum and spit management, coughing/sneezing etiquette, maintenance of hand hygiene, treatment, maintenance of home health, and efforts to prevent transmission of household contact totaled 16 questions.<sup>18</sup> Each variable was given a score of 1 when done, and 0 if not done.

### Data analysis

Then it is analyzed descriptively and categorized mediumly from the total score obtained  $\geq$  median (11) from all total scores of respondents, then categorized respondent behaves well and vice versa.<sup>19</sup> Bivariate analysis  $X^2$  (*chi square*) to see the relationship between respondent

characteristic variables, the presence of PMO, the regularity of ingesting anti-tuberculosis drugs (OAT), the search for treatment, knowledge and attitudes towards TB transmission prevention behaviors and multivariate analysis of linear regression to determine the most dominant factors influencing the behavior of pulmonary TB patients towards the prevention of TB disease transmission.<sup>20</sup>

## RESULTS

The characteristics of respondents with pulmonary TB at the East Perak Health Center, and Jagir Health Center were obtained through a survey using a questionnaire. The distribution of questionnaires to 298 respondents in two health centers and one hospital and have carried out Molecular Rapid Test, however, the questionnaire returned 262 respondents.

Based on Table 1, it can be seen that age, education, regularity of ingestion of OAT, and search for treatment have an association with TB prevention behaviors. The age of over 46 years and the elderly (>66 years) risk 3.2 times and 4.7 times

**Table 1. Characteristics and prevention behaviors of pulmonary TB respondents**

Variable	p value	OR	CI 95%
Gender			
- Woman	0.465	1.243	0.673 – 2.345
- Man			
Age Categories			
- < 25 years	0.034		
- 26 – 45 years	0.106	2.1	0.9 – 5.1
- 46 – 65 years	0.021	3.2	1.3 – 7.8
- $\geq$ 66 years	0.007	4.7	1.5 – 14.4
Education			
- Higher education (Maximum High School)	< 0.001	2.857	1.728 – 4.650
- Low education (Maximum Junior High School)			
Categories of patients			
- New	< 0.001	2.657	0.69 – 2.435
- Old			
The Existence of Drug Ingestion Supervisors			
- Yes	0.642	0.82	0.43 – 1.67
- Not			
Regularity of ingesting OATS			
- Yes	0.016	4.35	1.18 – 16.45
- Not			
Search for treatment			
- Category 1 ( $\leq$ 2 weeks)	< 0.003	3.54	2.05 – 6.13
- Category 2 (2 weeks >)			

**Table 2. Preventive behaviors based on knowledge and attitudes of pulmonary TB**

Variable	Behavior				Total	
	Good (n=138)	% (52,7)	Less (n=124)	% (47,3)	Sum (N=262)	% (100)
Knowledge:						
- Good	63	61.8	39	38.2	102	38.9
- less	75	46.9	85	53.1	160	61.1
Attitude:						
- Good	67	65	36	35	103	39.3
- Less	71	44.7	88	55.3	159	60.7

**Table 3. Results of linear regression tests preventive behaviors and pulmonary TB transmission**

Variable	p value	OR	CI 95 %
Knowledge	0.023	1.978	1.147 – 3.453
Attitude	0.024	2.434	1.145 – 3.567
Search for treatment	0.004	0.476	0.220 – 0.872
Regularity of swallowing OAT	0.043	4.876	1.247 – 18.546
Education	0.002	2.456	1.407 – 4.254

to behave less well in preventing TB compared to the age of  $\leq 25$  years. TB patients who have higher education have good behavior in preventing pulmonary TB almost 3 times compared to those with low education. Respondents who did not regularly drink OAT 4.3 times had a risk of misbehaving with TB prevention compared to those who regularly drank OAT. Patients who perform a category 1 treatment search (the time it takes for TB patients to search for treatment after symptoms arise, namely  $\leq 2$  weeks), has a risk of good TB prevention behavior almost 4 times compared to patients who do category 2 treatment searches (the time it takes TB patients to search for treatment after symptoms arise is  $> 2$  weeks).

Based on Table 2, in total respondents with more knowledge about TB prevention with poor knowledge, namely 61%. Of all respondents who had poor behavior about TB prevention, the most were respondents with poor knowledge namely 53% compared to those with good knowledge only 38%. In general, the attitude of respondents is not good, which is 60%. Meanwhile, the largest proportion who have poor behavior towards TB prevention is those who have a bad attitude, which is 55% compared to those who have a good attitude, which is 35%.

Table 3 was the result of a multivariate analysis of existing variables so that the most dominant variables that affect TB

transmission prevention behavior are known. After two tests, namely the Chi Square selection with the provision of a p value of  $< 0.25$  then continued linear regression modeling with the provision of a p value of  $< 0.05$  obtained the five most dominant risk factors, namely knowledge, attitude, search for treatment, regularity of swallowing OAT, and education. Pulmonary TB patients who have good knowledge, good attitude, search for category 1 treatment, regularly swallow medicine, and have higher education will influence good behavior in preventing the transmission of pulmonary TB disease.

## DISCUSSION

TB disease is a disease that can be prevented and cured.<sup>21</sup> Transmission prevention behavior of TB is important to break the chain of transmission. This is the main goal of TB management in addition to preventing recurrences and treating patients.<sup>22</sup> In this study, most of the transmission prevention behaviors that have been done are the use of masks, not spitting carelessly, taking medications regularly, and managing home hygiene (ventilation, lighting by sunlight, and drying pillow mattresses).<sup>23,24</sup> But there are still few who apply cough etiquette by covering their mouths with elbows, tissues, or handkerchiefs.<sup>25</sup> Most cover their mouths with their hands.<sup>26</sup> This is if

you don't wash your hands immediately, it will be easy to transmit to other people or the items they touch.<sup>27,28</sup>

Prevention behaviors and TB transmission are better obtained at younger ages, and it is also found that there is an age relationship with TB prevention behaviors. Ages over 46 years have a 3.2 times risk and the elderly ( $>66$  years) are at 4.7 times risk of behaving less in the prevention of TB transmission than  $>25$  years of age. Different results were obtained in the study<sup>29</sup>, that there was no age relationship with efforts to prevent TB transmission.<sup>30</sup> Related to preventive measures for TB transmission, it is related to clean and healthy living behaviors. Research on the elderly found 73.37% of clean and healthy living behaviors that were sufficient (less), other studies mentioned unhealthy behaviors in the elderly 23.4%. According to the assumptions of researchers, behavior is closely related to a habit that is already part of everyday life. When the elderly are accustomed to unhealthy living behaviors, it will be easy for them to become infected with diseases including TB.<sup>31</sup> This is also supported by insufficient knowledge and wrong perception of the disease suffered so that it tends to behave less well in the prevention of TB disease transmission.<sup>15</sup>

The condition of education is one of the indicators in measuring the level of human development of a country.<sup>32</sup> Education contributes to health behaviors. Knowledge that is influenced by the level of education is one of the precipitating factors that play a role in influencing a person's decision to behave.<sup>33</sup> In this study (Table 1) it can be observed that the education of TB sufferers the most is low education at 5.6.1%, in contrast to the results of research at community health center which is mostly higher education. In accordance with several other studies, TB is more common in groups with low education.<sup>34</sup>

TB respondents with low education levels (not in school and not graduating from elementary school) have a strong relationship to behave poorly in preventing TB transmission. The results of the linear regression test (Table 3) also found that higher education status is the dominant factor influencing TB transmission

prevention behavior<sup>34</sup>. Low of education affects a person's understanding of the disease.<sup>28</sup> A person who is highly educated, will tend to seek as much information as possible on something experienced. The information obtained will influence the person to behave and behave, in which case the sufferer will try to prevent tb transmission properly.<sup>35</sup> In addition, low levels of education are likely to be difficult in providing interventions in the form of health education due to the lack of understanding.<sup>36</sup> Currently, the government through the Healthy Indonesia Program with a Family Approach (is conducting home visits to families in its primary health care work are.<sup>37</sup> Especially for families who are in TB care and with low education, TB officers must be more proactive in providing patient and family education. Efforts include providing flyers, leaflets, or pocket books containing information about TB, drug ingestion monitoring books, and sputum re-examinations according to the prescribed schedule.<sup>38</sup>

Based on the category of patients, namely patients with new TB and patients with old TB, respectively, 53.8% and 48% had good TB transmission prevention behaviors. This shows some of the group of TB sufferers reported good TB transmission prevention behaviors, just like the study. The old TB patients referred to in this study were patients with relapses and patients who had dropped out of treatment, the result was that more people behaved less well, namely 52%. Several studies reported that more than half of respondents had good TB prevention behaviors.<sup>39</sup> This is based on a history of having undergone treatment and having been informed in advance so as to have a better understanding of how to prevent TB, the benefits, and impacts of not preventing TB. In addition to being a companion to taking medications, some studies have also revealed that drug ingestion supervisors also act as a companion to control TB transmission, especially when the supervisor swallows the drugs from family members. Most of the pulmonary TB patients in this study had drug ingestion supervisors in the implementation of TB treatment.<sup>40</sup> As many as 52% of TB patients accompanied

by drug ingestion supervisors reported having good TB transmission prevention behavior. Drug inspectors can come from families, health workers, or community leaders. But if the supervisor swallows the drug from a family member, based on the emotional connection of the family, it will increase the motivation of TB sufferers to behave well.

Things that supervisors can do to swallow medicine for TB sufferers such as providing a special place to get rid of sputum when coughing, reminding them to cover their mouths when coughing, separating the eating and drinking utensils of TB sufferers, opening the windows of the house every morning, drying pillows, bolsters and mattresses, and maintaining the cleanliness of the environment around TB sufferers.<sup>41</sup> As many as 54.4% of patients who regularly drink OAT have good TB prevention behavior. Further analysis found that patients who regularly took OAT 4.5 times had good TB prevention behavior compared to those who did not regularly drink OAT. Further analysis found that patients who regularly took OAT 4.5 times had good TB prevention behavior compared to those who did not regularly drink OAT. Side effects that are not managed properly and last for a long time can certainly affect and decrease the behavior of individuals in undergoing treatment and taking preventive measures of transmission.<sup>13</sup>

In this study, most only conducted a search for treatment after two weeks of feeling symptoms, which was 68.7%. The behavior of seeking treatment is also the dominant factor influencing the behavior of preventing TB transmission. The recommended time to have a medical examination is 14 days after feeling the symptoms.<sup>26</sup> Delays in seeking treatment may indicate a patient's ignorance of TB, symptoms, and resulting severity.<sup>16</sup> In addition, the stigma factor against TB disease is also the reason for the delay in conducting treatment searches. As a result of this stigma sufferers hide their illness, activities as usual which can eventually infect family and others.<sup>42</sup> But there are also those who report that as a result of this stigma, they isolate themselves from interacting with family, friends, and relatives to avoid infecting them and

avoid becoming the subject of gossip and discrimination in the community.<sup>1</sup>

From the results of this study, it can be seen that TB patients who have poor knowledge about TB, then the behavior of preventing TB transmission is also not good. In this study, the less knowledge was more than 61.6%. The results of linear regression also show that good knowledge is the dominant factor influencing TB transmission prevention behavior. In line with other studies that reveal there is a knowledge relationship with TB transmission prevention behaviors. The patient's good knowledge of the signs and ways of transmitting TB disease, shows that there are efforts from sufferers to carry out treatment, although there are still patients who already know about the signs and ways of transmitting TB, but have not implemented cough etiquette and throw saliva in any place and do not sleep separately with other family members.<sup>43</sup> TB sufferer who have low knowledge and poor preventive behavior at the beginning of treatment, but during the treatment process they interact with health workers with social proximity, will improve the quality of care, and are effective against behavior change.<sup>40</sup>

In the attitude component, it can be observed that those whose attitudes are not good (negative) about TB, then respondents will also have TB prevention behaviors are also not good. The results of linear regression also show that attitudes are the dominant factor influencing behavior. A good attitude about TB, then the behavior of preventing TB transmission is also good. Similar to the findings obtained in the study of pulmonary patients in Surabaya.<sup>28</sup> There is a relationship between attitudes about TB and TB prevention behaviors, like other studies that reveal there is an attitude relationship with TB transmission prevention behaviors. The attitude of a person can change by obtaining additional information about a particular object through persuasive actions as well as pressure from his social group. It is hoped that someone who has good knowledge will get a good attitude towards efforts to prevent the transmission of pulmonary TB.<sup>44</sup> The positive attitude of respondents is the willingness to seek health services

supported by the willingness to behave clean and healthy.<sup>45</sup>

## CONCLUSION

Good knowledge, good attitude, the search for a  $\leq 2$  weeks of regularly swallowing OAT, and higher education are the most dominant factors influencing TB transmission prevention behavior. In addition, older age is also able to prevent the transmission of pulmonary TB. Further studies are needed to evaluate more deeply regarding preventive behaviors toward transmission of pulmonary tuberculosis.

## ACKNOWLEDGMENT

A thank you for the Rector of Nahdlatul Ulama University Surabaya, through Task Letter No. 1072.1/UNUSA-LPPM/Adm-E/VI/2022 internal innovation research grant Nahdlatul Ulama University Surabaya.

## DISCLOSURES

### Funding

The authors are responsible for all the study funding is supported by LPPM Universitas Nahdlatul Ulama Surabaya.

### Conflict of Interest

No potential conflict of interest relevant to this article was reported.

### Author Contribution

All authors similarly contribute to the think about from the investigate concepts, information acquisitions, information investigation, factual investigations, changing the paper, until detailing the consider comes about through publication.

### Ethical Consideration

Ethical approval was obtained from The Research Ethics Committee of Universitas Nahdlatul Ulama Surabaya (No.104/EC-KEP-UNUSA/II/2021).

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