TREATMENT-SEEKING BEHAVIORS AND IMPROVEMENT IN ADHERENCE TO TREATMENT REGIMEN OF TUBERCULOSIS PATIENTS USING INTENSIVE TRIAD-MODEL PROGRAM, THAILAND

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Abstract. The aims of this study were to determine tuberculosis patients' treatment-seeking behaviors, to describe knowledge of TB among TB patients, how that knowledge affected their treatment-seeking behaviors, and to develop an appropriate model to strengthen the existing DOTS program. A cross-sectional study was conducted in all government TB clinics in Samut Prakan Province, Thailand during November 2005-May 2006. The triad model, which emphasizes the role of a triad of persons (the healthcare provider, the TB patient, and his/her treatment supporter), can improve patient adherence to TB treatment regimen. The results showed that only about a quarter (27.7%) of TB patients chose the hospitals with TB clinic for first treatment, while others chose alternative healthcare modes, including self-care and purchasing drugs from drugstores. The rate of successful treatment was higher for the experimental group (96.0%) than the control group (84.9%) (p=0.057). The confirmed cure rate was also significantly higher in the experimental group (95.3% *vs* 78.9%, p=0.02). The program could be utilized to strengthen the existing DOTS program.

INTRODUCTION

Tuberculosis (TB) remains a major global public-health problem. Despite the availability of effective treatment since the 1940s, there were a million new TB cases and about 2 million TB deaths in 2004 (WHO, 2006a). Tuberculosis kills more young and middle-aged adults than any other infectious disease (WHO, 1999). Although it is curable and preventable, TB remains a major cause of morbidity and mortality, particularly in the developing countries (Raviglione *et al*, 1997). Access to quality health services and adherence to effective treatment are issues making TB control in many countries still a challenge.

Thailand is ranked as one of the 22 high-burden TB countries. Tuberculosis has been affecting two subgroups in the population: young adults, the most economically productive group, with TB that is often linked with HIV, and older-age groups, with TB that is more often the result of reactivation (WHO, 2005). In 2004, the incidence of TB in Thailand was 142 cases per 100,000 population/year. In 2006, WHO reported a prevalence of

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208 cases per 100,000 population, with a mortality rate of 19 per 100,000, a 71% DOTS' case-detection rate, and a 73% DOTS' treatment-success rate (WHO, 2006a). Tuberculosis is still a major public health problem in Samut Prakan Province; in 2006, more than 700 TB cases were registered for treatment. The morbidity rate was 70 per 100,000 population, the cure rate was 78.1%, and the default rate 7.4%; therefore, not yet achieving National Tuberculosis Control Program (NTP) targets (Samut Prakan Provincial Public Health Office, 2006).

To identify cases of TB, the NTP, which has been implementing the WHO-recommended Directly Observed Treatment, Short-course (DOTS), has relied on the passive method of screening respiratory-symptomatic individuals seeking care at public healthcare units. A better understanding of the treatment-seeking behaviors of TB patients is needed to identify barriers to timely TB diagnosis and for the development of effective strategies to improve treatment adherence among TB patients. This would help improve the quality of care for all TB cases and increase the proportion of cases successfully treated, while, at the same time, achieve NTP targets.

Many people with tuberculosis first adopt an alternative approach before consulting the healthcare facility. There are several factors that may explain the patients' use of health services other than public health centers; namely, people expect private, providers to be more effective, more easily accessible, more sympathetic, and more likely to respect privacy when compared to government healthcare providers (Pathania *et al*, 1997). The strategy of multiple health-seeking behavior may be called "shopping" for diagnosis and treatment therapy, changing from one healthcare provider to another, often resulting in delays in diagnosis and initiations of effective treatment (Auer *et al*, 2000). Previous studies that addressed the factors that affect health-seeking behavior found that those factors were the poor perception of the health problem, cost of care, physical distance or accessibility of healthcare, and other reasons have been reported as reasons for delay in seeking proper care amongst TB patients in many parts of the world (Godfrey-Faussett *et al*, 2002; Buu *et al*, 2003; Baldwin *et al*, 2004). Amongst TB patients who took any action to relieve symptoms during the symptomatic period, studies found that the accessibility of TB care could be influenced by the patients' demographic and socio-economic characteristics (Wares *et al*, 2001; Chen *et al*, 2002; Xu *et al*, 2004). Studies in Ethiopia on patient and health service delay in diagnosis and treatment of pulmonary TB found limited access to diagnostic facilities, inadequate knowledge about TB, less education, and long distances to healthcare services have been associated with patients delaying proper diagnosis and treatment (Madebo and Lindtjorn, 1999; Demissie *et al*, 2002).

Failure to complete treatment can result in prolonged infectiveness, relapse, drug resistance, and death. Incomplete treatment poses a serious risk for the individual patient and the community. Completing treatment is usually an independent decision made by the patient, a process best referred to as *adherence*. Non-adherent patients remain infectious and can spread *Mycobacterium tuberculosis* infection in a community, thus, impeding achievement of national program targets for TB control. Therefore, early and accurate diagnosis, and effective treatment leading to cure are the core elements of TB control.

Adherence to treatment for tuberculosis over a long period is called short-course chemotherapy, which involves taking medications for at least 6 months. This regimen leads to problem with treatment adherence (Sumartojo, 1993). Studies in many countries have reported that alcohol use, low educational level, low income, younger age, and longer dura-

tion of treatment were associated with non-adherence (Ormerod and Prescott, 1991; Menzies *et al*, 1993; McDonnell *et al*, 2001). It is difficult to predict which patients would not adhere to treatment, and there are several reasons why TB patients cannot adhere to TB treatment; ranging from healthcare provider factors and deeply-held cultural beliefs among patient, and for economic reasons (Sbarbaro, 1990; Rubel and Garro, 1992; Sumartojo, 1993; Bosman, 2000). To minimize non-adherence among TB patients, it is necessary to develop innovations to encourage TB patients to adhere to treatment regimens.

Methods for promoting adherence to therapy should be tailored to the patient's needs. Patients should be educated about the causes and the effects of TB, the dosing and possible adverse reactions of their medication, and the importance of taking their medication according to the treatment plan (Bloch, 1995; Advisory Council for the Elimination of Tuberculosis, 1995). To understand the importance of their illness, the patient needed to understand how their treatment would be organized.

The triad model focused on TB patient centeredness and problem-solving based on interrelationships among healthcare provider, TB patient, and patient's treatment supporter. It was assumed that good relationships between providers and clients form an importance component of quality health care (WHO, 2002). Good doctor-patient communication has been shown to have a positive impact on a number of health outcomes. In previous studies (Stewart, 1995; Stewart *et al*, 2000), the quality of communication between doctor and patient in both history taking and discussion of the management plan was found to be associated with health outcomes, and the level of patient-centered communication was associated with better recovery from discomfort and concern, and better emotional health in the patient. Patient-centered communication influenced patient's health through perceptions that their visit was patient centered.

The doctor-patient relationship model, a mutual participation type that relies on the patient, works with the doctor as a full participant in the control of the disease (Szasz and Hollender, 1956 cited in Cockerham, 2001). This model depicts the doctor and patient working together as more of a team than the patient simply following a doctor's orders does. The doctor-patient relationship may have an important role to play in improving a patient's adherence. The provision of appropriate information, the demonstration of empathy, and the development of patient trust are the key determinants of good compliance with medical treatments in patients (Safran *et al*, 1998).

In general, adherence to medical treatment depends on the characteristics of the treatment, the characteristics of the healthcare delivery system, and the patient-healthcare worker bond. The primary characteristics of tuberculosis treatment that can cause a decrease in adherence include its duration and the need to take several medications (Fujiwara *et al*, 2000). Any long-term therapy needs a positive approach; thus, requiring an adequate basic knowledge about the disease and the importance of regular treatment for cure (Pichu, 2004). To maximize the chance that patients with tuberculosis complete their treatment, a program of Directly Observed Treatment-short course (DOTS), a systematic strategy for TB control, has been developed. This approach is the internationally recognized strategy for TB control (WHO, 2006b). DOTS involves a health professional or other responsible person who observes the patient taking each dose of their anti-TB medication. Treatment cannot be effective unless the patient takes the medications prescribed. The way to ensure that effectiveness is that the patient must be given medications under direct observation by establishing a personal bond between the patient and the healthcare provider

with DOTS. The person who observes treatment is called the *treatment supporter*. The patient and his/her treatment supporter can be effectively trained to participate in the medical decision-making process by empowering with the appropriate knowledge. Ultimately resulting in increased compliance and overall improvement the TB treatment outcomes.

The purposes of the first stage of this study were to describe the patterns of treatment-seeking behaviors among TB patients, and the knowledge of TB among TB patients, and how that knowledge affected their treatment-seeking behaviors. The purposes of the second stage of the study were to evaluate the effectiveness of the intervention program aimed at improving patients' adherence to anti-tuberculosis therapy related to cure rates and treatment completion rates and to determine its effect on TB control program.

MATERIALS AND METHODS

Stage I was a cross-sectional study to investigate patterns of treatment-seeking behaviors among TB patients. Stage II was a quasi-experimental study of a pre-test/post-test, comparison-group design to evaluate the effectiveness of the intervention program to promote TB patient adherence to the treatment regimen.

Study setting and study population

The study was conducted at all government hospitals having TB clinics in Samut Prakan Province, during the period November 2005-May 2006. A purposive sampling technique was used to recruit 300 TB patients who attended one of the five government hospitals with TB clinics (consisting of one general hospital and four district hospitals) in the study site and who were diagnosed as new pulmonary tuberculosis cases. For the intervention study, 103 smear-positive TB cases who attended district TB clinics in November 2005-January 2006 were recruited. They were followed throughout the TB treatment course (for six months), and any special events during the course of treatment and treatment outcomes were documented.

Development of the intervention program

The concept of the intensive triad model was based on interrelationship among the key collaborators that sharing the goal of patient adherence to the TB treatment regimen, namely, the healthcare provider, the patient, and the patient's treatment supporter. This model was intended for TB patients and their treatment supporters and included information about TB and its treatment regimen under the DOTS strategy. The treatment supporters provide counseling, and support to the TB patient taking prescribed medications. One approach should be used to improve TB case management in order to increase the effectiveness of a TB control program; the intensive triad model program was viewed as an innovative way of encouraging TB treatment outcomes.

The model depicts the triad of persons, the healthcare provider, TB patient, and treatment supporter, working together as a team, rather than the patient being required simply to adhere to the doctor's prescriptions. While patients need to be well informed, many still prefer the doctor to be their chief decision-maker. Under the intensive triad model program, patients were received adequate information about their illness condition, for decision-making, and to guide behavior. In TB treatment, where complex regimens are required, the quality of learning and communication for TB-treatment awareness, between healthcare provider, TB patient, and the TB patient's treatment supporter are major determinants of patient adherence.

After the participant was diagnosed as having pulmonary TB, the patients who met the inclusion criteria of the study were recruited into the study together with their treatment

supporter. When the patients and their treatment supporters consented to be included in the study, pre-testing the knowledge regarding TB and its treatment was performed. Subsequently, only the TB patients and treatment supporters received the TB education training program, which included information about the disease, including the symptoms of TB, mode of transmission, TB treatment, and the importance of adherence with anti-TB drugs for the full duration of the treatment, the patient and treatment supporter roles in TB treatment regimens /DOTS, and side-effects of anti-TB drugs. The TB education media consisted of a pamphlet, poster, flipchart, brochure, and the reminding and motivating script on the medication bag, which took about two hours to conduct.

All of the subjects, in both the experimental and comparison groups, received anti-TB drugs for six months under the DOTS program, and free-of-charge care. However, only with the experimental group was the intensive triad-model program implemented for each patient and his/her treatment supporter. This consisted of comprehensive health education about TB and the importance of its treatment. All patients were visited at home once monthly to encourage them to take medication regularly under the supervision of the healthcare provider. In contrast, for the comparison group, none of these interventions were conducted.

Instrument

There were two instruments: 1) the data-collection instrument (structured and unstructured questionnaires), and 2) the intensive triad-model program manual.

1) Data collection instruments. A structured questionnaire consisted of socio-demographic characteristics, TB-related symptoms, time between awareness of symptoms and start of TB treatment regime (defined in weeks), treatment-seeking behaviors, and knowledge about tuberculosis. Monthly medical records and TB cards were used to evaluate patient adherence to the TB treatment regimen and treatment outcome. An unstructured questionnaire was designed for in-depth interviews of patients regarding the reasons actions were taken by the patient to relieve symptoms.

2) The manual of the intensive triad-model program was used to guide the intervention; it included the goals, materials, content, and detailed guidelines for the group education of the TB patients and their treatment supporters. The content consist of the knowledge of TB and the importance of its treatment; TB drugs' names, their indications, usages, and possible side-effects; the reasons why the patient needs to take several medications, the importance for the full duration of the treatment; the role of patient during treatment course, and the role treatment supporter to provide ongoing support to the patient to take the correct TB drugs until completion of the full course of TB treatment.

Definitions

Treatment-seeking behaviors. This refers to actions taken by TB patients to relieve their symptoms, including self-care (home remedy or self-medication), going to a hospital with a TB clinic, purchasing drugs from drugstores, seeing doctors at hospitals and private clinics, visiting a healthcare provider at the community health center (CHC), and using a workplace clinic.

Knowledge about tuberculosis. This refers to the knowledge of the patient about TB, based on the medical perspective on TB, promoted by the National Tuberculosis Control Program (NTP). This section of the questionnaire consisted of eight items, scored as "1" for a correct answer, and "0" for an incorrect answer. Levels of knowledge were categorized as good or poor.

Patient adherence to treatment means fol-

lowing the recommended TB treatment regimen, by taking all of the prescribed medications for the full period required.

Treatment success was defined as cure (smear-negative at treatment completion) or completion of treatment without confirmation by microscopy.

Default case was defined as a smear-positive TB patient who has been on treated for at least one month and whose treatment was interrupted for more than two months.

Data collection

The study was approved by the Ethics Committee of the Faculty of Tropical Medicine, Mahidol University. After obtaining informed consent, the patients were interviewed by the researcher or a trained assistant researcher using the structured questionnaire to collect data on socio-demographic characteristics (age, gender, marital status, education, monthly income, etc), present signs and symptoms related to TB, how long ago the earliest symptoms of pulmonary tuberculosis were evident, and treatment-seeking behaviors, that is, any action taken by the patient to find relief from symptoms, up until the medical diagnosis of pulmonary tuberculosis and initiation of treatment. All subjects were evaluated for TB knowledge: cause of TB, main symptoms suggestive of TB, whether TB was contagious, modes of transmission, and whether TB was curable.

In addition, the medical records of the TB patients were reviewed for patient demographics, sputum-smear results, chest radiograph, signs and symptoms, and the interval between earliest symptoms and date of diagnosis as pulmonary TB and initial treatment. All subjects were asked about their current TB symptoms and any action taken to find relief from them prior to coming to a hospital with a TB clinic.

Of the total participants, 247 TB patients who attended TB clinics were selected and interviewed to determine their reasons for seeking and choosing their type of treatment. Patients were asked how long ago they had their first symptoms, when the earliest symptom of pulmonary tuberculosis arose, and what they did to relieve their symptoms. Sixty-five TB patients, who came directly to a hospital with a TB clinic for treatment as their first choice, were asked for their reasons for doing so. Another 182 TB patients who went to other places prior to visiting a hospital with a TB clinic were asked for their reasons.

Data for the intervention study were collected throughout the treatment course regarding treatment outcomes. TB knowledge was assessed in two stages (pre-test and post-test). After registration for treatment, a formal interview was conducted and knowledge about TB was assessed (pre-test). At two months, at the end of the initial treatment phase, TB knowledge was measured again (post-test), for each TB patient and treatment supporter.

Data analysis

Data were analyzed for socio-demographic variables and distributions of factors related to the treatment-seeking behavior of tuberculosis patients. The independent sample *t*-test was used to compare the differences between the mean scores for knowledge about TB among patients who went as their first choice to a hospital with a TB clinic for treatment, and patients who went to other places prior to visiting a TB clinic, and patients in the experimental and comparison groups. The chi-square test was used to examine relationships between socio-demographic characteristics, knowledge about TB, and treatment-seeking behavior. It was also used to compare treatment outcomes, between the experimental and comparison groups. The level of significance was set at $p < 0.05$. Content analysis was used for in-depth information.

Table 1
Characteristics of the tuberculosis patients studied.

Population characteristics	Number (*N*=300)	(%)
Gender		
Male	172	57.3
Female	128	42.7
Age (years)		
< 25	48	16.0
25-34	75	25.0
35-44	79	26.3
45-54	47	15.7
55-64	27	9.0
≥ 65	24	8.0
$\bar{X}$ = 39.9 SD = 14.9 Min = 15 Max = 86		
Marital status		
Single	94	31.3
Married	167	55.7
Divorced	17	5.7
Widowed	11	3.7
Separated	11	3.7
Education		
Illiterate	30	10.0
Primary school	157	52.3
Secondary school	69	23.0
High school	33	11.0
College	11	3.7
Occupation		
Unemployed	172	57.3
Officer	22	7.3
Laborer	115	38.3
Agriculturist	21	7.0
Merchant	27	9.0
Monthly income (Baht)		
No income	38	12.7
< 5,000	112	37.3
5,000-10,000	132	44.0
> 10,000	18	6.0
Family size (persons)		
< 4	94	31.3
4-6	181	60.3
≥ 7	25	8.3
$\bar{X}$ = 4.3 SD = 1.6 Min = 2 Max = 11		
Health information media (some had more than one information source)		
TV	248	82.7
Radio	74	24.7
Newspaper	87	29.0
Healthcare provider	14	4.7
Had a person to remind to take medication		
Yes	228	76.0
No	72	24.0

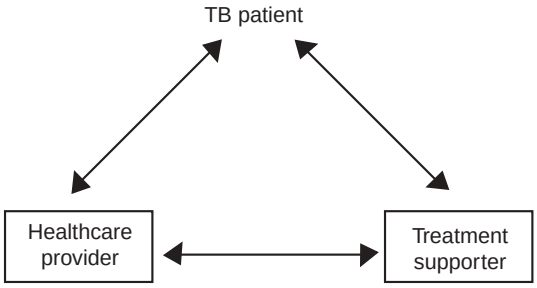

Fig 1–The Triad Model: interactions among key persons in the TB treatment model and the DOTS strategy.

RESULTS

Study Stage I: treatment-seeking behaviors

Socio-demographic characteristics. The ages of the participants ranged from 15-86 years; 51.3% were aged 25-44 years (25.0% were 25-34 years; 26.0% were 35-44 years). Of the total, 57.3% were male, 52.3% had finished primary school, 55.7% were married, 57.3% were unemployed, and 38.3% were laborers; 44.0% had incomes of 5,000-10,000 Baht per month and 37.3% < 5,000 Baht; 41.0% had a child aged < 15 years living in their house; 24.0% had no person to remind them to take their medication; 91.7% had received some information about tuberculosis, and the major source was a television campaign (82.7%).

Actual treatment-seeking behaviors. Table 2 shows the participants' actual treatment-seeking behaviors when they first chose relief from their symptoms. In the self-care category, including rest and self-medication by home remedy, higher percentages were found among first-stage treatment-seekers (132; 44.0%). Among the remainder, 83 (27.7%) came to a hospital with a TB clinic, were diagnosed with TB, and started a TB treatment regimen; 40 (13.3%) purchased drugs from a drugstore; 25 (8.3%) went to a community health center (CHC), 10 (3.3%) utilized a workplace clinic; and 5 (1.7%) went to either a private clinic or

Table 2
Actual treatment-seeking behaviors of TB patients, from first to fifth stages of treatment.

Stage	Hospital with TB clinic No. (%)	Self-care No. (%)	Drug store No. (%)	Private clinic No.(%)	Community health care No. (%)	Hospital[a] No. (%)	Workplace clinic No. (%)	Total *N*=300 (%)
Stage1	83 (27.7)	132 (44.0)	40 (13.3)	5 (1.7)	25 (8.3)	5 (1.7)	10 (3.3)	300 (100)
Stage2	26 (8.7)	0 (0.0)	136 (45.3)	19 (6.3)	19 (6.3)	17 (5.7)	0 (0.0)	217 (72.3)
Stage3	53 (17.7)	0 (0.0)	0 (0.0)	21(7.0)	40 (13.3)	77 (25.7)	0 (0.0)	191 (63.7)
Stage4	101 (33.7)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	37 (12.3)	0 (0.0)	138 (46.0)
Stage5	37 (12.3)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	37 (12.3)
Total, *N* = 300 (100)								

[a]Both government and private hospitals.

hospital. In the second stage, after the participants had decided to take action to find relief from their symptoms, but the symptoms continued and were not diagnosed as TB, 136 (45.3%) purchased drugs from a drugstore; 26 (8.7%) came to a hospital with a TB clinic, were diagnosed with TB, and started a TB treatment regimen; 19 (6.3%) went to either a private clinic or CHC; and 17 (5.7%) went to a hospital. In the third stage, 77 (25.7%) went to a hospital but were not diagnosed with TB, while 53 (17.9%) went to a hospital with a TB clinic, were diagnosed with TB and started a TB treatment regimen; for the remainder, 40 (13.3%) went to a CHC and 21 (7.0%) went to a private clinic. In the fourth stage, 101 (33.7%) went to a hospital with a TB clinic, were diagnosed with TB and started a TB treatment regimen, while the remainder, 37 (12.3%), went to a hospital but were not diagnosed with TB. At the final, fifth stage, after having taken multiple actions to find relief from their symptoms, but the symptoms were still present or even more persistent, 37 (12.3%) came to a hospital with a TB clinic, were diagnosed with TB, and started a TB treatment regimen.

Over half of the TB patients visited more than one source of medical care to find relief from their symptoms before TB was diagnosed. One of the most common first choices when seeking medical care outside the household was the private sector, in particular, private pharmacies. In the second and third stages of treatment seeking, some patients sought treatment at a hospital but were not diagnosed with TB, and thus did not start a TB treatment regimen. This finding revealed that the lack of TB awareness among physicians and professional caregivers was the cause of delayed diagnosis and effective TB treatment.

Delays in effective TB treatment are often prolonged and related to both patient treatment-seeking behaviors and case-detection failures by physicians. Regarding the TB patients' first choice of various medical care sources for relief of their symptoms, rather than a hospital with a TB clinic, the TB patients had initially perceived their early symptoms as not being serious and were not aware that they had TB, so they opted for self-care (home-remedies). When their symptoms persisted, they self-diagnosed and self-medicated, purchasing drugs from drugstores. Other factors related to their treatment-seeking behaviors may be the accessibility of medical care resources other than hospitals with

TB clinics, and the long waiting times at hospitals.

Most of the patients were not aware of the symptoms of TB until they were diagnosed; they thought there were multiple causes of TB, such as smoking, working hard, environmental factors (including dust and living in an unclean environment), and not being in good physical condition. However, a small number of patients knew that TB was caused by bacteria. Awareness of TB by the study participants, its symptoms, and the seriousness of the disease, was generally poor. Most participants reported symptoms typically associated with TB, while treatment seeking was generally delayed until the disease was advanced or interfered with their work or normal activities. They considered the early symptoms of TB as not serious; thus, they were unable to distinguish between cough and fever due to a common cold and similar symptoms that indicate TB. Because the patients initially felt that their condition was not serious, a large number used self-medication, such as purchasing drugs from a pharmacy (drugstore). They were successful in controlling the fever and the feeling of being sick, but could not get rid of the cough, which led to the use of stronger home remedies and a second visit to the pharmacy (drugstore) for anti-cough drugs. While self-medication and visiting a pharmacy were the most common behaviors for dealing with the initial symptoms, several patients said they attended a private clinic or public-health center where they received similar prescriptions to those who visited pharmacies. Therefore, it may be concluded that a lack of awareness of TB symptoms was one of several reasons why they chose self-care, visited private practitioners, purchased drugs from drugstores, went to private clinics or community health centers, and when they were not cured or did not feel better, they went to see a doctor at a hospital (TB clinic). The other factors that influenced the decision to seek treatment were family members and friends, and the limitations imposed by the working hours of both health providers and patients.

A number of TB patients reported that their family members or friends influenced their treatment-seeking behavior. They believed that their family members and friends had told them whether to visit a doctor. However, many patients reported they had no time, because of heavy working hours. When they had spare time, the patients said, the hospital (TB clinic) was closed when they visited (outside working hours), so they resorted to other healthcare facilities.

Overall, the male TB patients had poorer knowledge of TB than the females. Patients aged ≤ 40 years had better TB knowledge levels than those aged > 40 years did. The "illiterate/finished primary school" TB patients had a higher percentage of poor TB knowledge than those who had finished secondary/higher school, as shown in Table 3.

TB patient characteristics and treatment-seeking behaviors. The socio-demographic characteristics of the TB patients and their treatment-seeking behaviors are shown in Table 4. TB patients aged ≤ 40 years were more likely to choose a hospital with a TB clinic first than those aged > 40 years were ($p = 0.02$). Employed TB patients were more likely to visit a hospital with a TB clinic first than unemployed were ($p<0.001$). TB patients who had finished secondary/ higher school levels were more likely to visit a hospital with a TB clinic first than the "illiterate/finished primary school" group ($p<0.001$), and those with better knowledge levels about TB were more likely to visit a hospital with a TB clinic first than those with poorer knowledge levels ($p<0.001$).

Patient knowledge of TB. Table 5 shows the differences in mean scores for patient knowledge of TB in the experimental and comparison groups, before and after the experiment.

Table 3
Socio-demographic variables and patient knowledge about TB.

Variables	Knowledge about TB (*N*=300)		p-value[a]
	Low No. (%)	High No. (%)	
Gender			
Male	67 (72.0)	105 (50.7)	0.001
Female	26 (28.0)	102 (49.3)	
Age			
≤ 40 years	43 (46.2)	131 (63.3)	0.006
> 40 years	50 (53.8)	76 (36.7)	
Employment status			
Unemployed	35 (37.6)	80 (38.6)	0.86
Employed	58 (62.4)	127 (61.4)	
Educational level			
Illiterate and primary	72 (77.4)	115 (55.6)	<0.001
Secondary and higher	21 (22.6)	92 (44.4)	
Monthly income (Baht)			
No income and < 5,000	52 (55.9)	98 (47.3)	0.17
≥ 5,000	41 (44.1)	109 (52.7)	

[a]Chi-square test

The minimum and maximum scores for TB knowledge were 0 and 8, respectively. Before the intervention, the groups had similar mean knowledge scores (4.58 and 4.64, for experimental and comparison groups, respectively). After the intervention, the experimental group had a significantly higher mean knowledge score (7.98) than the comparison group had (6.75, p<0.001).

Study Stage II: improvement in patient adherence to treatment

Patient adherence to tuberculosis-treatment regime was followed-up through the outcomes of treatment (for six months). Table 6 shows TB patients' compliance with taking anti-tuberculosis drugs for six months under the DOTS strategy. The study revealed that non-compliance with taking anti-tuberculosis drugs first appeared on month 4 in the experimental group; 9 (18.0%) were taking anti-tuberculosis medication irregularly by month 4, 4 (8.0%) and 1 (2.0%) by month 5, and by month 6, even more. The TB patients in the comparison group were taking anti-tuberculosis medication irregularly from months 1 through 6. Moreover, defaulters occurred in the comparison group by months 4, 5, and 6.

Treatment outcomes

Comparing the treatment outcomes of the experimental and comparison groups, the study found that 5 (9.4%) defaulted in the comparison group, while none defaulted in the experimental group. Of the 50 TB patients in the experimental group, 41 (82.0%) were cured, while of the 53 TB patients in the comparison group, 30 (56.6%) were cured. Therefore, the experimental group had a substantially higher cure rate than the comparison group.

Table 7 shows successful treatment outcomes for 96.0% of the experimental group and 84.9% of the comparison group. While this difference is not statistically significant

Table 4
Comparison of the socio-demographic characteristics of TB patients and their treatment-seeking behaviors.

Variables	Visit hospital with TB clinic as first choice *n* (%)	Visit hospital with TB clinic as other choice *n* (%)	p-value[a]
Gender			
Male	45 (54.2)	127 (58.5)	0.5
Female	38 (45.8)	90 (41.5)	
Age			
≤ 40 years	57 (68.7)	117 (53.9)	0.02
> 40 years	26 (31.3)	100 (46.1)	
Employment status			
Unemployed	18 (21.7)	97 (44.7)	<0.001
Employed	65 (78.3)	120 (27.3)	
Educational level			
Illiterate and primary	30 (36.1)	157 (72.4)	<0.001
Secondary and higher	53 (63.9)	60 (27.6)	
Monthly income (Baht)			
No income and < 5,000	42 (50.6)	108 (49.8)	0.89
≥ 5,000	41 (49.4)	109 (50.2)	
Marital status			
Married	43 (51.8)	124 (57.1)	0.4
Single and divorced	40 (48.2)	93 (42.9)	
Knowledge about TB			
Poor (Low)	13 (15.7)	80 (36.9)	<0.001
Good (High)	70 (84.3)	137 (63.1)	

[a]Chi-square test

Table 5
Comparison of TB knowledge among TB patients.

Variables	Experimental group (*n* = 50)		Comparison group (*n* = 53)		*t*-value	df	p-value
	$\bar{X}$	SD	$\bar{X}$	SD			
Knowledge of TB							
Before experiment	4.58	1.05	4.64	1.4	0.25	101	0.81
After experiment	7.98	0.14	6.75	1.4	6.0	101	< 0.001

(p = 0.057) in terms of the confirmed cured rate (patients cured, with negative sputum-smears in month 6), most patients in the experimental group were more likely to confirm cure than the comparison group. The results showed a significant difference in confirmed-cure rates between the experimental and comparison groups.

Table 6
Comparison of TB patient compliance with taking medication for a tuberculosis treatment regimen, between experimental and comparison groups.

Regularly taking medications[a]	Experimental group *n* = 50 (%)	Comparison group *n* = 50 (%)
1st month		
Yes	50 (100)	49 (92.5)
No	0 (0.0)	4 (7.5)
2nd month		
Yes	50 (100)	48 (90.6)
No	0 (0.0)	5 (9.4)
3rd month		
Yes	50 (100)	50 (94.3)
No	0 (0.0)	3 (5.7)
4th month[b]		
Yes	41 (82.0)	36 (67.9)
No	9 (18.0)	15 (28.3)
5th month[b]		
Yes	46 (92.0)	35 (66.0)
No	4 (8.0)	14 (26.4)
6th month[b]		
Yes	49 (98.0)	36 (67.9)
No	1 (2.0)	12 (22.6)

[a]Measured by pill count and TB card records
[b]Some TB patients defaulted

DISCUSSION

Currently, most countries use passive case-finding approaches to detect TB, as recommended by WHO. This means that persons who suspect they have TB must initiate patient-healthcare provider contact. In this context, knowledge of TB symptoms and the curability of TB play a crucial role. The unchallenged assumption behind this approach is that the symptoms of TB are so severe that patients will seek treatment soon after they develop (Newell, 2002). The onset of active tuberculosis is insidious, and the symptoms can be nonspecific. Pulmonary-TB symptoms range from very mild to severe, and can present with productive cough with or without bloody sputum, fatigue, anorexia, weight loss, fever, sweating and/or chills, and chest pain. The time between onset of symptoms to diagnosis and proper treatment by a qualified health provider (treatment delay), can contribute to increased TB transmission in the community and more severe disease. Both patient and healthcare-provider factors, such as the accessibility or quality of services and the physician's awareness of TB, can contribute to delays in diagnosis and treatment.

The determinants of TB patients' treatment-seeking behaviors in this study appeared to be complex and represented the interaction of a number of influences on behavior. An awareness of TB symptoms by patients did not always result in their seeking treatment, because the early symptoms of TB were nonspecific. Treatment seeking at multiple healthcare sources before diagnosis and start of TB treatment is a common pattern among TB patients. In addition, seeking different kinds of medical relief/help may account for delays in diagnosis and correct treatment. This finding indicated that government health services, including hospitals with TB clinics, were not the first choice for TB patients, for the relief of their symptoms.

Physicians were also partially responsible for delays in case detection. Tuberculosis is a disease with diverse manifestations, which can mimic other diseases, and in the early stages, symptoms are non-specific. Clinical manifestations can be typical or atypical, depending on the immune status of the patient. It is, therefore, not surprising that diagnosis can elude the most astute physicians, tuberculosis tends to be forgotten, and the clinical picture is ascribed to a severe form of respiratory tract infection.

Our study findings were consistent with

Table 7
Comparison of treatment outcomes for the two TB-patient groups.

Treatment outcomes	Experimental group *n*=50 (%)	Comparison group *n*=53 (%)	p-value[a]
Successful	48 (96.0)	45 (84.9)	0.057
Failure/default	2 (4.0)	8 (15.1)	
Confirmed cure	41 (95.3)	30 (78.9)	0.02
Failure/default	2 (4.7)	8 (21.1)	

[a]Chi-square test

several other reports. Tupasi *et al* (1999) found that TB patients who received suggestions about TB took no action (43%), self-medicated (31.6%), and consulted a healthcare provider (25.4%), which included private medical practitioners (11.8%), public health centers (7.5%), private hospitals (4.4%), and traditional healers (1.7%). A study by Sudha *et al* (2003) revealed that a greater percentage of symptomatic cases attended private healthcare facilities (78% of urban, 78% of rural) than government ones (55% of urban, 60% of rural), while 33% of urban, and 21% of rural chest symptomatic cases self-medicated. Kiwuwa *et al* (2005) found that patients went to pharmacies or drug stores (39.4%) and private clinics (36.8%) more commonly than government health units (14%), for the initial contact. Grover *et al* (2003) found that patients with chronic chest symptoms had taken some treatment: 52.5% home remedies, 47.5% self-medication, and the majority (82.0%) went to healthcare providers late. The study by Ouedraogo *et al* (2006) found that, before obtaining a diagnosis, 24.5% of patients had visited a public health unit, 31% had visited a private health unit, 31% had treated themselves, and 6% had visited a traditional healer.

Knowledge is an essential component of the health behaviors of TB patients, as regards seeking medical care for symptomatic relief. This study found that knowledge was significantly associated with treatment-seeking behaviors. Patients with better knowledge of TB were more likely to come to a hospital with a TB clinic first than those with poorer knowledge. Knowledge of TB enables people to recognize the symptoms of TB and seek early and appropriate medical care. Similarly, a study in Ethiopia by Demissie *et al* (2002) found knowledge to be an independent variable resulting in significant treatment-seeking delays. Therefore, educating people about TB will help people seek medical care earlier.

The result of this intervention study using the intensive triad model suggested that the successful treatment rate was higher for the experimental than the comparison group was. Moreover, the confirmed cure rate was higher for the experimental than the comparison group ($p = 0.02$).

The intensive triad-model program emphasized the participation of key persons to implement program activities, focusing on patient adherence to the treatment regimen. Cure rates were higher for TB patients who received the intensive triad model intervention and the DOTS program, than those who received DOTS alone were. Family members observed treatment for most patients in this study. The study results suggested that treatment supporters (family members) and treatment supervised by a TB-care team provided

effective and convenient support for TB patients. This model could be helpful in improving TB cure rates, which is one of the important targets of the National Tuberculosis Control Program (NTP). The effectiveness of this model is based on the strength of the DOTS program at the household level.

This study had several limitations that the information used in the study largely depended on self-reports by patients, while the survey of treatment-seeking behaviors was based on patient recall and interpretation of the history of the onset of TB symptoms and their duration. Recall bias was thus a serious threat to the estimates of treatment-seeking action taken and duration before TB diagnosis and treatment. To minimize bias, questionnaires were pre-tested to ensure that all questions were understood. Questions were crosschecked and repeated in different sections of the questionnaire to check for internal consistency. Interviewers were carefully trained and with direct interviews of the cases, recall bias was minimized. Another limitation was potential selection bias of the sample that all patients were selected by purposive sampling technique and were only patients diagnosed at government hospital TB clinics. Therefore, the results may not explain the treatment-seeking behaviors of TB patients diagnosed and treated in private hospitals, especially patients with social-security insurance. However, the results of this study should be interpreting with caution when generalize them to the others, because the study was carried-out only in Samut Prakan Province.

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