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Preliminary study: Exploring the influence of healthcare services and antibiotic discontinuation among pulmonary tuberculosis patients with self-administration in Western Thailand: A case-control study

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ABSTRACT

Background: Outpatients generally use self-administration, which might result in defaulting from treatment.

Objective: This study evaluated the association between patient treatment discontinuation and health service.

Materials and methods: This retrospective case-control study was conducted in a TB clinic at Makarak Hospital, Kanchanaburi Province, Thailand. Participants who completed and discontinued treatment from 2017 to 2021 were surveyed using questionnaires.

Results: A total of 198 patients with TB who discontinued (N=49) and completed treatment (N=149) were analyzed. Associated factors of discontinued treatment in those who were male were (OR=8.41, 95%CI: 1.55-45.61), not receiving support from a family member (OR=33.75, 95%CI: 3.22-353.76), and waiting time of more than 3 hours for health services (OR=9.39, 95%CI: 1.98-44.64).

Conclusion: Prolong treatment delivery services that exceed more than 3 hours and living without family support were associated with drug discontinuation in patients with TB who were self-administration treatment. These factors should be considered to enhance TB treatment success and infection control.

Introduction

Pulmonary tuberculosis (PTB) remains a significant public health concern with global implications.[1,2] The Global Tuberculosis 2023 report reported that the incidence rate of new and relapsed TB cases was estimated at approximately 150 per 100,000 people, particularly in western Thailand.[4,5]

Antibiotics (ATB) is the standard treatment for cue TB infection. The estimated TB treatment coverage among Thai people is 67%.[3] Medication adherence is crucial for treatment successiveness. Inappropriate adherence, especially treatment discontinuation, is the possibility of developing antibiotic-drug resistance, which results in the persistence of the infection, enhanced transmission, and high relapse rates and becomes more complex, costly, and less successful due to these strains' resistance to the medications.[6,7]

Directly observed treatment short (DOTs) course is recommended for TB treatment. This strategy is for encouraging patients to receive medication adequately and results in increased treatment progression and

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infection control.[8] Self-administration treatment (SAT) is uncommonly used, and some patients are at risk of self-adjusted doses of medication, which results in defaulting to TB treatment. However, previous systematic reviews and meta-analyses showed DOTs were not superior to SAT.[9,10]

One of the main challenges of TB control is avoiding the acquisition of drug resistance. However, directly observed treatments are limited in some areas; thus, outpatients generally use SAT, and healthcare delivery systems are reasonable to apply. However, the risk of discontinuation of TB treatment has remained. Therefore, drug discontinuation in outpatients who have self-administration and collaborate with healthcare services in local Thai areas is not well established. This study explored the factors that affected drug discontinuation, particularly in healthcare services.[6,8,11-15]

Materials and methods

Study design and participants

A retrospective case-control study was conducted among TB patients who tested IGRA positive and aged over 15 years old were included in this study. All participants were self-administered during the continuation phase of TB treatment, during which the healthcare providers instructed the medication procedure participants. Those who discontinued treatment by interviewing were assigned to the study group, whereas those who always continued TB treatment were assigned to the control group. Informed consent was obtained before participating in this study. This study was approved by the Institutional Review Board of Makarak Hospital (IRB number 2/65).

Protocol

Participants were registered at the TB clinic, and data were collected from the pulmonary TB clinic at Makarak Hospital from 2017 to 2021. The questionnaire was developed based on a review of literature related to factors associated with treatment discontinuation in pulmonary TB patients. It was pre-tested and revised with feedback from a focus group of nurses and staff members responsible for identifying case controls and recording participant information at the TB clinic. Three experts evaluated the content validity of the research tool before it was used in the study. The questionnaire collected information on sociodemographic factors, such as sex, age, marital status, religion, ethnicity, educational level, occupation, household members, and family support, as well as details about travel time to the hospital and waiting time for services at the TB clinic.

Data analysis

For the descriptive analysis, frequencies and percentages were used for categorical data, whereas means and standard deviations were used for continuous data. Chi-squared tests were used to determine the factors associated with discontinuation. The level of significance was set at $p<0.05$.

A conditional logistic regression model included all variables with a $p<0.20$ in univariate analysis. Binary logistic regression was used to analyze factors related to treatment discontinuation in patients with PTB.

Results

A total of 198 patients with PTB were eligible for participation in the study. The majority were aged 46-60 (34.80%), men (67.70%), Buddhists (98.00%), and Thais (98.00%).

The characteristics of the participants in the study and control groups and the factors associated with the discontinuation of TB treatment in the univariate analysis (Table 1). Significant factors for discontinuing TB treatment included being male, unmarried, Buddhist, Furthermore, having primary education, being employed, living with household members, not receiving support from family members, biking to the hospital, and having a waiting time of more than 3 hours for services at the TB clinic were additional significant factors related to treatment discontinuation ($p<0.05$).

Table 1. Sociodemographic factors associated with discontinuing tuberculosis treatment among the study and control groups.

Factor	Total participants (N=198)		Chi-square	*p* value
	Discontinuation (N=49)	Control (N=149)		
Gender			4.226	0.040
Male	39 (19.70)	95 (47.98)		
Female	10 (5.05)	54 (27.27)		
Age (years)			4.593	0.332
15-30	9 (4.55)	13 (6.57)		
31-45	9 (4.55)	28 (14.14)		
46-60	18 (9.09)	51 (25.76)		
61-75	9 (4.55)	40 (20.20)		
>76	4 (2.02)	17 (8.59)		

Table 1. Sociodemographic factors associated with discontinuing tuberculosis treatment among the study and control groups (continued).

Factor	Total participants (N=198)		Chi-square	*p* value
	Discontinuation (N=49)	Control (N=149)		
Type of TB			5.012	0.171
TB	34 (17.2)	122 (61.6)		
MDR-TB	12 (6.1)	21 (10.6)		
Pre-XDR-TB	3 (1.5)	4 (2.0)		
XDR-TB	0 (0.0)	2 (2.10)		
Comorbidity			6.102	0.014
Yes	17 (8.6)	82 (41.4)		
No	32 (16.2)	67 (33.8)		
Drug side effect			2.748	0.097
Yes	41 (20.7)	107 (54.0)		
No	8 (4.0)	42 (23.7)		
Marital status			17.485	<0.001
Single	21 (10.61)	24 (12.12)		
Married	17 (8.59)	96 (48.48)		
Widowed/separated	11 (5.56)	29 (14.65)		
Religion			12.414	<0.001
Buddhist	45 (22.73)	149 (75.25)		
Others	4 (2.02)	0 (0.00)		
Ethnicity			12.414	<0.001
Thai	45 (22.73)	149 (75.25)		
Not Thai	4 (2.02)	0 (0.00)		
Level of education			17.186	0.004
Non-formal	8 (4.04)	7 (3.54)		
Primary	26 (13.13)	90 (45.45)		
Secondary	15 (7.58)	28 (14.14)		
Diploma, vocational certificate	0 (0.00)	10 (5.05)		
Undergraduate	0 (0.00)	13 (6.57)		
Postgraduate	0 (0.00)	1 (0.51)		
Occupation			23.448	<0.001
Agriculture	3 (1.52)	22 (11.11)		
Employment	37 (18.69)	54 (27.27)		
Government service	0 (0.00)	7 (3.54)		
Business owner	2 (1.01)	12 (6.06)		
Others	7 (3.54)	54 (27.27)		
Number of household members			28.270	<0.001
1-2	30 (15.15)	31 (15.66)		
3-5	16 (8.08)	98 (49.49)		
>5	3 (1.52)	20 (10.10)		
Receiving support from a family member			62.673	<0.001
Yes	22 (11.11)	141 (71.21)		
No	27 (13.64)	8 (4.04)		
Method used for travel to the hospital			29.765	<0.001
Walking	2 (1.01)	0 (0.00)		
Bicycling	0 (0.00)	1 (0.51)		
Motorbike	29 (14.6)	75 (37.88)		
Car	11 (5.56)	72 (36.36)		
Bus	7 (3.54)	1 (0.51)		

Table 1. Sociodemographic factors associated with discontinuing tuberculosis treatment among the study and control groups (continued).

Factor	Total participants (N=198)		Chi-square	*p* value
	Discontinuation (N=49)	Control (N=149)		
Distance from home to the hospital (km)			2.219	0.528
<5	4 (2.02	23 (11.62)		
5-15	36 (18.18)	94 (47.47)		
16-30	8 (4.04)	28 (14.14)		
>31	1 (0.51)	4 (2.02)		
Waiting time for services at the TB clinic (hour)			23.824	<0.001
<1	1 (0.51)	2 (1.01)		
1-2	8 (4.04)	84 (42.42)		
>3	40 (20.20)	63 (31.82)		

Note: data represented as N (percentage).

The factors related to treatment discontinuation in patients with PTB from the final regression model using binary logistic regression are shown in Table 2. Significant factors for discontinuing TB treatment were male sex (OR=8.41; 95% CI=1.55-45.61), living without support from a family member (OR=33.75; 95% CI=-3.22-353.76), and a waiting time of more than 3 hours at the TB clinic to receive treatment (OR=9.39; 95% CI=1.98-44.64).

Table 2. Factors related to the discontinuation of treatment in patients with pulmonary tuberculosis.

Variable	B	SE	Wald	*p* value	Odds ratio	95% CI	
						Lower	Upper
Sex							
Male	2.13	0.86	6.09	0.014*	8.41	1.55	45.61
Social factors							
Not receiving support from a family member	3.52	1.20	8.62	0.003**	33.75	3.22	353.76
Hospital service							
Waiting time of more than 3 hours for services at the clinic	2.24	0.80	7.93	0.005**	9.39	1.98	44.64
R-square = 0.587							

**p<0.05; ** p<0.01*

Discussion

Over the past decade, Kanchanaburi province has faced a TB epidemic in Thailand, with Tha Maka district reporting the highest rates of TB and MDR-TB infection.[16,17] This study identified factors related to drug discontinuation in patients with pulmonary TB, focusing mainly on the influence of healthcare services. The tuberculosis clinic handles screening for both TB and MDR-TB patients and provides guidance on medication adherence to ensure that patients complete their treatment. The study found that medication-related complications were rare and were generally managed effectively by clinic staff, preventing these issues from leading to discontinuation. Additionally, evaluations revealed that the percentage of TB and MDR-TB patients remains high, as the study site is one of the largest sources of MDR-TB cases in Thailand, continuing to see new cases despite existing control measures. This situation highlights the importance of the study and is a key reason why the research focused on this issue.

This study demonstrated that male participants were more likely to discontinue treatment than female participants (OR=8.41, 95% CI:1.55-45.61), consistent with the study by Herreo-.[18] which reported that men were more likely to discontinue TB therapy, with odds ratio of 2.8 (95% CI = 1.2-6.7). Additionally, Umo *et al*.[19] reported that men had an odds ratio of 1.9 (95% CI = 1.2-3.0).

According to the social factor, it was the meaningful factor in patient adherence (OR=33.75, 95% CI: 3.22-353.76). The study indicated that a lack of family support to supervise and remind patients about taking their medication significantly increased the likelihood of tuberculosis patients missing doses. Therefore, patients who do not receive care from their relatives are at a higher risk of experiencing interruptions in their tuberculosis treatment, leading to less effective outcomes compared to those with family support. In contrast, Tian *et al*.[9] reported no significant difference between family and non-family directly observed treatment. This different finding might be from socio-cultural influences.

Waiting more than 3 hours at the TB clinic was significantly associated with a higher probability of discontinuing TB treatment (OR=9.39; 95%CI: 1.98-44.64).

This finding, related to a previous study by Zegeye *et al*.,[12] revealed that waiting an hour for treatment significantly increased the chance of terminating treatment (OR=4.88; 95% CI:3.44-6.91). In addition, Muture *et al*. reported that waiting more than 1 hour at the TB clinic significantly contributed to treatment discontinuation (OR=2.34, 95CI: 1.32-4.16).[6] Hence, these studies' results support the findings that longer waiting times at TB clinics and discontinuation of ongoing TB treatment correlate across various countries.[20-22] Waiting for healthcare service for a longer time results in negative patient satisfaction, which might increase the discontinuation treatment rate. According to the participants' characteristics, most of the occupations in this study were employers, and waiting too long might disrupt patients' income.

Therefore, pulmonary TB patients with self-administration might be drug discontinuation due to family support and waiting time of more than 3 hours since these strains are resistant to the drugs, cause the infection to persist, increase in transmission, and have a high recurrence rate.

Limitation

This study was a preliminary study with a small sample size and different proportions between groups. According to the study, it was clinical research, and participants were selected based on the patients' treatment outcomes.

Conclusion

Waiting times exceedingly more than 3 hours for receiving treatment from healthcare services and living without family support result in treatment discontinuation. Therefore, the appropriate healthcare service should be concerned with enhancing treatment success and infection control in pulmonary TB with self-administration.

Conflict of interest

There were no conflicts of interest in this study.

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References

[1] Salame FM, Ferreira MD, Belo MT, Teixeira EG, Cordeiro-Santos M, Ximenes RA, *et al*. Knowledge about tuberculosis transmission and prevention and perceptions of health service utilization among index cases and contacts in Brazil: Understanding losses in the latent tuberculosis cascade of care. Hasnain SE, editor. PLoS ONE. 2017; 12(9): e0184061. doi.org/10.1371/journal.pone.0184061.

[2] WHO. Global tuberculosis report 2022 [Internet]. Geneva; 2022 [cited 2023 Oct 15]. Available from: https://www.who.int/teams/global-tuberculosis-programme/tb-reports/global-tuberculosis-report-2022.

[3] WHO. Global Tuberculosis Report 2023 [Internet]. 2023 [cited 2024 May 31]. Available from: https://www.who.int/teams/global-tuberculosis-programme/tb-reports/global-tuberculosis-report-2023.

[4] Jiraphongsa C, Wangteeraprasert T, Henpraserttae N, Sanguanwongse N, Panya L, Sukkasitvanichkul J, *et al*. Community outbreak of multidrug resistance tuberculosis, Kanchanaburi province, Thailand on 2002-June 2010. J Prev Med Assoc Thai. 2011; 1: 261-71.

[5] Sujariyakul A, Rudeeaneksin J, Tipkrua N, Phetsuksiri B. Epidemiology and genotypes of Mycobacterium tuberculosis at an outbreak area in Kanchanaburi province. Dis Control J. 2016; 42(4): 337-47. doi.org/10.14456/dcj.2016.7.

[6] Muture BN, Keraka MN, Kimuu PK, Kabiru EW, Ombeka VO, Oguya F. Factors associated with default from treatment among tuberculosis patients in nairobi province, Kenya: A case control study. BMC Public Health. 2011; 11(1): 696. doi.org/10.1186/1471-2458-11-696.

[7] Garrido M da S, Penna ML, Perez-Porcuna TM, Souza AB de, Marreiro L da S, Albuquerque BC, *et al*. Factors Associated with Tuberculosis Treatment Default in an Endemic Area of the Brazilian Amazon: A Case Control-Study. PLOS ONE. 2012; 7(6): e39134. doi.org/10.1371/journal.pone.0039134.

[8] WHO. WHO consolidated guidelines on tuberculosis. Module 4: treatment - drug-resistant tuberculosis treatment, 2022 update. Geneva; 2022.

[9] Tian JH, Lu ZX, Bachmann MO, Song FJ. Effectiveness of directly observed treatment of tuberculosis: a systematic review of controlled studies. Int J Tuberc Lung Dis. 2014; 18(9): 1092-8. doi.org/ 10.5588/ijtld.13.0867.

[10] Pasipanodya JG, Gumbo T. A meta-analysis of self-administered vs directly observed therapy effect on microbiologic failure, relapse, and acquired drug resistance in tuberculosis patients. Clin Infect Dis. 2013; 57(1): 21-31. doi.org/ 10.1093/cid/cit167.

[11] Namukwaya E, Nakwagala F, Mulekya F, Mayanja-Kizza H, Mugerwa R. Predictors of treatment failure among pulmonary tuberculosis patients in Mulago hospital, Uganda. Afr Health Sci. 2011; 11(Suppl 1): S105-11. doi.org/ 10.4314/ahs.v11i3.70079.

[12] Zegeye A, Dessie G, Wagnew F, Gebrie A, Islam SMS, Tesfaye B, *et al*. Prevalence and determinants of anti-tuberculosis treatment non-adherence in Ethiopia: A systematic review and meta-analysis. PLOS ONE. 2019; 14(1): e0210422. doi.org/ 10.1371/journal.pone.0210422.

[13] Dodor EA, Afenyadu GY. Factors associated with tuberculosis treatment default and completion at the Effia-Nkwanta Regional Hospital in Ghana. Trans

R Soc Trop Med Hyg. 2005; 99(11): 827-32. doi.org/ 10.1016/j.trstmh.2005.06.011.

[14] Mekonnen HS, Azagew AW. Non-adherence to anti-tuberculosis treatment, reasons and associated factors among TB patients attending at Gondar town health centers, Northwest Ethiopia. BMC Research Notes. 2018; 11(1): 691. doi.org/ 10.1186/s13104-018-3789-4.

[15] Gugssa Boru C, Shimels T, Bilal AI. Factors contributing to non-adherence with treatment among TB patients in Sodo Woreda, Gurage Zone, Southern Ethiopia: A qualitative study. Infect Public Health. 2017; 10(5): 527-33. doi.org/ 10.1016/j.jiph.2016.11.018.

[16] Jiraphongsa C, Wangteeraprasert T, Henpraserttae N, Sanguanwongse N, Panya L, Sukkasitvanichkul J, *et al*. Community outbreak of multidrug resistance tuberculosis, Kanchanaburi province, Thailand on 2002-June 2010. J Prev Med Assoc Thail. 2011; 1: 261-71.

[17] Sujariyakul A, Rudeeaneksin J, Tipkrua N, Phetsuksiri B. Epidemiology and genotypes of Mycobacterium tuberculosis at an outbreak area in Kanchanaburi province. Dis Control J. 2016 ; 42(4): 337-47.

[18] Herrero MB, Ramos S, Arrossi S. Determinants of non adherence to tuberculosis treatment in Argentina: barriers related to access to treatment. Rev bras epidemiol. 2015; 18: 287-98. doi.org/ 10.1590/1980-5497201500020001.

[19] Umo I, Kulai M, Commons RJ. Factors associated with loss to follow-up among TB patients in rural Papua New Guinea. Public Health Action. 2021; 11(4): 186-90. doi.org/ 10.5588/pha.21.0054.

[20] Slama K, Tachfouti N, Obtel M, Nejjari C. Factors associated with treatment default by tuberculosis patients in Fez, Morocco. East Mediterr Health J. 2013; 19(08): 687-93.

[21] Suliman Q, Lim PY, Md. Said S, Tan KA, Mohd. Zulkefli NA. Risk factors for early TB treatment interruption among newly diagnosed patients in Malaysia. Sci Rep. 2022; 12(1): 745. doi.org/ 10.1038/s41598-021-04742-2.

[22] Gube AA, Debalkie M, Seid K, Bisete K, Mengesha A, Zeynu A, *et al*. Assessment of Anti-TB Drug Nonadherence and Associated Factors among TB Patients Attending TB Clinics in Arba Minch Governmental Health Institutions, Southern Ethiopia. Tuberc Res Treat. 2018; 2018: e3705812. doi.org/ 10.1155/2018/3705812.