ORIGINAL ARTICLE

FACTORS ASSOCIATED WITH DELAY IN TUBERCULOSIS MANAGEMENT IN SARAWAK, MALAYSIA

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ABSTRACT

Delay in Tuberculosis (TB) management is a public health concern that leads to unfavourable treatment outcomes. The delays could come from the patients or the health care facilities. This study aimed to determine TB management in terms of delays in diagnosis and treatment initiation among TB patients in Sarawak, Malaysia. This cross-sectional study was conducted among adult TB patients through face-to-face interviews using adapted and validated questionnaires. Seven hundred twenty-four patients were selected using a systematic random sampling method from 17 TB clinics in Sarawak. Data entry and analysis were done by IBM SPSS Version 22.0. The median duration of patient, diagnostic and treatment delay was 1080 days, 61 days, and two days, respectively. The multivariate binary logistic regression analysis revealed that the university level of education (p<.05) and visiting healthcare facilities four times and above (p<.001) appeared to be statistically significantly associated with patient delay. In diagnostic delay, female, moderate family stigma (p<.01), multiple visits to a healthcare facility (p<.001) were found to be significant factors. However, age 50-59 years, ethnicity, primary and secondary level of education (p<.01), TB knowledge (p<.05), number of symptoms, the action was taken (p<.001), been advised (p<.01), and investigations during the first visit (p<.05) were significantly associated with treatment delay. Though the study did not depict the national scenarios of overall delays in TB management, the factors identified in this study would be policy options to reduce the delays in the initiation of future TB management.

Keywords: *Tuberculosis, Patient delay, Diagnosis delay, Treatment delay, Tuberculosis management, Sarawak*

INTRODUCTION

In 2014, the World Health Organization (WHO) came out with a new Tuberculosis (TB) control strategy, and the world has pledged its commitment to end TB by 2035 [1]. This strategy includes reducing TB death by 95% between 2015 and 2035. The WHO has introduced two pillars to achieve the target. One of the cornerstones is an integrated, patient-centred TB care and prevention, focusing on early diagnosis, treatment, and prevention for all including children [2]. Globally, 9 to 11 million people were infected with TB in 2018, and Southeast regional countries contributed about 40% of the TB cases [3]. In Malaysia, the number of cases had increased from 20,666 cases in 2011 to 24220 in 2015 [4].

There were 3122 cases in Sarawak in 2018, making it the second-highest TB case in Malaysia after Sabah. Early detection and treatment are vital to control TB [5]; any delay in TB management would be a barrier to achieving TB control target [6]. The patient's condition may worsen with a delay in TB management, and the risk of mortality is higher [7]. The delay in treatment would increase the transmission of TB in the community, and more people are at risk of getting infected [8]. The TB treatment delay can be divided into three types: patient delay, diagnostic delay, and treatment delay [9]. The patient delay happens because of patient factors, and diagnostic and treatment delay occurs because of issues in the healthcare system [10].

Multiple factors contribute to delay in TB treatment, such as socio-economic condition[11], disease awareness [12], myths/beliefs[13], accessibility[14], the healthcare staff [15], delay in referral for diagnosis [16], non-adherence of treatment [17]. Several studies regarding the delay in TB management have been conducted in Malaysia [18-20]. Most of the studies involved smear-positive TB patients [21-25]. Limited studies have been conducted to simultaneously determine factors associated with three delays in TB treatment. Therefore, the current aimed to determine the duration of delay in terms of patients, diagnostic and treatment delay, and factors contributing to all the three delays among TB patients. In this context, the current study included all three types of delay for a single patient and all types of TB.

METHODS

Study design, participants, sample, and sampling procedure

This cross-sectional study was conducted in the southern region of Sarawak, which has five administrative divisions, viz. Kuching, Samarahan, Serian, Sri Aman and Betong. All the adult TB patients registered in the selected TB treatment centre of the five administrative divisions were considered the study population.

There were 18 TB treatment centres in the five selected administrative divisions. The sample size was calculated using epi info 7 with a confidence interval of 95% anticipated patient delay proportion of 35.6% 26 and inflated with a non-response rate of 20%. A total of 724 samples were required to get the desired representativeness. The inclusion criteria for this study were adult (≥18 years old) TB patients who were registered and followed up at selected treatment centre irrespective of gender— Malaysian citizens and willing to participate in the study. Respondents who were mentally disorientated were excluded from this study. The respondents were selected consecutively until the required sample size was achieved. The study was conducted over three years, from 2017 to 2020.

Data collection instruments and procedure

An adapted and validated semi-structured questionnaire 19, 20, 25 was used to collect the data and was collected by face-to-face interview. The questionnaire consists of seven parts. Part A consisted of 15 questions of the sociodemographic characteristics of the TB patients. Part B was about knowledge of TB. In this section, TB causes, TB signs and symptoms, Facts on TB, mode of TB transmission, duration of TB treatment, and how to prevent TB are items in TB knowledge assessment. The correct answer was given one mark and zero for incorrect answers. Part C was about TB stigma. Four types of TB stigma were assessed: community stigma, family stigma, self-stigma, and healthcare worker stigma. Each stigma has six items. Participant answered either "never, "rarely," "sometimes," "very often" or "always." Level of stigma measured by using a Likert scale ranging from 0 to 4. Part D consisted of 5 questions regarding respondents' attitudes toward TB. Part E was about accessibility to healthcare which contains distance to a healthcare facility (minutes), types of transportation, cost of transportation, and bad experience at the healthcare facility. Part F consisted of 10 questions regarding health-seeking behaviour and quality of care. The questionnaire was pretested in a hospital setting. After the pretest, a minor correction was done and ensured a reliability coefficient of .70 and above.

Definition of delays

Patient delay is an interval (in days) between the onset of TB symptoms and the first visit to the health care providers. The cut-off for the patient delay is 30 days 26.

Diagnostic delay is an interval (in days) between the first visit to the healthcare facility until confirmation of TB diagnosis with cut off days 14 days 26. Treatment delay is an interval (in days) from the confirmation of TB diagnosis until initiation of TB treatment 27. The cut-off point days of treatment delay is 0 days 26.

Data analysis

Data were cross-checked and cleaned before analyses using SPSS Version 2728. The descriptive analysis presented for qualitative variables, frequency percentages, and quantitative variables, mean, standard deviation, and minimum and maximum values. For example, the patient, diagnostic, and treatment delay were presented with mean, median, minimum, and maximum values. However, the delays were dichotomised into delay and not delayed for bivariate and multivariate analysis26. Three binary logistic regression analysis was done to determine the factors associated with patient, diagnostic, and treatment delay. All the variables were entered into the model in each model and checked for significance level. Any variables that were not statistically significant were excluded from the model. Finally, a better-fitted model was chosen for interpretation. Before interpretation, assumptions of sample size, multicollinearity, and absence of outliers were checked29. The adjusted Odds Ratios (OR) with 95% confidence interval (95% CI) obtained from binary logistic regression were used to determine the effects of predictors of delays in TB management. A p-value ≤0.05 was considered statistically significant.

Ethical issues

The Ethics Committee of Universiti Malaysia Sarawak approved this study (Ref: UNIMAS/NC-21.02/03-02 Jld.2 (120) and Medical Research & Ethics Committee Ministry of Health Malaysia (Ref: NMRR-18-279-39754 (IIR). Respondents' informed written consent was obtained before conducting the interview, and they were assured for data confidentiality.

RESULTS

Characteristics of the patients

The respondents' mean (SD) age was 46.19(17.05) years with a minimum of 18 years and a maximum of 92 years. About one-third (63.4%) of the participants were male, and the rest were female. There were 265 Malay (36.6%), Iban 214(29.6%), Bidayuh 124(17.1%), and other ethnic groups 121(16.7%). Regarding respondents' level of education, 80(11%) did not have formal education, 160(22.1%) have a primary school background, 387 (53.5%) secondary school and 48 (6.6%) have university level of education (Table 1).

Table 1: Characteristics of the patients

Characteristics	N	Mean(SD)/%
Age (SD) years	724	46.19(17.05)
Gender		
Male	459	63.4
Female	265	36.6
Ethnicity		
Malay	265	36.6
Iban	214	29.6
Bidayuh	124	17.1
Others	121	16.7
Religion		
Muslim	288	39.8
Christian	382	52.8
Others	54	7.5
Marital status		
Single	176	24.3
Married	548	75.7
Occupation		
Unemployed	264	36.5
Self-employed	160	22.1
Private	153	21.1
Goverment	68	9.4
Business	11	1.5
Others (farming, labourer etc)	68	9.4
Level of education		
Informal education	80	11.0
Primary school	160	22.1
Secondary school	387	53.5
Pre - University	38	5.2
University and above	52	7.2
Others (religious school)	7	1.0
Residence		
Urban	214	29.6
Sub urban	216	29.8
Rural	294	40.6

Delays in TB management

There were 67(6.3%) respondents with patient delay, and the median (IQR) patient delay was 61 days (60-150). The range of days for the patient delay was 1-1065 days. There were 119 (16.4%) respondents who experienced TB diagnostic days (2-4) with a range of 1-150 days (Table 2). delay. The median (IQR) for the diagnostic delay was 30 days (21-60) with a range of 15-1080 days. One hundred and seventy-six (24.3%) respondents experienced TB treatment delay, and the median (IQR) for treatment delay was two

Table 2: Delays in TB management (n=724)

Variables	Delay/ No delay	n	%	Mean (days)	Median (days)	Min. days	Max. days
Patient	No delay	657	90.7	12.3	10	0	30
	Delay	67	9.3	123.7	61	1	1065
Diagnostic	No delay	605	83.6	4.7	2	0	14
	Delay	119	16.4	70.5	30	15	1080
Treatment	No delay	548	75.7	0	0	0	0
	Delay	176	24.3	4.6	2	1	150

Factors affecting delays in TB management: Binary logistic regression analysis

Two factors significantly influenced patients' delay, such as level of education and frequency of clinic visits. However, the smear positivity and appearance of first symptoms did not influence patients' delay ($p>.05$). The university level of education was appeared to be a protective factor for the patient delay (AOR 0.402; 95% CI: 0.175-0.924). More than four times visit the healthcare facility was an influencing factor (AOR 5.043; 95% CI: 2.283-11.138). In terms of diagnostic delay, female, moderate family stigma, and frequency of clinic visits appeared to be potential predictors of diagnostic delay.

Female 2.037 times (AOR 2.037; 95% CI: 1.230-3.373), likely and moderate family stigma 3.982 times (AOR 3.982; 95% CI: 1.752-9.047) likely to be delayed in diagnosis moderate family stigma and 5.487 times odds of delay in 2 times visit in health centre (AOR 5.487; 95%CI: 2.372-12.691), 25.861 times likely to 3 visits (AOR 25.861; 95% CI: 10.961-60.970) and 77.185 times likely to visit if the more than four visits to the health centre (AOR 77.185; 95% CI: 29.591-201.331). The religiosity, residence, spear positivity, first times visit to the health centre, and first diagnostic test for TB did not influence diagnostic delay (p>.05). Age, ethnicity, level of education, TB knowledge, number of TB signs and symptoms, action taken in the first visit, advice received, and diagnostic test is done in the first visit appeared to be significant predictors of treatment delays (p<.05). However, residence, current smoking status, attitude towards TB patients, contact with TB patients, and type of health centre attended did not influence treatment delay (p>.05). Treatment delay significantly associated with age 50-59 years old (AOR 0.336; 95%CI: 0.168-0.671), other ethnics (AOR 3.173; 95% CI: 1.573-6.397), the primary (AOR 5.629; 95% CI: 1.842-17.198) and secondary level of education (AOR 3.342; 95% CI: 1.164-9.592), knowledge on TB (AOR 1.535; 95%CI: 1.020-2.309), 3-4 TB sign and symptoms (AOR 0.493; 95%C1: 0.274-0.887), no action was taken during first symptoms (AOR 3.414; 95%CI: 1.821-6.402), received advised to seek treatment (AOR 1.912; 95%CI: and investigation during the first visit (AOR 0.401; 95%CI: 0.174-0.922)

Table 3a: Factors associated with patient, diagnostic, and treatment delay: Multivariate binary logistic regression analysis

Risk factors	Patient delay (>30 days)		Diagnostic delay (>14 days)		Treatment delay (>0 days)	
	AOR	95% CI	AOR	95% CI	AOR	95% CI
Age in years						
<30 (Ref)		-		-		1
30-39					1.174	0.626-2.199
40-49					1.003	0.560-1.795
50-59					***0.336****	0.168-0.671
> 60					0.702	0.374-1.319
Gender						
Male (Ref)		-		1		-
Female			***2.037****	1.230- 3.373		
Ethnicity						
Malays (Ref)		-		-		1
Iban					1.300	0.672-2.514
Bidayuh					1.225	0.615-2.440
Others					***3.173****	1.573-6.397
Religion						
Muslim (Ref)		-		1		-
Christian			0.885	0.512- 1.529		
Others			0.803	0.978-5.097		
Level of education						
Informal education (Ref)		1		-		1
Primary school	0.588	0.324 – 2.273			***5.629****	1.842-17.198
Secondary school	0.393	0.148 - 1.043			***3.342****	1.164-9.592
University	***0.402****	0.175 -0.924			2.135	0.845-5.391
Residence						
Urban (Ref)				1		1
Suburban		-	1.787	0.959-3.332	0.887	0.536-1.470
Rural			4.321	1.039-3.643	0.811	0.490-1.359
Smoking status						
Yes (Ref)		-		-		
No					1.320	0.872-1.997
TB contact						
Yes (Ref)		-		-		1
No					1.320	0.872-1.997
Types of TB						
PTB smear +ve (Ref)		1		1		-
PTB Smear -ve	0.581	0.288-1.1755	1.755	0.994-3.101		
Extrapulmonary	0.694	0.312-1.542	1.259	0.641-2.472		

Table 3b: Factors associated with patient, diagnostic, and treatment delay: Multivariate binary logistic regression analysis

TB knowledge						
Poor (Ref)		-		-		1
Good					***1.535****	1.020-2.309
Family stigma						
No stigma (Ref)		-		1		-
Mild stigma			1.361	0.767- 2.415		
Moderate stigma			***3.982****	1.752-9.047		
Attitude						
Positive (Ref)		-		-		1
Negative					0.750	0.508-1.107
Bad experience						
Yes (Ref)				-		-
No						
No. of TB signs and symptoms						
1-2 (Ref)		-		-		1
3-4					***0.493****	0.274-0.887
>5					0.649	0.358-1.177
The action was taken during the first symptoms						
Yes (Ref)		1				1
No	0.521	0.246-1.105			***3.414****	1.821-6.402
Advice for treatment						
Yes (Ref)				-		1
No		-			***1.912****	1.206-3.032
First Healthcare facility visit						
Government (Ref)		-		1		1
Private			0.732	0.377-1.418	0.694	0.381-1.263
The test is done during the first visit						
Not done (Ref)		-		1		1
Done			0.972	0.461-2.048	***0.401****	0.174-0.922
No. of clinic visit before diagnosed with TB						
1 (Ref)		1		1		-
2	1.649	0.848-3.209	***5.487****	2.372-12.691		
3	1.963	0.899- 4.284	***25.86****	10.969-60.970		
>4	**5.043****	2.283-11.138	***77.19****	29.59-201.331		

**p < .05, **p < .01, *** p< .001 Ref = reference*

DISCUSSION

In this study, the median patient delay was 61 days and ranged from 1 to 1,065 days, which was longer than previous studies where the median patient delay was only 30 days [27]. Those studies only involved sputum-smear-positive PTB patients, whereas all three types of TB patients, namely: sputum-smear-positive PTB, sputum-smear-negative PTB, and extra-pulmonary TB, were included. The median duration of patient delay of 61 days in our study was much longer than the 30 days found by Chang et al.[26]; this could be attributed that the previous study included only sputum-smear-positive patients in their study. Buregyeya et al. [10], who studied sputum-smear-positive PTB patients in Uganda, reported that the median duration of patient delay was four weeks. For diagnostic delay, our study found that the median diagnostic delay was 30 days which was longer compared to those in Italy (7 days) [30] and France (14 days) [31], but it was nearly the same as in the Norwegian study (33 days) [32]. The median of 2 days treatment delay in our study is similar in Pakistan [9] and India [27]. Even though the median treatment

delay in our study is much longer than in other countries, it is still within an acceptable range of 1-4 days, based on the WHO recommendations [33]. Our analysis revealed that the younger aged TB patients had a preponderance of delayed TB diagnosis. However, the middle-aged had lower odds of TB diagnosis. This finding was consistent with Yirgu et al.[34] in Ethiopia. This study also revealed that being female significantly correlates with TB diagnostic delay. This might be because of a heavy workload, either in the house or office, resulting in limited time to access healthcare services; lack of independence; not empowered to make decisions; and limited access to finances. This is similar to the findings in Bangladesh, where females experienced more prolonged TB diagnostic delay[35]. In the current study, ethnicity and treatment delay significantly correlate, whereby 'others ethnicity' had more delay compared to Malay, Iban, and Bidayuh. In general, Chinese and Indians in Malaysia were

more likely to use Traditional Complementary Medicine (TCM) to treat their illness compared to other ethnic groups [36]. That is a possible reason why 'other ethnic' which consisted of Chinese and Indians in this study had a delay in the initiation of TB treatment. In the current study, the level of education is significantly associated with patient delay and treatment delay. The respondents who had better education did not experience patient delay or treatment delay than respondents with a lower educational level. This could be due to respondents with better education status having more exposure to TB information. Therefore, they were more likely to seek care in the early phase than respondents who had low-level education. These were similar to the findings in Southern Ethiopia, where respondents who could not read and write had higher odds of delay than the respondents who had higher education [37].

It was also found that respondents with good TB knowledge had a delay in TB treatment. Good knowledge does not always translate into good practice. This has been explained by Fekadu et al. [38], who stated that TB knowledge did not influence patients' attitudes and practices. However, our results are different from Htun et al. [39], who found that patients with a lack of TB knowledge might delay their treatment because they did not understand the importance of the TB treatment. This study has shown that there was an association between patient delay and diagnostic delay with the number of healthcare facility visits. The risk of delay increased with the number of visits. Our findings are similar to those in Nigeria, who found that respondents who had multiple healthcare-seeking had a more prolonged delay [40]. It may be due to respondents tending to do 'doctor shopping' before seriously looking for definitive treatment. In the current study, respondents who received advice to seek treatment were unlikely to have treatment delays. This is because giving advice shows that respondents have good family and social support. Good social support has been identified as one of the protective factors for treatment delay [41], where TB patients who lived with their families had a shorter treatment delay than respondents who lived alone.

The limitation of this study is the concern with data reliability because it was self-reported data. Self-reported data is known to create a potential bias, for example, recall bias. The recall bias happened when participants were required to remember certain experiences or events, such as in respondents were asked to recall their first TB symptoms and what actions they took when they had TB symptoms

CONCLUSION

In conclusion, delays in TB management still occur despite the advancement of technology and TB management system. The critical factors for delay worldwide are quite the same. In our analysis, several variables significantly influence delays in TB management, such as age, being female, ethnicity, level of education, TB knowledge, family stigma, apperence of TB signs and symptoms, and frequency of clinic visits. Therefore, efforts should be made to reduce the delay taking into consideration the factors that have been identified. Community awareness programme should be designed to incorporate the societal issues to decrease the delays in TB management.

Conflict Of Interest
The authors declare there are no competing interest

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