

Pulmonary Tuberculosis in Mumbai, India: Factors Responsible for Patient and Treatment Delays

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Date of Submission: Mar 05, 2011

Date of Acceptance: Dec 02, 2011

How to cite this article: Tamhane A, Ambe G, Vermund S, Kohler CL, Karande A, Sathiakumar N. Pulmonary tuberculosis in Mumbai, India: Factors responsible for patient and treatment delays. *Int J Prev Med* 2012;3: 569-80.

ABSTRACT

Purpose: To determine the factors responsible for patient delay and treatment delay in newly diagnosed sputum smear-positive pulmonary tuberculosis (TB) patients.

Methods: Study subjects ($N = 150$) were randomly selected from municipal health centers in Mumbai, India. Duration of symptoms, treatment, and reason for delay were assessed using interviews and medical records. We defined patient delay as presentation to a health care provider (HCP) >20 days of the onset of TB-related symptoms and treatment delay as therapy initiated more than 14 days after the first consultation (for TB-related symptoms) with an HCP.

Results: Of the 150 subjects, 29% had patient delays and 81% had treatment delays. In multivariable analysis, patient delay was significantly associated with the self-perception that initial symptoms were due to TB [odds ratio (OR) = 3.8, 95% confidence interval (CI) = 1.1–12.6] and perceived inability to pay for care (OR = 2.9, 95% CI = 1.2–7.1). Treatment delay was significantly associated with consulting a non-allopathic provider (OR = 12.3, 95% CI = 1.4–105) and consulting >3 providers (OR = 5.0, 95% CI = 1.4–17.4). Patient interval was half the treatment interval (median days: 15 vs. 31). Women were slightly more likely to experience patient and treatment delays than men. For two-thirds of the patients, another TB patient was a source of TB-related knowledge, while health education material (16%) and television (10%) played a smaller role.

Conclusion: Treatment delay, primarily due to diagnosis delay, was a greater problem than patient delay. Expanding public–public and public–private partnerships and regular training sessions for HCPs might decrease treatment delay. Media coverage and cured TB patients as peer advocates may help to reinforce TB-related health education messages.

Key words: Patient delay, pulmonary tuberculosis, India, treatment delay

INTRODUCTION

India has more new tuberculosis (TB) cases annually than any other country.^[1] The annual incidence of sputum smear-positive cases is estimated to be 168/100,000 persons. Every day in India,

>5000 develop TB and >1000 die from TB.^[2] TB kills more women than all causes of maternal mortality combined.^[3]

It is estimated that an untreated smear-positive patient may infect >10 contacts annually.^[4] Delay in diagnosis and treatment leads to more advanced disease, more complications, higher mortality,^[5-7] and has resulted in community outbreaks.^[8] We undertook the present study to determine the factors responsible for “patient delay” and “treatment delay” in newly diagnosed sputum smear-positive pulmonary TB and to compare gender differences in these delays.

METHODS

Study site

Mumbai (India) with a population of approximately 12 million is divided into 23 wards (administrative areas). The Brihan-Mumbai Municipal Corporation (BMC) operates 243 health centers (BMCCs) within these wards, providing Directly Observed Treatment-Short course (DOTS) therapy in addition to primary health care; the TB clinics are also referred to as DOT centers. An estimated 50% of the population of Mumbai belonging to low to low-middle income groups seeks care from these health centers. In addition, at the time of the study (2002), BMC had involved 50 private physicians and/or non-governmental organizations (NGOs) [non-municipal centers (NMCs)] to implement the national TB program in Mumbai.

Study design and subject selection

We conducted a cross-sectional study in early 2002. Eligible subjects were ≥ 18 years of age; sputum smear-positive, newly diagnosed, with pulmonary TB alone, i.e. without any concomitant chronic lung disease such as asthma, bronchitis, emphysema, or lung cancer; had received anti-TB treatment for <6 months; and were non-pregnant.

We randomly selected 12 municipal wards and then randomly selected up to three DOT centers within that ward. This selection was made using the “DOTS Directory” (maintained by the BMC) that lists all DOT centers. Within each center, we randomly selected up to 15 patients using “treatment cards” that contained information on patient’s demographic, diagnostic, and treatment

history on the day of our visit. The final study size was 75 men and 75 women (1:1 ratio) selected from 29 BMCC/DOTS centers.

Of 150 subjects initially selected, 18 could not be contacted. Of the remaining 132 subjects, 126 (95%) agreed to participate in the study. We replaced all the 24 subjects with re-recruitment. In addition, subjects (totally 10) were interviewed from three randomly selected NMCs to examine the differences between BMCCs and NMCs; the three centers selected were run by NGOs.

Interview

One physician (AT) conducted all 150 interviews in person at the DOT centers using a pre-tested questionnaire in Marathi or Hindi language, as preferred by the subject. The questionnaire elicited information about seeking care and initiating treatment, socio-demographic characteristics, lifestyle and health care access factors, presenting symptoms, knowledge and perceptions about TB, and sources of information about TB. Patients were particularly asked about TB-related symptoms such as cough, hemoptysis, fever, loss of appetite and weight, chest pain, shortness of breath, and tiredness. In addition, they were asked about any other symptoms/signs they attributed to TB that were experienced before seeking treatment. In addition to physicians practicing modern medicine (allopath) or alternative medicine (non-allopaths), a health care provider (HCP) was defined as any person/facility from where the patient sought care for his symptoms/signs. Pharmacies/drug stores, acupressurist, acupuncturist, and traditional healers were also included as HCPs.

We also abstracted information from the medical records available at the health centers (especially treatment cards) and records carried by subjects. Treatment cards included information on patient’s socio-demographic characteristics, dates, results of sputum microscopy, and radiological and other investigations. Medical records available with subjects included information on visits and treatment received in and out (other HCPs) of the health center. We used this data to supplement information obtained from patient interviews.

Time intervals and delays [Figure 1]

There is no consensus on what might be called “delay” with regard to seeking care and initiating treatment for TB; some have suggested this period to

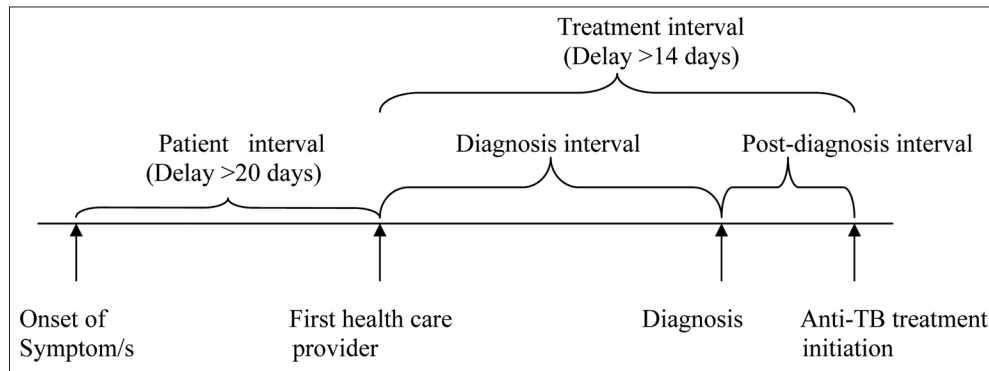


Figure 1: Patient and treatment (diagnosis and post-diagnosis) time intervals and operational definitions of corresponding delays (indicated in parenthesis)

be ≤ 1 month or < 2 months.^[9-11] We defined patient delay as presentation to an HCP > 20 days of onset of TB-related symptoms (patient interval > 20 days). Considering local health infrastructures, we defined treatment delay as therapy initiated more than 14 days after the first consultation (for TB-related symptoms) with an HCP (treatment interval > 14 days).

Analysis

Delays were classified both as continuous and dichotomous variables. We compared median time-intervals between men and women using Wilcoxon rank-sum test. For the dichotomous outcome, we compared the presence/absence of delay and the presence/absence of a risk factor using crude prevalence odds ratio (POR) with its corresponding 95% confidence interval (CI). Proportions were compared using Fisher’s exact test. Unconditional multiple logistic regression was used to calculate adjusted PORs for risk factors. A factor was included in the logistic model if it was statistically significant ($P < 0.05$, two-tailed) or had moderate association (crude POR was ≤ 0.5 or ≥ 2.0) with outcome. Power calculations, based on a study conducted in Mumbai (India),^[12] indicated that a study of 75 men and 75 women would have 82% power to detect a 20% difference in patient delay and 76% power to detect 20% difference in treatment delay between men and women. Data analysis was performed using SAS statistical software, version 8.0 (SAS, Inc., Cary, NC, USA).

RESULTS

The study subjects had a median age of 30 years [Table 1]. They were of low socioeconomic status

with a median per capita monthly income of ` 525 (\approx US \$11). Men were likely to be more literate (87% vs. 63%), to be employed (68% vs. 24%), and to be resident in the immediate area (18 years vs. 7 years) than women. Differences in age, marital status, per capita income, and number of household members between men and women were small. Families of 97% subjects, relatives of 56% subjects, and neighbors of 48% subjects were aware of the patient’s TB status, indicating perceived social stigma by the patient.

Time intervals and delays

Patient interval was half the treatment interval (median days: 15 vs. 31) [Table 2]. The long treatment interval was primarily due to longer diagnosis interval than post-diagnosis interval (median days: 27 vs. 2). Women had slightly longer patient and treatment intervals than men. Of the 150 subjects, 43 (29%) had patient delay and 122 (81%) had treatment delay [Table 2]. As compared to men, women were more likely to experience both patient delay (POR = 1.6, 95% CI = 0.8–3.2; $P = 0.28$) and treatment delay (POR = 1.7, 95% CI = 0.7–3.9; $P = 0.30$); however, the differences were not statistically significant.

Risk factors for patient delay

Thirteen risk factors were moderately associated with patient delay (crude or gender stratified POR: ≤ 0.5 or ≥ 2.0) [Table 3]. Of these risk factors, those who waited to get better on their own, those who thought initial symptoms were not serious, and those who reported inability to pay an HCP were statistically significant.

In multivariable analysis, perception of initial symptoms to be of TB (adjusted POR = 3.8,

Table 1: Selected subject characteristics by gender

Characteristic	Men		Women		P	All subjects	
	n	%	n	%		n	%
Total	75	100	75	100		150	100
Age (years)							
20–34	43	57	50	67		93	62
≥ 5	32	43	25	33		57	38
Median	32.0		28.0		0.12 ^a	30.0	
Marital status							
Married	53	71	56	75		109	73
Other ^b	22	29	19	25	0.71 ^c	41	27
Literacy							
Illiterate	10	13	28	37		38	25
Literate ^d	65	87	47	63		112	75
Median	6.0		4.0		0.01 ^a	5.0	
Per capita income ^e							
<500	25	37	24	37		49	37
≥500	42	63	41	63		83	63
Median	620.0		500.0		0.36 ^a	525.0	
Employment status							
Unemployed	24	32	57	76		81	54
Employed	51	68	18	24	<0.001 ^c	69	46
Household members ^f							
0–4	58	77	53	71		111	74
≥5	17	23	22	29		39	26
Median	3.0		4.0		0.05 ^a	4.0	
Stay at current residence ^g							
<1 year	5	7	12	16		17	11
≥1 year	69	93	63	84		132	89
Median	18.0		7.0		<0.001 ^a	12.0	

^aMann–Whitney–Wilcoxon test ^bSingle/separated/divorced/widow ^cFisher’s exact test ^dLiterate: those who can read and/or write any language ^ePer capita income in rupees (Indian currency) (\$1 ~ Rupees 48): Total income of the family divided by number of family members. Category “unknown” excluded (men 8, women 10) ^fPatient is excluded ^gCategory “unknown” excluded

95% CI = 1.1–12.6) and perceived inability to pay an HCP (adjusted POR = 2.9, 95% CI = 1.2–7.1) were significant [Table 4]. Gender differences were not significant for these risk factors. Patients whose neighbors were not aware of the patient’s TB status, an indicator of social stigma, were almost equally likely to have delay as compared to those whose neighbors were aware (OR = 1.1, 95% CI = 0.5–2.4).

Risk factors for treatment delay

Fourteen risk factors were moderately associated with treatment delay [Table 5]. Of these, those with ≥5 household members, those who consulted a non-allopathic HCP on their first visit, and those who consulted >3 HCPs (prior to initiation of treatment) were significant.

In multivariable analysis, consulting a non-allopathic HCP on the first visit (adjusted POR = 12.3, 95% CI = 1.4–104.9) and consulting >3 HCPs (adjusted POR = 5.0, 95% CI = 1.4–17.4) remained significant [Table 6]. Gender differences were not significant.

Other findings

Fever was the most common presenting symptom (85%) with cough >20 days in 23% and hemoptysis in 11% subjects. Of 116 subjects for whom the type of first HCP was known, 30% had consulted a non-allopathic HCP and the remaining (70%) had consulted an allopathic HCP (municipal/government or private practitioner). Non-allopathic HCPs were less likely

Table 2: Patient and treatment time intervals for all subjects and for those with delay according to gender

Time intervals (days)	Men	Women	<i>P</i> ^a	Total
All subjects				
Patient interval				
Number	75	75		150
Range (min, max)	1–120	1–183		1–183
Median	12.0	15.0	0.33	15.0
Mean (SD)	18.7 (21.5)	24.7 (32.7)		21.7 (27.7)
Treatment interval				
Number	75	75		150
Range (min, max)	4–194	2–196		2–196
Median	27.0	33.0	0.13	31.0
Mean (SD)	39.7 (38.2)	47.5 (40.9)		43.6 (39.6)
Diagnosis interval				
Number	75	75		150
Range (min, max)	2–190	1–184		1–190
Median	22.0	30.0	0.07	27.0
Mean (SD)	35.7 (38.4)	43.9 (40.6)		39.8 (39.6)
Post-diagnosis interval				
Number	75	75		150
Range (min, max)	0–24	0–55		0–55
Median	2.0	2.0	0.07	2.0
Mean (SD)	4.0 (4.6)	3.6 (7.1)		3.8 (6.0)
Subjects with delay ^b				
Patient interval (>20 days)				
Number (%)	18 (24%)	25 (33%)		43 (29%)
Range (min, max)	21–120	25–183		21–183
Median	45.0	30.0	0.40	45.0
Mean (SD)	48.7 (25.1)	56.8 (40.3)		53.4 (34.6)
Treatment interval (>14 days)				
Number (%)	58 (77%)	64 (85%)		122 (81%)
Range (min, max)	16–194	15–196		15–196
Median	33.5	38.0	0.40	36.0
Mean (SD)	48.7 (39.1)	53.9 (40.9)		51.4 (40.0)

Min, Minimum; max, Maximum; SD, Standard deviation ^aUsing Wilcoxon rank-sum test ^bPatient delay only (men 4, women 5); treatment delay only (men 44, women 44); both patient and treatment delays (men 14, women 20)

to suspect/diagnose TB than allopathic HCPs (POR = 0.2, 95% CI = 0.1–0.4). In an analysis restricted to 27 subjects who presented with cough ≥ 3 weeks and for whom first HCP was known, 18 consulted a non-allopathic HCP on the first visit and 9 consulted an allopath. Non-allopathic HCPs provisionally diagnosed TB in 39% (7/18) while allopathic HCPs provisionally diagnosed TB in 78% (7/9) ($P = 0.10$). Similarly, in 17 subjects with hemoptysis at onset, non-allopathic HCPs were less likely diagnose TB as compared to allopathic HCPs (45% vs. 100%; $P = 0.08$). Of the 116 subjects, 65% consulted a private practitioner on the first visit.

Those who consulted a government health facility were about equally likely to have patient delay (POR = 0.8, 95% CI = 0.3–1.9; $P = 0.7$), but were much less likely to have treatment delay (POR = 0.2, 95% CI = 0.1–0.6; $P = 0.002$) than those who consulted a private practitioner. Seventy percent of the subjects with perceived inability to pay an HCP consulted a private practitioner on the first visit.

Most (95%) of the subjects walked to the health center providing DOTS therapy [Table 3] and 61% subjects lived within a 15 min walking distance [Table 5]. About 31% subjects (women more than

Table 3: Crude prevalence odds ratio (POR) and corresponding 95% confidence interval (CI) of potential risk factors for patient delay by gender

Risk factor	Men (n = 75)			Women (n = 75)			All subjects (N = 150)	
	N/T ^a	POR	95% CI	N/T ^a	POR	95% CI	POR	95% CI
Marital status								
Married	10/53	1.0		21/56	1.0		1.0	
Other	8/22	2.8	0.8–7.4	4/19	0.4	0.1–1.5	1.0	0.5–2.3
Employment status								
Employed	10/51	1.0		5/18	1.0		1.0	
Unemployed	8/24	2.1	0.7–6.1	20/57	1.4	0.4–4.5	1.9	0.9–4.0
Smoking status ^b								
Never	9/28	1.0		25/75	1.0		1.0	
Ever	9/45	0.5	0.2–1.5	-	-	-	0.5*	0.2–1.1
Hemoptysis at onset								
Yes	3/12	1.0		3/5	1.0		1.0	
No	15/63	0.9	0.2–3.9	22/70	0.3	0.1–2.0	0.7	0.2–2.0
Perception after onset of symptoms								
Non-TB	13/63	1.0		22/71	1.0		1.0	
TB	5/12	2.8	0.6–12.0	3/4	6.7	0.6–176.9	2.8*	0.9–9.1
Self-perceived knowledge of TB								
Some	5/14	1.0		2/10	1.0		1.0	
Nothing	13/61	0.5	0.1–1.7	23/65	2.2	0.4–11.2	1.0	0.4–2.5
Waited to get better on own								
No	1/13	1.0		0/11	1.0		1.0	
Yes	17/62	4.5	0.5–37.6	25/64	-	-	11.5*	1.5–88.1
Thought symptoms not serious								
No	1/10	1.0		0/11	1.0		1.0	
Yes	17/65	3.2	0.4, 27.1	25/64	-	-	9.7*	1.3–74.4
Perceived inability to pay an HCP								
No	13/65	1.0		14/53	1.0		1.0	
Yes	5/10	4.0	1.0–15.9	11/22	2.8	1.0–7.8	3.4*	1.5–7.6
Could not take time off work ^c								
No	14/64	1.0		12/32	1.0		1.0	
Yes	3/9	1.8	0.4–8.1	1/5	0.4	0.04–4.2	1.1	0.3–3.7
Busy in general								
No	15/67	1.0		22/64	1.0		1.0	
Yes	3/8	2.1	0.4–9.7	3/11	0.8	0.2–3.0	1.2	0.4–3.3
Travel mode								
Walk	18/72	1.0		22/70	1.0		1.0	
Other	0/3	-	-	3/5	3.3	0.5–21.0	1.5	0.3–6.7
Traveling is a problem								
No	13/61	1.0		14/42	1.0		1.0	
Yes	5/14	2.1	0.6–7.2	11/33	1.0	0.4–2.6	1.5	0.7–3.1

HCP, Health care provider ^aN/T = Number of subjects with patient delay/total number of subjects in the risk factor category ^bCategory “unknown” (n = 2) excluded ^cThose who “never” worked or “unknown” (men 2, women 38) excluded
 *Statistically significant

men) felt that traveling to the current health center was “problematic” (44% vs. 19%; *P* = 0.001).

When asked about the perceived level of TB-related knowledge (prior to onset of symptoms),

115 had “little” and 24 had “some” knowledge about TB, while the remaining 11 said they knew “nothing” about TB. Of the 139 subjects with “little/some” knowledge about TB, 66% had heard about TB

Table 4: Adjusted prevalence odds ratio (POR) and 95% confidence interval (CI) for selected risk factors of patient delay

Potential risk factor	Model 1		Final model	
	N = 150		N = 150	
	Adj. POR (95% CI)	P	Adj. POR (95% CI)	P
Sex: Women vs. men*	0.8 (0.3–2.3)	0.73	1.5 (0.7–3.4)	0.32
Perception based on symptoms: TB vs. non-TB*	4.2 (1.2–14.5)	0.02**	3.8 (1.1–12.6)	0.03**
Waited to get better on own: Yes vs. no*	4.4 (0.5–37.7)	0.18	4.7 (0.5–40.8)	0.16
Thought symptoms not serious: Yes vs. no*	6.1 (0.7–55.5)	0.11	5.7 (0.6–51.1)	0.12
Inability to pay an HCP: Yes vs. no*	3.3 (1.3–8.1)	0.01**	2.9 (1.2–7.1)	0.02**
Smoker: Yes vs. no*	0.4 (0.1–1.2)	0.09	-	-

Adjusted PORs calculated using multiple logistic regression modeling *Reference category **Statistically significant TB, Tuberculosis; HCP, Health care provider

from relatives/friends while 63% reported acquiring knowledge about TB from another TB patient. About 16% reported health education materials displayed in health care facilities/community as a source of knowledge. Media (television, 10%; radio, 2%) played a small role in educating patients about TB. More than two-thirds of subjects (men, 53/75; women, 63/75) knew that TB is propagated by cough. Most (70%) subjects thought that TB is more serious than the common cold/flu. Misconceptions about modes of transmission included sexual intercourse (53%), sharing blade/injection (66%), and using public toilets (43%). Thirteen percent of the subjects believed that evil eye/witchcraft causes TB.

Comparison between municipal and non-municipal health centers

No significant differences were found between BMCCs and NMCs with regard to age, demographics, employment, and household characteristics (data not shown). Median patient (BMCC = 15 days vs. NMC = 12.5 days; *P* = 0.41) and treatment (BMCC = 31 days vs. NMC = 24 days; *P* = 0.21) intervals were slightly shorter for the NMCs than BMCCs.

DISCUSSION

We found that 29% subjects had patient delay and 81% had treatment delay, slightly more in women than men. Significant risk factors for patient delay included perception of initial symptoms to be due to TB and perceived inability to pay an HCP. Significant risk factors for treatment delay included consulting non-allopathic HCP on the first visit and consulting >3 HCPs. Non-allopathic HCPs were less likely than allopathic HCPs to

diagnose TB when present. About two-thirds of subjects acquired knowledge about TB from either relatives/friends or a TB patient; media and health education materials played only a small role.

Patient delay

In this study, the median time interval from the onset of symptoms to seeking care (15 days) is closer to lower bound of the range (10–119 days) reported in other studies.^[12-17] We noted that 29% had patient delay based on a 3-week (>20 days) cut-off point. On the other hand, other studies report patient delay ranging from 20 to 81%^[12,13,18-21] based on a 4-week/1-month cut-off point for patient interval. Using a 4-week cut-off point, we noted that 15% had patient delay, indicating that patient delay was less problematic in our study population as compared to others in the literature. This may be due to interplay of various factors such as easy availability and accessibility of health care facilities in Mumbai and higher (if still sub-optimal) community awareness about TB.

In our study, two factors were significantly associated with patient delay: perception of initial symptoms to be due to TB and perceived inability to pay an HCP. It might be expected that those who perceive the initial symptoms to be due to TB would seek care earlier to be diagnosed and treated at the earliest. However, fear of being diagnosed with TB itself can delay seeking care,^[22] further compounded by fear of social stigmatization/ isolation.^[23] In this study, patient's TB status was not known to his/her neighbors in >50% of subjects, indicating perceived social stigma by the patients in the community. However, social stigma was not associated with patient delay in this study in contrast to other studies.^[21,24,25]

Table 5: Crude prevalence odds ratio (POR) and corresponding 95% confidence interval of potential risk factors for treatment delay by gender

Risk factor	Men (n = 75)			Women (n = 75)			All subjects (N = 150)	
	N/T ^a	POR	95% CI	N/T	POR	95% CI	POR	95% CI
Age (years)								
20–34	33/43	1.0		39/50	1.0		1.0	
≥35	25/32	1.1	0.4, 3.2	25/25	-	-	2.1	0.8–5.3
Marital status								
Married	41/53	1.0		49/56	1.0		1.0	
Other	17/22	1.0	0.3, 3.3	15/19	0.5	0.1, 2.1	0.8	0.3–1.8
Literacy								
Literate	20/25	1.0		40/47	1.0		1.0	
Illiterate	38/50	0.2	0.1, 0.9	24/28	1.1	0.3, 4.0	0.7	0.3–1.6
Per capita income								
≥500	31/42	1.0		38/41	1.0		1.0	
<500	21/25	1.9	0.5, 6.6	17/24	0.2	0.04, 0.8	0.7	0.3–1.7
Household members								
0–4	42/58	1.0		43/53	1.0		1.0	
≥5	16/17	6.1	0.7, 49.8	21/22	4.9	0.6, 40.7	5.7*	1.3–25.1
Stay at current residence ^b								
>10 years	38/49	1.0		27/29	1.0		1.0	
≤10 years	19/25	0.9	0.3, 2.9	37/46	0.3	0.1, 1.5	0.7	0.3–1.7
History of TB in family								
Yes	8/11	1.0		13/14	1.0		1.0	
No	50/64	1.3	0.3, 5.7	51/61	0.4	0.05, 3.3	0.8	0.3–2.6
Hemoptysis at onset								
Yes	7/12	1.0		4/5	1.0		1.0	
No	51/63	3.0	0.8, 11.2	60/70	1.5	0.2, 14.8	2.8	0.9–8.2
Perception of seriousness of TB								
More than flu	41/56	1.0		56/62	1.0		1.0	
Not serious/as serious as flu	17/19	3.1	0.6, 15.1	13/18	0.3	0.1, 1.2	1.0	0.4–2.5
First health care provider ^b								
Allopath	28/42	1.0		29/39	1.0		1.0	
Non-allopath	16/17	8.0	1.0, 66.6	18/18	-	-	14.3*	1.9–110.6
No. of health care providers								
1–3	27/42	1.0		29/37	1.0		1.0	
>3	31/33	8.6	1.8, 41.1	35/38	3.2	0.8, 13.3	5.4	1.9–15.2
Time to reach the center								
1–15 min	42/55	1.0		28/36	1.0		1.0	
>15 min	16/20	1.2	0.4, 4.4	36/39	3.4	0.8, 34.1	2.2	0.9–5.6
Traveling is a problem								
No	47/61	1.0		33/42	1.0		1.0	
Yes	11/14	1.1	0.3, 4.5	31/33	4.2	0.8, 21.1	2.4	0.9–6.8
Type of center								
Microscopy	13/19	1.0		34/38	1.0		1.0	
DOTS	45/56	1.9	0.6–6.1	30/37	0.5	0.1–0.9	0.9	0.4–2.1

*Statistically significant TB, tuberculosis; DOTS, Directly Observed Treatment Short-course ^aN/T = number of subjects with treatment delay/total number of subjects in the risk factor category ^bCategory “unknown” excluded

Perceived inability to pay an HCP indirectly indicates preference for a private practitioner over a government health facility. When a patient

consults a private practitioner, the direct out-of-pocket costs could include diagnostics, treatment, and consultation fees, which are free/ very

Table 6: Adjusted prevalence odds ratio (POR) and 95% confidence interval for selected risk factors of treatment delay

Potential risk factor	Model 1		Final model	
	n = 116		n = 116	
	Adj. POR (95% CI)	P	Adj. POR (95% CI)	P
Sex: Women vs. men*	1.1 (0.4–3.5)	0.84	1.1 (0.4–3.4)	0.85
Age (years): ≥35 vs. 20–34*	2.9 (0.9–9.4)	0.08	3.0 (0.9–9.6)	0.07
Household members: ≥5 vs. 0–4*	4.7 (0.9–24.8)	0.07	4.4 (0.8–23.5)	0.08
Hemoptysis at onset: No vs. yes*	1.9 (0.4–8.6)	0.39	2.4 (0.6–10.1)	0.23
First provider: Non-allopath vs. allopath*	12.4 (1.5–105.4)	0.02**	12.3 (1.4–104.9)	0.02**
Number of health care providers: >3 vs. 1–3*	5.3 (1.5–18.7)	0.01**	5.0 (1.4–17.4)	0.01**
Traveling is a problem: Yes vs. no*	1.3 (0.3–5.3)	0.72	1.9 (0.6–6.5)	0.31
Time to reach health center (min): >15 vs. 1–15*	2.2 (0.6–8.0)	0.24	-	-

Adjusted PORs calculated using multiple logistic regression modeling. Subjects for whom type of first health care provider was not available are excluded (n = 34) *Reference category **Statistically significant

minimal at a municipal/government health facility. In spite of this, paradoxically poverty can compel patients to seek care from private health sector than governmental clinics.^[3] This could be related to hidden costs such as related to travel or longer distances.^[26,27] In our study too, those subjects whose mode of travel to the DOTS center was other than walking and who reported that overall traveling was a problem were more likely to have patient delay; however, this association was not found to be significant. Other reasons, if any, for not consulting a governmental health care facility on first visit (e.g. dissatisfaction or distrust, crowding, long waiting time, and other) or preference for consulting a private practitioner were not explored in this study.

Initially consulting with a private practitioner is common in India.^[17,24,28-33] In our study, 65% of subjects consulted a private practitioner on their first TB-related visit, of whom 32% had a patient delay. In addition, 70% of the subjects with perceived inability to pay an HCP consulted a private practitioner on the first visit. Probably those 70% could arrange money with extra efforts for private consultation, while the remaining 30% could not and had no “choice” but to consult a municipal/government facility. Nair *et al.*^[31] in their study conducted in Mumbai observed that as the disease progressed, patients shifted from the private practitioner to municipal and NGO health services, the primary reason being cost of treatment. Economic constraints/poverty has been reported to be associated with patient delay in other studies too.^[34,35]

Women were somewhat more likely to experience patient delay than men (33% vs. 24%; $P = 0.28$). Women had lower literacy, greater unemployment, lower median per capita income, and greater family size, as compared to men. Other studies also found delay occurring more in women than men,^[13,27,34,36,37] though the magnitude of the differences found may have been due to chance alone, given our sample size.

Treatment delay

In our study, median treatment interval was 31 days. In other studies, median treatment interval varied from 15 to 60 days.^[11,14,17,19,37] We found that 81% had treatment delay. Other studies have reported treatment delay from 18 to 62% subjects with 4 weeks/1 month cut-off point.^[13,18,19,20] Using a 4-week criterion, 43% subjects in our study had treatment delay, suggesting the similarity of our findings with those elsewhere.

Our finding that consulting non-allopathic HCP on the first visit and consulting >3 HCPs were significantly associated with treatment delay is similar to the reports by others.^[12,14,37] In our study, HCPs associated with government health facilities were allopaths, while private practitioners were a mixture of both allopaths and non-allopaths. Similar to other studies,^[17,19,27,37] we also found that those who consulted a private practitioner on their first visit were significantly more likely to experience treatment delay than those who consulted a government health facility. Not all studies confirm this, as a previous study from Mumbai reported that TB management practices of

non-allopaths did not differ significantly than that of allopaths.^[12] Consulting multiple HCPs may reflect dissatisfaction with services,^[31] failure to address the problem, or may be related to patient characteristics (e.g. not returning after initial consultation). We cannot distinguish these in our study.

As in other studies,^[27,36,38] women were more likely to experience treatment delay than men; however, the difference was not significant. Other studies^[13,34,37,39] have found significant gender differences. Several possible reasons have been suggested for observing treatment delay more in women than men. Low sputum positivity in women may be due to their inability to produce enough sputum,^[40] social embarrassment about producing a sputum sample at the health center,^[41] or family or social obligations limiting the time that they can spend.^[3] In contrast, in a study conducted in southern part of India, it was found that men were more likely to experience treatment delay than women (32% vs. 23%).^[17]

Lastly, though majority of the patients correctly knew about transmission of TB through cough, other misconceptions about transmission were prevalent too. Overall, majority of the patients reported relatives/friends and other TB patients being sources of knowledge, while media played a small role in educating patients about TB, which has been observed in other studies too.^[22]

Strengths and limitations

Interviews were conducted by a single investigator to increase consistency and overall reliability. High participation rate (86%) and supplementation of interview with medical record reviews increased internal validity of the study. Due to inclusion of all municipal DOTS centers from Mumbai and random selection of the study centers and patients, we believe that our results may be applicable to the other patients attending municipal DOTS centers in Mumbai. Limitations of our study include possible recall bias, especially when medical records were unavailable to verify accuracy of information given by subjects, and lack of power to detect small differences between men and women with regard to time intervals/delays and some risk factors.

CONCLUSION

Thus, treatment delay, primarily due to diagnosis delay, was more of a problem than patient delay. Expanding public–public and public–private

partnerships and conducting regular training sessions for both allopathic and non-allopathic HCPs, especially in the private sector, might be expected to decrease treatment delay. Media efforts may not be penetrating the community to reduce patient delays. Reinforcing TB-related health education messages with effective media coverage (e.g. involving movie stars) and using innovative methods of community education (e.g. training cured TB patients as peer advocates) might be beneficial.

ACKNOWLEDGMENTS

The study was supported in part by the John J. Sparkman Center for Global Health (University of Alabama at Birmingham, USA) and the Brihan-Mumbai Municipal Corporation (Mumbai, India). The authors are grateful to the staff of health centers of BMC who helped in contacting patients and scheduling interviews. We extend special thanks to the District Tuberculosis Officer of Mumbai, Dr. S. Mujumdar, for her active participation in the training associated with the study.

This study was submitted as a masters' level project toward requirement for the MSPH degree in public health (epidemiology) at the University of Alabama at Birmingham. In addition, it was presented in part as an oral presentation at the 131st Annual Meeting of the American Public Health Association, San Francisco, CA, USA (2003) and in the seminar series in global health organized by the John J. Sparkman Center of the University of Alabama at Birmingham, Birmingham, AL, USA.

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Source of Support: Nil. **Conflict of Interest:** None declared.

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