



THE FACTORS PREDICTING OF PREVENTION PULMONARY TUBERCULOSIS IN PATIENTS WITH TYPE 2 DIABETES MELLITUS IN THE NORTHEASTERN REGION OF THAILAND

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Abstract

The purpose of this predictive research was to study the factors predicting of prevention pulmonary tuberculosis in patients with type 2 diabetes mellitus in the northeastern region of Thailand. The sample consisted of 1,218 TB patients with type 2 diabetes mellitus. Data were collected using questionnaires. Analyze the data with descriptive statistics. Pearson correlation coefficient and multiple regression statistics ($\bar{x}=72.55$, S.D. = 8.62). Factors associated with TB prevention behavior ($r = 0.791$). Factors associated with TB prevention behaviors were perceived benefits of TB ($r = 0.758$), perceived barriers of TB ($r = 0.235$), perceived susceptibility of TB ($r = 0.453$), induced health motivation of TB prevention ($r = 0.781$), exposure. Know the benefits of TB prevention ($r = 0.769$) and the relationship to the patient ($r = -0.736$). The co-parenting variable predicted 60.80% of TB prevention behaviors ($R^2 = .608$, $F = 0.019$, $p < 0.001$). The predictable factor was perceived barrier of TB infection ($\beta = .235$, $p < 0.001$) and health motivation of TB infection ($\beta = 0.453$, $p < 0.001$). The findings could lead to the development of care with an emphasis on recognizing risk factors for TB infection and providing recommendations for pulmonary tuberculosis prevention in diabetic patients.

Keywords: Pulmonary tuberculosis, Diabetes Mellitus, Preventive behavior, Health belief model

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Introduction

Based on the latest available data in the World Bank database, some upper-middle-income, and lower-middle-income countries

(e.g., Thailand, India, China, Indonesia, Brazil, and South Africa) appear to be performing relatively well. However, progress is likely to have been set back by the COVID-19 pandemic.



Even before the pandemic, other high TB burden countries already faced major challenges in achieving a range of TB-related SDG targets. Moreover, values for poor populations and vulnerable groups most at risk of developing TB are more likely to be worse than national averages [1-5]. Among the 30 high TB burden countries, 21 (70%) referred to the importance of TB screening among people with diabetes mellitus in at least one of their national documents. TB screening was featured in 18 (60%) NSPs for TB but was recommended in the national guidelines of only 15 (50%) countries. Overall, 20 (67%) countries referred to screening of diabetes mellitus in TB patients and 24 (80%) referred to management of diabetes mellitus in TB patients, but these topics had a limited profile in the NSPs for TB [6]. Among the 24 (80%) countries that recommend diabetes mellitus management among people diagnosed with TB in their guidelines, nine (30% of the total) recommended it only for patients with MDR-TB. Only two (7%) countries (South Africa and United Republic of Tanzania) had plans for joint or bidirectional screening and co-management for TB and diabetes mellitus within their NSPs for NCDs [4, 7]. Patients with suspected symptoms of pulmonary tuberculosis are not promptly tested for treatment. The transmission of pulmonary tuberculosis will increase in number. and can destroy the patient's lungs until there is a pathology that is a cavity wound This allows the patient to be in the infecting phase quickly as well, which affects the difficulty of treatment. It may take longer to heal. or may cause harm fatal However, since tuberculosis is a chronic disease, the disease progression is slow, in the early stages there may be no symptoms. causing delays in admission Patients with suspected symptoms of pulmonary tuberculosis, namely chronic cough, chest pain and hemoptysis, if not properly treated, will increase the spread of the disease in the community [6]. The TB prevention behavior was influenced by various factors including personal factors. From a study in Ratchaburi province, it

was found that females had better TB prevention behaviors than males. Higher levels of education had better TB prevention than those with lower levels of education [4, 8]. People who earn more than 3,000 baht per month will have protective behaviors. TB was 6.07 times better than those with lower incomes. 5.13 times higher in TB prevention behaviors than those with low incomes [8]. A study conducted in Indonesia found that married couples with TB patients had a statistically significant effect on TB prevention behavior [9]. A study in Sisaket Province found that perceived barriers to tuberculosis prevention, support from health personnel and perceived benefits of tuberculosis prevention were good predictors of TB prevention behavior in pulmonary tuberculosis patients with type 2 diabetes mellitus [10, 11], consistent with health beliefs model [12-15]. Moreover, in the past 5 - 10 years, no studies have been found in the context of communities in the central region of Thailand. Therefore, the researcher is interested in studying the statistical analysis between the prevention pulmonary tuberculosis of health believes model and type 2 diabetes mellitus patients in the northeastern region of Thailand in this context to use as data or information guidelines for caring for this group of people.

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Experimental section

Research objectives

1. To predictive factors of prevention pulmonary tuberculosis in patients with type 2 diabetes mellitus in Thailand's northeastern region.
2. To study the statistical analysis ability between the prevention pulmonary tuberculosis of health believes model and type 2 diabetes mellitus patients in the northeast region of Thailand, depending on personal and individual perception factors.

Research conceptual framework

The research conceptual framework is based on the concept of health belief model.



which consists of the perception of the person, i.e. the perception of the risk of disease and perceptions about the severity of the disease, which affects the perception of the threat of the disease. Common factors were demographic factors: age, sex, income, race, religion, congenital disease and educational level. Psychosocial factors such as stress or social status, cultural values. Structural factors such as knowledge of the disease or past experiences. The trends in behavioral behavior were perceived benefits of preventive behavioral practice, perceived obstacles to preventive behavioral practice, self-efficacy, which was added to the concept of prophylactic behavioral practice. believe in health. What induces action is what motivates the behavior or action that is appropriate to be a factor that guides or guides a person to recognize and decide to act, which is divided into two types. These include internal and external influences. Intrinsic cues include perceptions of one's own body states, such as symptoms of induced fatigue. External influences include obtaining information through the mass media. or from the warnings of respected and respected persons such as father, mother, husband and wife, teachers, sickness of family members, posters and pamphlets, articles from books, receiving postcards, reminders from personnel medical etc.

Research methods

This research is a predictive descriptive research. The study population was pulmonary tuberculosis patients with type 2 diabetes mellitus in the central region of Thailand. The sample consisted of 1,218 TB patients with type 2 diabetes mellitus according to patient perception. By assigning effect size values to use in power analysis applied to statistics. Multiple regression analysis was performed using medium effect size ($R^2 = .1514$). By setting the power analysis equal to .95 and the confidence value at the statistical significance level was .05. Calculated using G* Power program[16], 12 predictive variables. When

substituted, a sample size of 1,023 people is obtained to prevent loss of sample size. The researcher then increased the sample size by 20 percent[17, 18], representing a total sample size of 1,228 people. But after collecting the data, 9 anomalously distributed data sets were eliminated, leaving a total of 1,219 data sets. By using statistical methods, substituting with next value or Winsorized mean, in order to maintain sample count and to obtain reliable sample.

Research tools

The instrument used in this research, the researcher created from the review of related documents and research, consisted of a four-part questionnaire as follows: 1) personal data. 2) perception of TB risk, perception of TB severity, perception of benefits of tuberculosis prevention, perception of barriers to tuberculosis prevention and self-efficacy in tuberculosis prevention. 3) TB prevention behavior inducers, and 4) TB prevention behavior of household contacts with pulmonary tuberculosis patients. The tool was then taken to experts to verify the content validity and then used to calculate the content validity (Content Validity Index: CVI), which the result is 0.82. The questionnaire was then used to experiment with pulmonary tuberculosis patients with type 2 diabetes mellitus with similar characteristics to the sample group of 30 people and to determine the reliability (Reliability) to obtain the Cronbach's alpha coefficient are .87, .82, 0.91, .81, .80, .84 and .88, respectively. The reliability value of the overall questionnaire was 0.93. To protect the rights of the sample, the researcher informs the researcher of the purpose and benefits of the research. Participation is voluntary. Participants will read the document and agree to it before signing and can stop providing information at any time. The information will be kept confidential and will be destroyed once the research is complete. The presentation of the research results will be general only. Analyzing the data, the data was tested in accordance with the preliminary agreement of using statistics and

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then analyzed as follows: personal factors, analyzed by frequency distribution, percentage, mean score, standard deviation, correlation between variables using Pearson's correlation coefficient. and factors predicting of TB prevention of pulmonary tuberculosis in patients with type 2 diabetes mellitus were analyzed by using simultaneous multiplicative regression statistics. Ethical Approved No. HE592004.

of the education levels were primary and secondary, accounting for 54.8%. Most of them had other congenital diseases, namely hypertension, accounting for 85.80%. The highest monthly income is between 600 – 1,500 baht, equivalent to 34.90%. Most of the relationships with patients were close to the patients. Tuberculosis includes husband, wife, father, mother and children, accounting for 50.90%. The subjects had mean scores, standard deviations and scores of various aspects of perception and TB prevention behavior as shown in Table 1.

Results and discussion

Most of the samples were female. 62.7%, mean age (\bar{x} = 77.55, S.D. = 8.63). Most

Table 1 Determination of the Perceived Risk Score Criteria for Pulmonary Tuberculosis

Range 13 – 39 points		
low level	13.00 – 21.66	points
middle level	21.67 – 30.33	points
high level	30.34 – 39.00	points

Table 2 Determination of the Perceived Severity Score Criteria for Pulmonary Tuberculosis

Range 15 – 45 points		
low level	15.00 – 25.00	points
middle level	26.00 – 35.00	points
high level	36.00 – 45.00	points

Table 3 Determination of the Perceived Score Criteria for the Benefits of Pulmonary Tuberculosis Prevention

Range 13 – 39 points		
low level	13.00 – 21.66	points
middle level	21.67 – 30.33	points



high level	30.34 – 39.00	points

Table 4 Determination of the Perceived Score Criteria for the Benefits of Pulmonary Tuberculosis Prevention

Range 14–42 points		
low level	14.00 – 23.33	points
middle level	23.34 – 32.67	points
high level	32.68 – 42.00	points

Table 5 Determination of the Efficacy Score Criteria themselves in the prevention of pulmonary tuberculosis

Range 14–42 points		
low level	14.00 – 23.33	points
middle level	23.34 – 32.67	points
high level	32.68 – 42.00	points

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Table 6 Determination of the Efficacy Score Criteria themselves in the prevention of pulmonary tuberculosis

Range 0-16 points		
low level	0.00–5.33	points
middle level	5.34 – 10.67	points
high level	10.68 – 16.00	points

Table 7 Determination of scoring criteria for questions about TB prevention behaviors of household contacts with pulmonary tuberculosis patients

Range 19-95 points		
low level	0 – 44.33	points



middle level	44.34 – 69.67	points
high level	69.68 – 95.00	points

Factors related to tuberculosis prevention behaviors of pulmonary tuberculosis patients and type 2 diabetes mellitus patients in northeastern region Thailand are shown in Table 9. The results of the analysis of the predictive ability of tuberculosis prevention behaviors of pulmonary tuberculosis patients with type 2 diabetes mellitus patients were analyzed using all concurrently variable regression analysis. The predictors were linearly correlated with statistical significance at the $p < .001$ level ($F = 0.019$). They were able to predict the TB prevention behaviors of pulmonary tuberculosis with type 2 diabetes mellitus patients by 60.80% ($R^2 = .608$).

Table 8 Correlations between the TB prevention behaviors of pulmonary tuberculosis with type 2 diabetes mellitus patients (n=1,219)

Variables	1	2	3	4	5	6	7
Family members	1						
Perceive of Severity	.014	1					
Perceive of Benefits	.020	.758**	1				
Perceive of Barrier	.018	.203**	.235**	1			
Perceive of Prevention behavior		.001**	.056*	.071*	.453**	1	
Perceive of Susceptibility	.270**	.084**	.063**	.519**	.781**	1	

(** $p < .0001$, * $p < .05$)

Consistent with and in line with the concept of health belief model, when a person is aware of the risk of infection and becoming ill, it leads to the person making behavioral decisions to prevent them from becoming ill. Perceive the risk of pulmonary tuberculosis, perceive the severity of pulmonary tuberculosis, perceive the benefits of pulmonary tuberculosis prevention, induce actions to prevent pulmonary tuberculosis, and prevent

pulmonary tuberculosis behaviors as a contagious disease. People with diabetes mellitus are at higher risk and more likely to have diabetes mellitus complications than the general public or other non-communicable diseases that may arise from prolonged close contact with the patient. Therefore, there is a high risk of getting sick with this disease.

Table 9 Multiple linear regression and discrimination (n = 1,219)

Predictions	b	SE	b Beta	(β)	t	p-value
Incomes	3.682	.001	.047	.606**	2.612	<0.001
Chronic diseases	-.034	.015	-.042	.608**	-2.340	<0.001
Perceive of barriers	.070	.015	.096	.604**	4.507	<0.001
Perceive of susceptibility	.263	.023	.729	.597**	1.283	<0.001
Health motivation	.684	.018	.745	.555**	38.946	<0.001
Constant = 1.176, R = .780, R ² = .608, R ² adj = .606, SEest = .407, F = 0.019						

The results of this study resulted in individuals making decisions to take action in

order to prevent themselves from getting sick. This is consistent with the study on TB



prevention behaviors of household contacts. The risk of TB was positively correlated with pulmonary tuberculosis prevention behaviors. The convulsive factor influencing pulmonary TB prevention behavior was positively correlated with pulmonary tuberculosis prevention behavior ($r = .191$), which was predictive of pulmonary tuberculosis prevention behavior ($\beta = .137$, $p < 0.001$) which is consistent with and in accordance with the conceptual framework of the health belief model. It is explained that when individuals are given things that encourage pulmonary tuberculosis prevention behaviors such as news, advice from health workers, other relevant health workers, and support equipment and administration. As a result, individuals are motivated to practice behaviors to prevent themselves from contracting pulmonary tuberculosis [11], which is consistent with the study said Received support for pulmonary tuberculosis, 4.82 times positively associated with TB prevention behaviors [8]. Receiving support for pulmonary tuberculosis prevention equipment from public health personnel were able to predict pulmonary tuberculosis prevention behavior of household contacts. Perceiving the severity of tuberculosis have a relationship positively with tuberculosis prevention behaviors ($r = .197$). They were able to predict the TB prevention behaviors of the samples and were statistically significant ($\beta = .131$). It can be said that household contacts have a perception that tuberculosis is a contagious disease that negatively affects themselves and those around them, both physically and mentally, economically and socially take a long time to heal may cause death. This is consistent with the study found that perceived disease severity was positively associated with pulmonary tuberculosis prevention behaviors ($r = .130$), perceived benefit of tuberculosis prevention was positively correlated with TB prevention behaviors. lung ($r = .169$) and was able to predict pulmonary tuberculosis prevention behavior of the sample, statistically significant ($\beta = .078$). It can be said that when residents of

TB patients are aware of the benefits of Practicing TB prevention behaviors is what prevents one from getting sick from TB, thus resulting in a person taking behaviors to prevent himself from getting sick from this disease consistent with and in accordance with the conceptual framework of health beliefs, which is consistent with the study said Recognizing the Benefits of Preventing Pulmonary Tuberculosis There was a positive correlation with TB prevention behavior ($r = .45$) and was able to predict pulmonary tuberculosis prevention behavior of household contacts, perceived barriers to tuberculosis prevention. There was no relationship with pulmonary tuberculosis prevention behaviors ($r = .056$) ($\bar{x} = 36.97$, S.D. = .93). But when the prediction equations were added together with other factors, it could be said that the other factors were able to predict pulmonary tuberculosis prevention behaviors and were statistically significant ($\beta = .073$). It can be said that although household contacts with pulmonary TB patients are aware of the barriers to preventing highly contagious pulmonary tuberculosis, But he was diabetic and therefore had to practice pulmonary tuberculosis prevention behaviors, which differed from this study [10], which said that perceived barriers were positively correlated. The self-efficacy in pulmonary tuberculosis prevention was associated with pulmonary tuberculosis prevention behavior. However, when taken into the predictive equation together with other factors, they were able to predict pulmonary tuberculosis preventive behavior and were statistically significant ($\beta = .036$), it can be said that although household contacts with pulmonary tuberculosis patients There will be self-efficacy in pulmonary tuberculosis prevention, but there must be other influencing and co-influencing factors, namely the perceived benefit of pulmonary tuberculosis prevention, to change practice. preventive behaviors for pulmonary tuberculosis. However, personal factors can predict pulmonary tuberculosis prevention behavior in patients



with diabetes mellitus [15] and it is statistically significant and consistent with the concept of health belief model. It can be said that other co-factors are factors that cannot directly cause behavioral change but are fundamental factors that co-exist with health-related factors. Recognizing and treating individual behavior.

Recommendations for applying the research results

1. This study provides information on the development of health belief model that emphasizes and encourages awareness of the risk factors for TB and increases support for academic and policy areas, such as preventing the use of surgical masks N95 to prevent tuberculosis, education and advice from health personnel and other relevant persons.

2. This study is a promotion and support for teaching and learning in biostatistics, health education, public health, nursing, medicine, and others.

3. This study is related to pulmonary tuberculosis prevention behaviors and promotion of appropriate pulmonary tuberculosis prevention behaviors among TB patients with type 2 diabetes mellitus.

Suggestions for doing research next time

In addition to this study, other factors that could predict of preventive pulmonary tuberculosis with diabetes mellitus patients or close contacts with pulmonary TB patients should be studied. It should be studied in other regions and spread across the world where tuberculosis is still a problem. A mathematical equation model for predicting behavioral factors in preventing pulmonary tuberculosis in patients with type 2 diabetes mellitus should be studied and used in further application in mobile application functionality in various systems.

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