



Original Article

Development of a TB Treatment Compliance Instrument using the Health Belief Model

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ABSTRACT

TBC disease is a long-term chronic disease that requires serious patient commitment to undergo long-term treatment with all kinds of perceived complications that will reduce the quality of life and increase the risk of non-compliance with TBC treatment. Several factors that influence patient non-compliance in undergoing treatment include the length of treatment, drug factors, diseases, and patients, as well as the lack of attention from the government and patients themselves, even though free treatment is available. This study aimed to compile a TBC medication-compliant instrument using health belief model theory. This study using survey The sample consisted of TBC patients in Palu City, namely at the Talise Health Center, and in Donggala Regency, namely the Wani Health Center and Gonenggati Donggala Health Center. A total of 69 participants participated in this study. The analysis technique used was multidimensional confirmatory factor analysis using structural equation modeling. A total of 20 questions were obtained from this study. Compliance questionnaires using the health belief model can be used to measure TBC patient compliance with treatment. consists of three assessment items: perceived benefit, perceived threat, perception of seriousness, and threat. Compliance questionnaires using the health belief model can be used to measure TBC patient compliance with treatment.



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INTRODUCTION

Pulmonary Tuberculosis (TBC) is a chronic, infectious disease. Long treatment times with a large number of drugs and various treatment effects often cause sufferers to be threatened with discontinuation of treatment (Drop Out) during the healing period, which will eventually become resistant to treatment.^{1,2} This figure is quite high in Indonesia, increasing from 2020 5.6% to 6.9% nationally in 2021. TBC bacteria usually infect the lung parenchyma, but usually also infect the pleura, lymph nodes, bones and other lung organs. The main bacteria that causes TBC infection is *Mycobacterium tuberculosis* which is transmitted between humans through air droplets, with the ability to survive in the air for 4 hours. TBC transmission usually occurs in dark rooms or rooms that have poor ventilation.³

Several groups that have a higher risk of contracting TBC disease are people who are HIV positive and other immunocompromising diseases, people with reduced immune systems, smokers, high alcohol consumption, children aged <5 years, the elderly, close contacts with TBC disease and finally health workers. Diagnosis of TBC is carried out through bacteriological examination with positive BTA results. The principles of TBC treatment are to cure, maintain the

patient's quality of life and productivity, prevent death, prevent recurrence, reduce transmission and prevent the development and transmission of drug resistance so that not many patients experience drug resistance. National TBC cases are based on doctors' diagnoses in 2018 based on basic health research data of 1,017,290 people; Central Sulawesi data is 11,548 people, while in 2023 the national number will decrease to 877,531 people and Central Sulawesi data will be 9,721 people with the largest age group being 25-34 years old and not much different between men and women with the highest number of diagnoses in urban areas.⁴ Before starting treatment, TBC patients must first undergo a bacteriological examination to confirm that they really suffer from TBC and the appropriate clinical symptoms. Guidelines for TBC treatment in Indonesia refer to guidelines issued by the World Health Organization (WHO) and International Standards for TBC Care.⁵

TBC treatment is a treatment that lasts a minimum of 6 months of treatment, and will take longer if drug withdrawal occurs with several treatment scenarios. The medication given is made to make it easier for patients so it is made in packages during the treatment period. To ensure that patients diligently or regularly take medication, a medication supervisor is prepared to ensure that patients take medication regularly according to schedule and in the correct dosage. Supervisors taking medication may be family, neighbors, health cadres, community leaders and even health workers. The prevalence of non-compliance with taking this medication also varies for various reasons;⁴ however, the incidence of treatment failure decreased from 0.4% to 0.3%. The cure rate has also decreased from 32% to 5 % %in 2021 to 18,28%. The positive news is that tuberculosis patients who underwent complete treatment increased to 67.2%.² Central Sulawesi itself, especially the three districts and cities that are the focus of this study, is in category 1 with a high burden. Several factors that influence patient non-compliance in undergoing treatment include the length of treatment;¹ In addition, there are drug factors, diseases, and patients themselves. Patients get bored, forget, and feel uncomfortable with their physical condition due to taking medication. Drug factors include inadequate drug guides, insufficient drug doses, irregular drug intake, shorter drug intake periods and resistance.⁶ Another fact is the lack of attention from the government and the patients themselves, because even though free treatment is available, the level of non-compliance is quite high.⁶

In addition to external factors, internal factors include motivation and strong desire. The motivation to maintain one's health is known as the patient's self-confidence or self-efficacy.⁷ The cause of patient non-compliance in completing treatment will cause psychological pressure for patients because they undergo long treatment, and patients feel symptoms decrease, so they are lazy to continue treatment and have a decreased appetite. It can be concluded that many factors affect compliance, not only from outside the patient but from within the patient themselves. Therefore, it is important to compile a patient compliance instrument for taking TBC medication based on the local culture. In fact, patients must realize that if they take medication regularly, their quality of life will improve, such as symptoms reducing or even disappearing, mental health improving. The health belief model (HBM) theory is the basis for creating a questionnaire to measure compliance with treatment that TBC patients will undergo because it is based on the belief that patients who are sick with TBC and undergoing long-term treatment will show healthy behavior or lead to healing, patients believe that long-term TBC treatment will lead to health and healing, beliefs about the difficulties they will face and are able to take action to continue TBC treatment and the vulnerability or severity that will be experienced if they do not continue treatment. The purpose of the study aimed was to compile a TBC patient medication compliance instrument for patients with TBC.⁸

METHODS

The method used in this research is survey method.⁹ Surveys were used for data collection, and no treatments were performed. The population in this study were TBC patients with TBC in Central Sulawesi Province. The sample included patients with TBC in Palu City, namely at the Talise Health Center, and in Donggala Regency, namely the Wani Health Center and Gonenggati Donggala Health Center. This research was a pilot project so that only a few respondents were

involved in this research. The study inclusion criteria were 1) patients undergoing TBC treatment for at least 3 months; 2) do not have other disease complications; 3) willing to participate in this research. A total of 69 participants participated in this study Respondents who met the criteria participated in the study and were selected randomly using purposive random sampling.

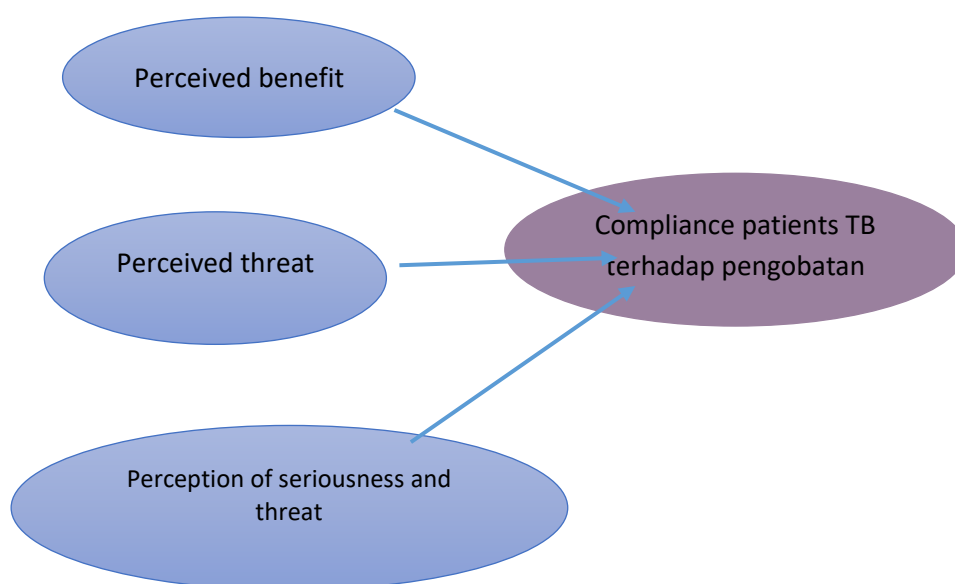


Figure 1. Confirmatory factor analysis Compliance of TBC patients with treatment

The independent variable of this research is the health belief theory model of medication adherence for TBC patients, the dependent variable is the adherence to medication for TBC patients. The instrument used in this study used a Likert scale with five assessment alternatives. This research instrument was created by the researcher himself for testing. The lowest and highest scores were 1 and 5, respectively. The analysis technique used was Multidimensional confirmatory factor analysis.⁶ This research has received the ethical of the Palu Ministry of Health Polytechnic Ethics Commission with number 000161/KEPK POLTEKKES KEMENKES PALU/2024.

RESULTS

Univariate analysis produced the following results, as shown in Table 1 below:

Table 1. Demographic Data of Tuberculosis Patients

No	Variables	Mean	Median	Percentage
1	Age	44.28	45	
2	Work	N	%	
	Housewife	24		34.8
	Fisherman/Farmer/ Laborer	22		31.8
	Self employee	18		26.1
	Civil Cervant	2		2.9
	Etc	3		4.3
3	Gender			
	Man	42		60.9
	women	27		39.1
4	Ethnic			
	Kaili	46		66.7
	Buginese	11		15.9
	Others	12		17.3

No	Variables	Mean	Median	Percentage
5	Education			
	Elementary	8		11.6
	Junior high school	23		33.3
	Senior high school	37		53.6
	University	1		1.4

Table 1 illustrates that the average age of the respondents was 44.28 years, with the youngest respondent being 18 years old and the oldest being 73 years old. Most work as housewives, fishermen, farmers, or laborers. There were 60.9% more men than women, and 53.6% had a high school education.

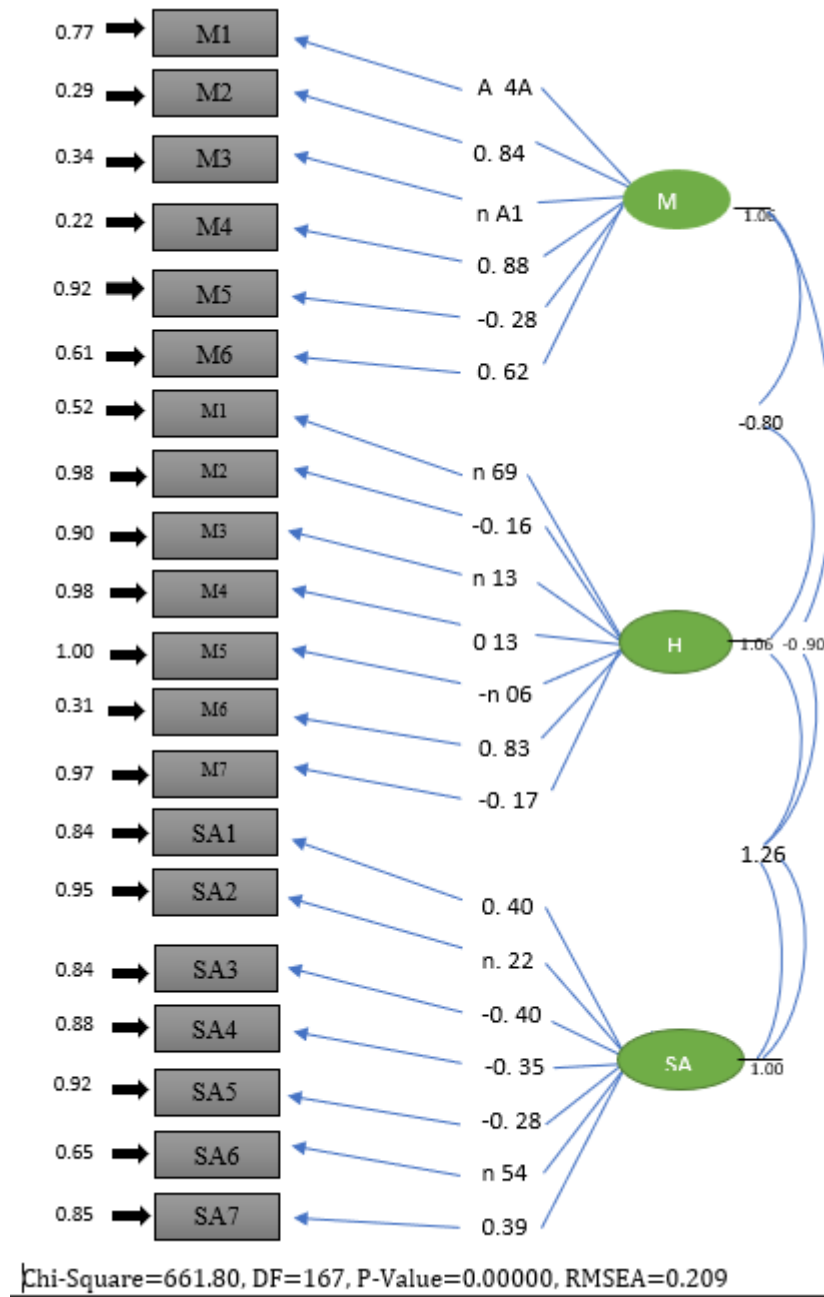


Figure 2. Assessment of each item

The results of the SEM test can be seen in Figure 2. From the picture above, it can be seen that questions M5, H2, H3, H4, SA1, SA2, SA3, SA4, SA5 and SA7 have a value of <0.5. Statistically, the

value is considered insignificant; however, due to the limitations of the instrument and the researcher's belief that this question can still be used, provided the researcher makes improvements to the question items. So the researcher still uses the 20 questions that have been prepared previously.

The next analysis is the analysis of the goodness of fit of the TB patient compliance model using the HBM modification (Table 1)

Table 1. Goodness of fit value for compliance in TB patients

GOF	Cut off value	Value	Description
Chi square (X^2)	Less than degrees of freedom	661.80	Marginal fit
df		167	good fit
Chi square/df	≤ 3	3.96	good fit
Probability	≥ 0.05	0.0005	Marginal fit
RMSEA	≤ 0.08	0.209	Marginal fit

From the results above, it can be seen that the questionnaire described is less suitable, but the researcher decided to continue using it by making improvements and adjustments. A wide trial will be conducted before this questionnaire is ready to be tested.

DISCUSSION

Univariate analysis of the respondents' characteristics revealed that they are considered to be quite representative of the population. A total of 69 individuals were recruited from three different areas. There were more male respondents than female respondents, although the national distribution of men and women is not significantly different. The highest level of education was high school, and most jobs were held by housewives, fishermen/farmers, and laborers. TBC can attack anyone, not only the elderly but also young people, and attacks at a productive age where they are still working and looking for additional income for the family.¹⁰⁻¹² New cases found in conditions where people are exposed are young, adolescents, and young adults who have poor immunity (immunocompromised) with cases of HIV, malnutrition, cancer/malignancy, etc., and have low economic status, mostly in rural areas. National data shows that most TBC patients are aged < 45 years, live in urban areas, and have a high school education or less, with middle to lower economic status.

Ways to break the chain of TBC transmission include understanding the natural course of TBC disease, identifying at-risk populations, and detecting cases of latent TBC infection.¹⁰ In addition to breaking the chain of TBC transmission, TBC prevention is also carried out with a target of 60%-90%, focusing on household contacts and close contacts of TBC patients.¹³ Before administering TBC medication, the patient must first be diagnosed so that they can undergo the correct treatment.¹⁴ With the purpose of treatment: 1) curing, maintaining the quality of life and productivity of patients, 2) preventing death from active TBC or subsequent effects, 3) preventing TBC recurrence, 4) reducing transmission of TBC to others and preventing the development and transmission of drug resistance. Adequate treatment must meet four principles: 1) Treatment guidelines for at least four types of drugs to prevent resistance; 2) the dose must be correct; and 3) swallowed regularly and supervised, and divided into two stages, namely the initial and continuation stages, which take 6 months. This treatment is quite long and requires compliance from patients and drug supervisors to comply with the established therapeutic regimen. Compliance is a condition of obedience or the degree to which patients follow recommendations related to the treatment being performed, including compliance to taking medication and following recommendations regarding diet and lifestyle changes related to their disease.

Several studies conducted on TBC patients' medication compliance found that the majority of respondents (87%) adhered to treatment; 12% had high compliance 76,47%, 20,58% moderate compliance, 15 76%, and 24% not obey.^{7,16} Some factors that influence compliance are family support, knowledge, work, the role of medication supervisors, and distance to health facilities.¹¹ The family plays a crucial role in supporting patient compliance in taking medication, and the distance to health facilities is related to the smooth distribution of drugs. This aligns with what

was conveyed by the program holder and the provincial person in charge during the focus group discussion. Sometimes, health workers have to pick up the ball to give medicine to patients. TBC drugs are usually administered once a week or every month. In addition to the family, health cadres play an important role in increasing patient compliance with medication. The factors that do not have an effect are income, education, and the side effects of drugs.¹¹

Compliance is unique; when viewed from the Health Belief Model (HBM) theory, this model emphasizes the reasons why an individual or person wants or does not want to carry out healthy behavior, or can be defined as an individual's belief in behaving healthily.¹⁷ Of the six dimensions of HBM, in this study, the researcher only took three dimensions that were appropriate for measuring compliance with TBC treatment: the benefit dimension or perceived benefits, the barrier dimension or perceived obstacles to change, and the seriousness or perceived threat, which is a person's perception of a disease in the form of an evaluation of clinical and medical consequences (death, disability, illness) and social consequences in the form of effects that will impact work, family life, and social relationships). The three dimensions were mixed by the researcher and described in one compliance instrument. The instrument created by the researcher referred to the compliance instrument created by Juliati. As for some questions related to this, it can be seen the health benefits that respondents will feel, reduced symptoms felt, no complications, and benefits that people around them will obtain if the patient complies with TBC treatment (questions 1-6). Upon closer examination, questions 1 and 5 describe the benefits experienced by patients. Still, the benefits obtained will last for a long time after undergoing treatment for 6 months, so it does cause boredom for patients, as well as question 5, where patients will receive benefits in the form of healing. However, complications may still be felt by patients, such as pain, liver, or kidney disorders due to excessive medication and other complaints.

Questions 7-13 describe the obstacles that respondents may feel when undergoing treatment in the form of difficulty in obtaining medicine, difficulty in obtaining information, wasted time during treatment, and negative effects of treatment. Some of these responses were negative. The appropriate results were only obtained in questions 7 and 12, where these questions clearly illustrate that TBC treatment facilities are easy to obtain, namely at the Health Center, there are health cadres who always remind them and they have a strong belief in undergoing treatment. The ease of obtaining information is considered less appropriate because patients may be busy working in the fields, gardens, or busy taking care of the household so that they feel that information related to TBC is challenging to obtain. The time for TBC treatment is quite long (6 months), which causes boredom and fatigue. In addition, even after taking medicine, patients still experience complaints such as coughing and shortness of breath. This affects the benefits obtained, so that it is still perceived as an obstacle by the respondents. Questions 14-20 describe the seriousness and threats felt by the respondents. Fear of complications that arise even though they have undergone long-term treatment, fear of not recovering, changes that occur in life, and complaints of prolonged coughing are threats that are felt quite seriously by respondents. Therefore, this questionnaire needs to be slightly modified by the researcher because it raises doubts for patients, especially regarding the level of education, which is mostly elementary and secondary education.

The health belief model states that factors influencing health behavior include motivation to treat an illness, belief in the existence of threats, and the anticipation of benefits or obstacles that may be encountered.¹⁸ Several studies that measure TB treatment compliance using HBM include measuring the knowledge of TBC patient families using HBM education and found that there was an influence of the education provided with a value of $p < 0,05$.¹⁹ There was an increase in respondents' knowledge before and after receiving education on using HBM for the prevention and control of tuberculosis in Pancoran Mas District, Depok City.^{20,21}

CONCLUSION

Compliance questionnaires using the health belief model can be used to measure TBC patient compliance with treatment. The resulting instrument describes the benefits, obstacles, seriousness and threats felt by TB patients related to the treatment they receive. The health belief

model theory is very appropriate to use because it describes the patient's self-confidence regarding the TBC treatment that is being undertaken so that the patient can provide a positive response to long-term TBC treatment with the ultimate target of the patient being cured and consistently undergoing long-term TBC treatment.²²

Author's Contribution Statement: **Aminuddin:** Conceptualization, Data curation, visualization. **Irsanty Collelin:** Data curation, writing manuscript, methodology, data analysis. **Ismunandar:** writing-reviewing, editing, investigation.

Conflicts of Interest: The authors declare that there are no conflicts of interest, financial or otherwise, relevant to this study.

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