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How do patients access the private sector in Chennai, India? An evaluation of delays in tuberculosis diagnosis

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SUMMARY

SETTING: The diagnosis and treatment of tuberculosis (TB) in India are characterized by heavy private-sector involvement. Delays in treatment remain poorly characterized among patients seeking care in the Indian private sector.

OBJECTIVE: To assess delays in TB diagnosis and treatment initiation among patients diagnosed in the private sector, and pathways to care in an urban setting.

DESIGN: Cross-sectional survey of 289 consecutive patients diagnosed with TB in the private sector and referred for anti-tuberculosis treatment through a public-private mix program in Chennai from January 2014 to February 2015.

RESULTS: Among 212 patients with pulmonary TB, 90% first contacted a formal private provider, and 78% were diagnosed by the first or second provider seen after a median of three visits per provider. Median total delay was 51 days (mean 68). Consulting an informal (rather than formally trained) provider first was associated with significant increases in total delay (absolute increase 22.8 days, 95%CI 6.2–39.5) and in the risk of prolonged delay >90 days (aRR 2.4, 95%CI 1.3–4.4).

CONCLUSION: Even among patients seeking care in the formal (vs. informal) private sector in Chennai, diagnostic delays are substantial. Novel strategies are required to engage private providers, who often serve as the first point of contact.

KEY WORDS: patient pathways; care-seeking behavior; transmission; diagnostic testing

DELAYS in the diagnosis of patients with tuberculosis (TB) are a key driver of transmission worldwide.[1,2] In India, where a thousand people die of TB every day, excessive delays often occur between the onset of TB symptoms, diagnosis of disease, and initiation of anti-tuberculosis treatment.[1,3,4] The Government of India's Revised National Tuberculosis Control Programme (RNTCP) aims to achieve 'universal access' to quality diagnosis and treatment for all patients with TB by 2017.[5] To realize this goal, it is important to understand where delays and missed TB diagnoses occur and how to implement diagnostic algorithms to reduce these delays.[6,7]

The RNTCP provides access to free TB diagnostic and treatment services in the public sector.[8] However, up to 80% of individuals with long-term cough first seek care in the private sector, where unqualified providers outnumber qualified, allopathic doctors.[4,9–11] Many patients with TB see multiple health care providers (HCPs), first seeking advice from informal private providers, then medical care from formal private HCPs, and eventually treatment through the RNTCP.[4,6,9,12,13] Other patients seek care exclusively in the private sector; however, we know very little about their pathways to TB diagnosis and treatment.[4,13,14] Although the Government of India has made TB case notification mandatory, this is rarely done by private practitioners.[15]

The RNTCP is currently seeking to better engage the private sector in partnerships for anti-tuberculosis treatment ('public-private mix', or PPM model), offering the opportunity to explore pathways to TB diagnosis among patients who seek care in the private sector.[4,11,16] We sought to evaluate delays in TB diagnosis among patients diagnosed in the private sector and started on treatment in a PPM program in Chennai, India.

STUDY POPULATION AND METHODS

Setting

This study was conducted in Chennai, Tamil Nadu State, in India. Chennai is the sixth largest city in India, with a population of 4.6 million in 2011,

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making it the most densely populated city in Tamil Nadu.[17]

Study design and study population

We conducted a cross-sectional survey of patients accessing the private sector for TB diagnosis in collaboration with the Resource Group for Education and Advocacy for Community Health (REACH). REACH is a non-governmental PPM organization established in 1999, operating in collaboration with the Corporation of Chennai to involve private HCPs in the RNTCP.[18] REACH operates four PPM centers located in private hospitals that work with a network of private HCPs in Chennai to support patients with TB. In the REACH PPM model, private HCPs refer patients with TB to PPM centers to receive free directly observed treatment under the supervision of REACH staff.

Sample selection and data collection

We recruited patients who were diagnosed with TB and referred to REACH PPM centers in Chennai by private HCPs (i.e., not referred by pharmacists or RNTCP practitioners). From January 2014 through February 2015, we consecutively enrolled consenting patients from all four REACH PPM centers and conducted interviews using a structured questionnaire. All adult patients with pulmonary TB (PTB), extra-pulmonary TB or drug-resistant TB receiving treatment for $\leqslant$6 months at a REACH PPM center were eligible for interview. Trained study staff performed the interviews privately at the REACH PPM centers or via telephone, at the patients' discretion. The interviews collected information on the patient's socio-demographics and clinical TB disease; intervals between symptom onset, TB diagnosis, and treatment; and the characteristics, sequence and type of providers consulted. Dates of symptom onset, health-seeking encounters, diagnosis, and treatment initiation were collected by patient recall and/or from patient treatment cards when available from the patient.

Definitions

We used the conceptual framework proposed by Sreeramareddy et al. for definitions of delay.[4] Our primary outcome was total symptomatic time, or total delay, defined as the interval from patient-reported symptom onset to the initiation of anti-tuberculosis treatment. We defined prolonged total delay as duration >90 days and extremely prolonged delay as duration >150 days, which was the 90th percentile in our sample.

For this analysis, we classified an HCP as any person or facility approached by the patient for relief from their health problem.[13] Formal HCPs include allopathic doctors and non-allopathic AYUSH (*ayurveda*, yoga and naturopathy, *unani*, *siddha*, homeopathy) practitioners[10] with formal training who practice in the public or private sector. The public sector comprises formal HCPs, while the private sector includes formal HCPs in private clinics or hospitals, and informal HCPs, including traditional healers, unlicensed practitioners, and chemists or pharmacists.

Statistical analysis

We assessed differences in proportion for categorical variables using Pearson's χ^2 and Fisher's exact test. Among patients with PTB, we examined patient pathways to anti-tuberculosis treatment by HCP type, sector, and sequence using the median (interquartile range). We evaluated differences in median total delay measured continuously in days, using the non-parametric Wilcoxon test. We explored patient pathway characteristics specified a priori for differences in mean total delay using generalized linear models with a gamma distribution, identity link function, and robust standard errors. We adjusted for potential clustering of health-seeking behaviors by the location of the PPM center. We investigated risk factors for prolonged delay comparing patients with total delay >90 days in multivariable Poisson regression models with robust standard errors, as log-binomial models failed to converge.[19]

RESULTS

Socio-demographic and clinical disease characteristics

Among the 479 patients initiated on treatment through the REACH PPM services during the study period, 289 were referred from private practitioners and were thus eligible for the study. No patients declined the interview. The median patient age was 42 years. The majority of the patients interviewed were male (56%), literate (87%), employed (54%), and lived in households earning <INR8000 per month (52%, approximately US$130). There were 212 PTB patients, 67% of whom reported cough lasting $\geqslant$30 days. Only 16% of patients had been previously treated for TB, and 29% reported a family member having received anti-tuberculosis treatment (Table 1).

Health-seeking characteristics

Of all patients, 243 (84%) first sought care in the formal private sector (240 allopathic and 3 AYUSH providers), 28 (10%) in the informal private sector (15 pharmacists and 13 traditional healers or other providers), and 18 (6%) in the public sector. Patients saw a mean of two HCPs prior to TB diagnosis; only 10% saw more than four HCPs. However, patients visited their first and second HCPs a median of three times each before being diagnosed with TB. For the first HCP, the median distance traveled was 1 km and median total cost incurred was INR1000 (approximately US$16). In univariate analysis, employment,

Table 1 Socio-demographic and care-seeking characteristics of patients with pulmonary and extra-pulmonary TB in the private sector in Chennai, India

Characteristic	Total ($n = 289$) *n* (%)	Total delay >90 days ($n = 70$) *n* (%)	*P* value*	Total delay >150 days ($n = 28$) *n* (%)	*P* value*
Age, median [IQR]	42 [28–53]	42 [27–53]	0.76	38 [28–50]	0.46
⩾45 years	127 (44)	29 (41)	0.63	10 (36)	0.36
Male	163 (56)	36 (51)	0.35	12 (43)	0.13
Education					
Illiterate	38 (13)	11 (16)	0.69	2 (7)	0.60
Literate, less than primary	40 (14)	7 (10)		4 (14)	
Primary and/or secondary	135 (47)	33 (47)		12 (43)	
Senior secondary and/or graduate	76 (26)	19 (27)		10 (36)	
Employment					
Unemployed	43 (15)	13 (19)	0.05	4 (14)	0.60
Other (retired/housewife/student)	89 (31)	28 (40)		11 (40)	
Employed	157 (54)	29 (41)		13 (46)	
Average household income/month, INR					
⩽4 000	38 (13)	9 (13)	0.82	1 (3)	0.31
4001–8000	112 (39)	30 (43)		10 (36)	
8001–10 000	64 (22)	13 (19)		7 (25)	
>10 000	75 (26)	18 (25)		10 (36)	
Cough duration prior to diagnosis, days, median [IQR]	30 [28–90]	90 [45–120]	<0.001	105 [30–165]	0.01
⩾30	156 (54)	41 (59)	<0.01	14 (50)	0.11
History of previous anti-tuberculosis treatment	38 (13)	7 (10)	0.42	4 (14)	0.77
Family member ever treated for TB	80 (28)	13 (19)	0.05	9 (32)	0.66
Site of TB disease					
Extra-pulmonary TB	77 (27)	24 (34)	0.10	13 (46)	0.01
Pulmonary TB	212 (73)	46 (66)		15 (54)	
First health care sector consulted					
Government	18 (6)	6 (8)	0.07	4 (14)	0.18
Private	243 (84)	53 (76)		21 (75)	
Informal or pharmacy	28 (10)	11 (16)		3 (11)	
First HCP type					
Informal	28 (10)	12 (17)	0.02	24 (86)	0.33
Formal allopathic or AYUSH	261 (90)	58 (83)		4 (14)	
HCPs seen prior to diagnosis, *n*, median [IQR]	2 [1–2]	2 [2–3]	<0.001	2 [2–3]	<0.01
1 HCP	117 (40)	16 (23)	<0.001	5 (18)	0.01
2 HCPs	106 (37)	27 (39)		11 (40)	
3 HCPs	36 (13)	12 (17)		6 (21)	
⩾4 HCPs	30 (10)	15 (21)		6 (21)	
Visits to first HCP, *n*, median [IQR]†	3 [1–5]	3 [2–5]	0.14	4 [3–6]	0.23
>2 visits	88 (30)	26 (37)	0.16	11 (39)	0.29
Distance to first HCP, km, median [IQR]	1 [0–3]	1 [1–4]	0.26	1 [1–4]	0.43
>2	73 (25)	23 (33)	0.09	10 (36)	0.18
Total cost incurred with first HCP, INR, median [IQR]	1000 [300–3000]	1500 [500–5000]	0.04	1500 [500–5500]	0.20
⩽400	88 (30)	16 (23)	0.10	6 (21)	0.36
401–1000	77 (27)	15 (22)		6 (21)	
1001–3000	57 (20)	17 (24)		6 (21)	
>3000	67 (23)	22 (31)		10 (36)	

* Pearson's χ^2 (or Fisher's exact) test for categorical variables comparing those with delays ⩽ and >90 days and 150 days; Wilcoxon test for continuous variables.
† Patients were classified as having ⩽2 visits to the first HCP if the number of visits was unknown.
TB = tuberculosis; IQR = interquartile range; INR = Indian rupee; AYUSH = *ayurveda*, yoga and naturopathy, *unani*, *siddha*, homeopathy; HCP = health care provider.

first health care sector consulted, first HCP type, and number of HCPs seen were associated with total delay >90 days from symptom onset to treatment initiation (Table 1).

Patient pathways to care for pulmonary tuberculosis

Of the 212 patients with PTB, we identified 34 unique pathways through the private sector to TB diagnosis and treatment (Figure 1). Over three quarters (165/212) of the patients were diagnosed with TB after visiting two or fewer providers. Diagnostic tests performed included chest X-ray (57%), blood test (46%), sputum smear (31%), and computed tomography scan (13%). The majority (167/212) of the patients sought care exclusively from formal private HCPs. Over one quarter (60/212) were diagnosed by the first provider accessed and were then referred to REACH PPM for anti-tuberculosis treatment for a median total delay of 50 days, and a median of three visits per provider, as mentioned above. Over half (119/212) of the patients reported that the provider they had first contacted was their contact for all

PTB patients *n* (%)	Provider encounter number 1	2	3	4	5	Total delay median [IQR]	Range
Total (*n* = 212)						52 [33–83]	(3–341)
60 (28)	PD	PPM				50 [28–72]	(3–341)
38 (18)	PD	PD				57 [40–88]	(14–316)
22 (10)	PD					37 [20–83]	(7–180)
21 (10)	PD	PD	PPM			46 [34–69]	(13–150)
10 (5)	PD	PD	PD			54 [30–108]	(17–199)
6 (3)	GD	PD	PPM			56 [31–73]	(8–77)
5 (2)	PD	PD	PD	PD		35 [27–71]	(21–163)
5 (2)	PD	PD	PD	PPM		54 [51–71]	(36–83)
4 (2)	PH	PPM				68 [60–117]	(60–117)
3 (1)	GD	PD				77 [63–170]	(63–170)
3 (1)	PD	PD	GD	PD		49 [37–58]	(37–58)
3 (1)	PH	PD	PPM			41 [31–69]	(31–69)
2 (1)	PA	PD				41 [4–78]	(4–78)
2 (1)	PD	GD	PD	PPM		75 [40–110]	(40–110)
2 (1)	PD	GD	PD			174 [25–322]	(25–322)
2 (1)	PD	GD	PPM			31 [22–40]	(22–40)
2 (1)	PD	PD	PD	PD	PPM	116 [97–135]	(97–135)
2 (1)	PH	PD	PD	PD		104 [98–111]	(98–111)
2 (1)	PH	PD				92 [73–110]	(73–110)
2 (1)	T	PD	PPM			235 [147–323]	(147–323)
2 (1)	T	PD				109 [73–145]	(73–145)
2 (1)	T	PPM				25 [19–31]	(19–31)
1 (0.5)	GD	PD	PD			72	—
1 (0.5)	GD	PPM				47	—
1 (0.5)	PA	PPM				59	—
1 (0.5)	PD	PD	GD	PD	PPM	48	—
1 (0.5)*	PD	PD	PD	PD	PD	98	—
1 (0.5)	PD	PD	PD	PD	PD	144	—
1 (0.5)	PD	PH	PD	PD	PD	34	—
1 (0.5)	PH	GD	PD	PPM		70	—
1 (0.5)	PH	PD	PD	PPM		176	—
1 (0.5)*	T	GD	PD	PD	PD	92	—
1 (0.5)	T	GD	PD	PPM		63	—
1 (0.5)	T	PD	PD	PD	PPM	108	—

Figure 1 Pathways and days of total delay from symptom onset to TB diagnosis and treatment initiation among patients being treated for PTB at a PPM center in Chennai, India. Each line represents a unique pathway taken by patients to arrive at health facilities with REACH PPM centers. Each box represents a different health care provider seen by patients; however, each box may represent more than one provider encounter. For each provider, multiple encounters were often performed. Patients who were diagnosed in a private hospital and then began treatment with the REACH PPM center within the hospital are noted as PD for the final encounter. Patients who were diagnosed by a PD in a separate clinic and then referred to a REACH PPM center for treatment are noted as PPM for the final encounter. *Patient pathways show only the first five HCP encounters for these patients; full paths for 8 HCPs were = PD→ PD→ PD→ PD→ PD→ PA→ PD→ PPM; and for 6 HCPs = T→ GD→ PD→ PD→ PD→ PPM. PTB = pulmonary tuberculosis; PD = formal qualified private doctor; PPM = REACH public-private mix; GD = formal qualified government doctor; PH = informal pharmacy; PA = formal qualified private AYUSH; IN = informal unqualified non-medical, traditional, other; TB = tuberculosis; AYUSH = *ayurveda*, yoga and naturopathy, *unani*, *siddha*, homeopathy.

medical needs. Furthermore, 65% (138/212) of the patients were not aware that free TB services were available at the government health centers.

Patient and health system delays

Among the patients with PTB, the median patient delay was 10 days (mean 25, range 0–339) from patient-reported symptom onset to first HCP contact; 23% waited >30 days to seek care after symptom onset. The median diagnostic delay from the first HCP encounter to confirmation of TB diagnosis was 28 days (mean 44, range 0–322). The median treatment delay from confirmation of TB diagnosis to TB treatment initiation was 2 days (mean 5, range 0–75). The median combined health system delay from first HCP contact to TB treatment initiation was 30 days (mean 46, range 0–323); 63% of patients experienced delays of >14 days and 45% experienced delays of >30 days.

Total delay

The median total delay from symptom onset to TB treatment initiation in patients with PTB was 52 days (mean 69, range 3–341). In adjusted analyses, patients who first consulted an informal HCP experienced a significant increase in mean total delay (mean increase 25.8 days, 95% confidence interval [CI] 9.9–41.7). Mean total delay also increased if patients sought care from >2 HCPs (20.3 days) or if they were unemployed (17.9 days) (Table 2).

Predictors of prolonged total delay

The mean total delay for patients who first sought care in the public sector was 66 days (95%CI 39–94, median 64), similar to that of patients accessing the private sector (mean 65, 95%CI 57–74, median 48) (Figure 2). Among patients who first sought care in the informal private sector, the mean total delay (96 days, 95%CI 66–126, median 73) was longer than among those seeking care in the formal private sector (difference in mean total delay 31 days, 95%CI 14.2–47.6, $P < 0.001$) and the public sector (difference in mean total delay 30 days, 95%CI 1.5–58.4, $P = 0.04$).

Nearly a quarter of PTB patients (46/212) experienced prolonged total delay of >90 days, and 7% (15/212) experienced extremely prolonged delay of >150 days. In adjusted analyses, patients who first sought care from an informal HCP had 2.5 times the risk of a delay of >90 days compared to formal HCPs (adjusted risk ratio [aRR] 2.5, 95%CI 1.3–4.5) (Table 3). Unemployment, no family history of TB, seeing >2 HCPs, and total cost incurred with first HCP significantly increased the risk of a delay of >90 days.

DISCUSSION

This study of patients diagnosed with TB in India's private sector demonstrates that prolonged delays are more common among patients accessing informal, rather than formal, providers as the first contact in their pathways to care. Among patients with PTB, first seeking care from an informal provider is associated with an almost 4-week increase in the total symptomatic time prior to treatment initiation. Although prolonged delays in diagnosis are often

Table 2 Predictors of differences in duration of total delay (in days) to diagnosis and treatment initiation among patients with PTB, Chennai, India ($n = 212$)

Characteristic	Total PTB ($n = 212$) *n* (%)	Total delay median [IQR]*	Total delay mean (SD)	Difference in total delay mean (95%CI)	*P* value	Adjusted difference in total delay mean (95%CI)†	*P* value
Age, years							
<45	111 (52)	48 [30–83]	68.3 (61)	Reference		Reference	
⩾45	101 (48)	58 [34–86]	69.1 (55)	0.8 (−6.8 to 8.4)	0.83	–4.1 (−16.1 to 7.9)	0.50
Sex							
Female	73 (34)	53 [36–90]	69.7 (55)	Reference		Reference	
Male	139 (66)	51 [32–82]	68.2 (60)	–1.5 (−23.4 to 20.4)	0.89	6.1 (−14.3 to 26.6)	0.56
Education							
Up to primary	118 (56)	49 [31–78]	66.3 (59)	Reference		Reference	
Secondary or greater	94 (44)	54 [37–93]	71.7 (56)	5.4 (−4.3 to 15.0)	0.28	1.5 (−8.3 to 11.2)	0.77
Employment status							
Unemployed	80 (38)	64 [36–100]‡	79.2 (63)	Reference		Reference	
Employed	132 (62)	48 [31–73]	62.4 (54)	–16.7 (−39.8 to 6.3)	0.15	–17.9 (−32.1 to −3.7)	0.01
Average monthly household income, INR							
⩽8000	114 (54)	51 [32–88]	68.3 (57)	Reference		—	
>8001	98 (46)	54 [33–78]	69.2 (60)	0.9 (−17.5 to 19.3)	0.92	—	
History of anti-tuberculosis treatment	34 (16)	54 [36–86]	73.4 (62)	5.6 (−16.7 to 27.9)	0.62	11.1 (−1.3 to 23.5)	0.08
No previous anti-tuberculosis treatment	178 (84)	51 [32–83]	67.8 (57)	Reference		Reference	
Family member treated for TB	61 (29)	46 [32–71]	62.2 (61)	–9.1 (−19.1 to 1.0)	0.08	–4.0 (−16.1 to 8.1)	0.52
No family member treated for TB	151 (71)	54 [33–94]	71.3 (57)	Reference		Reference	
Type of first HCP							
Informal	22 (10)	73 [63–111]§	96.4 (66)	30.9 (14.2 to 47.6)	<0.001	25.8 (9.9 to 41.7)	<0.01
Formal allopathic or AYUSH	190 (90)	49 [32–78]	65.5 (56)	Reference		Reference	
HCPs seen prior to diagnosis ⩽2	165 (78)	48 [31–77]§	63.8 (56)	Reference		Reference	
>2	47 (22)	71 [37–108]	85.8 (63)	22.1 (8.8 to 35.4)	<0.01	20.3 (5.4 to 35.2)	<0.01
Visits to first HCP							
⩽2 or unknown¶	153 (72)	51 [34–78]	65.8 (53)	Reference		Reference	
>2 visits	59 (28)	59 [30–94]	76.3 (69)	10.5 (−7.3 to 28.3)	0.25	7.2 (−7.5 to 22.0)	0.34
Distance to first HCP, km							
⩽2	159 (75)	53 [33–82]	67.0 (57)	Reference		Reference	
>2	53 (25)	49 [33–93]	73.5 (62)	6.5 (−1.5 to 14.6)	0.11	0.6 (−9.2 to 10.3)	0.91
Total cost incurred with first HCP, INR							
<1000	109 (51)	53 [33–77]	63.1 (48)	Reference		Reference	
⩾1000	103 (49)	51 [31–97]	74.5 (67)	11.4 (−5.5 to 28.3)	0.18	5.3 (−11.8 to 22.3)	0.54

* Medians assessed using non-parametric Wilcoxon test for equality where ‡$P < 0.05$ and §$P < 0.01$.
† Adjusted for all other variables with data in this column.
¶ Patients were classified as having ⩽2 visits to the first HCP if the number of visits was unknown.
PTB = pulmonary TB; IQR = interquartile range; SD = standard deviation; CI = confidence interval; INR = Indian rupee; TB = tuberculosis; HCP = health care provider; AYUSH = *ayurveda*, yoga and naturopathy, *unani*, *siddha*, homeopathy.

attributed to patients seeking care from multiple HCPs in the private sector, 78% of study patients were diagnosed with PTB, after relatively few visits, by the first or second provider they saw. Nonetheless, delays remain substantial, even among those who only saw formal providers; patients had a mean of three visits prior to TB diagnosis and a health system delay exceeding 40 days, suggesting that even qualified HCPs may use non-specific or empiric therapies prior to testing for TB.

Our study is among the first to characterize patients diagnosed with TB in the Indian private sector. The majority of previous research assessing delays in pathways to care was conducted among patients treated under the RNTCP.[4,9] However, more than three quarters of our patient sample sought care exclusively from formal private HCPs. We found that 84% of patients first consulted a formal private HCP, more than the 30–78% reported in previous studies in urban settings.[4,9,13,20] Compared to patients treated at RNTCP centers, those patients treated under PPM had higher literacy levels[13,14] and household income,[8,14] and lived in closer proximity to their first providers.[8,13,14]

Among the patients treated using PPM, the total delays reported were substantially lower than those

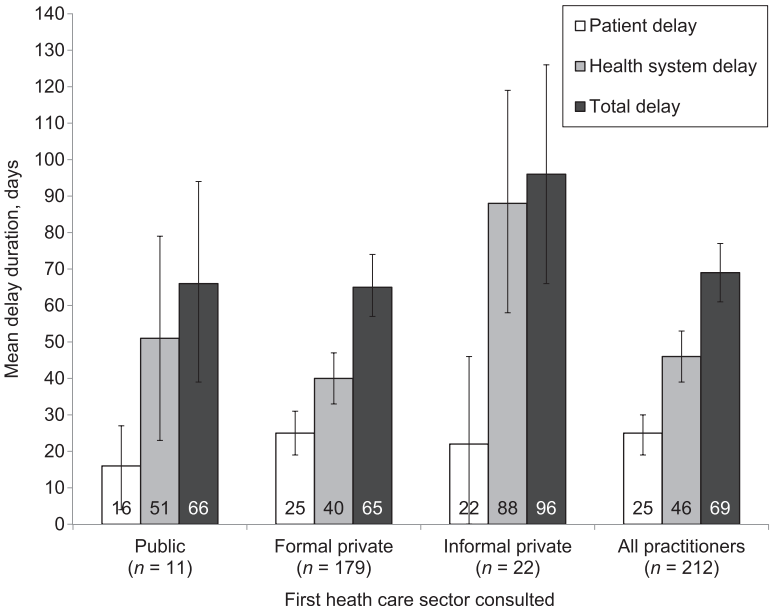

Figure 2 Distribution of mean patient, health system, and total delays by first HCP consulted after symptom onset among patients with PTB ($n = 212$) in Chennai, India. Patient delay was defined as the interval between onset of symptoms suggestive of PTB and patient's first contact with an HCP, health system delay as the time from the patient's first contact with any HCP to the initiation of anti-tuberculosis treatment, and total delay as time from symptom onset to the initiation of anti-tuberculosis treatment. Crossbars represent 95% confidence intervals for mean delays. The median patient, health system, and total delay for patients first seeking care from public sector practitioners were respectively 10, 44, and 64 days; from formal private providers respectively 10, 26, and 48 days; from informal private providers respectively 9, 72, and 73 days; and overall respectively 10, 30, and 52 days. The 11 patients who first sought care in the public sector were eventually diagnosed by private practitioners; patients diagnosed by public sector providers were not included in this study. PTB = pulmonary tuberculosis; HCP = health care provider.

(>90 days) among patients first seeking private sector care in a previous study of patients ultimately treated by the RNTCP.[9] Relative to previous estimates in the literature, health system delay in our study was shorter among patients who first consulted formal private HCPs, but longer among patients who first consulted government HCPs.[4,13,14] The majority of these PPM patients saw only one or two HCPs, suggesting that PPM may have reduced the number of providers required to be seen before diagnosis.[9,21] However, the prolonged delays and multiple visits required prior to TB diagnosis are consistent with a

Table 3 Risk factors for prolonged delay >90 days to diagnosis and treatment initiation among patients with pulmonary TB, Chennai, India

Characteristic	Total delay >90 days ($n = 46$) *n* (%)	>90 days RR (95%CI)	*P* value	>90 days aRR (95%CI)*	*P* value
Age ⩾45 years	22 (48)	1.1 (0.6–1.8)	0.86	0.9 (0.5–1.6)	0.66
Male	29 (63)	0.9 (0.3–2.4)	0.83	1.4 (0.5–4.3)	0.56
Secondary education or greater	23 (50)	1.3 (0.8–1.9)	0.25	1.2 (0.7–1.9)	0.51
Employed	22 (48)	0.5 (0.3–1.1)	0.09	0.5 (0.2–1.0)	0.04
History of previous anti-tuberculosis treatment	7 (15)	1.0 (0.5–1.8)	0.94	1.2 (0.9–1.5)	0.18
Family member ever treated for TB	7 (15)	0.4 (0.3–0.7)	<0.001	0.5 (0.3–0.9)	0.02
Informal first HCP	10 (22)	2.4 (1.6–3.8)	<0.001	2.5 (1.3–4.5)	<0.01
Saw >2 HCPs prior to diagnosis	17 (37)	2.0 (1.4–3.0)	<0.001	1.7 (1.3–2.3)	<0.001
Visited first HCP >2 times†	15 (33)	1.3 (0.9–1.8)	0.18	1.0 (0.7–1.4)	0.97
Distance to first HCP >2 km	14 (30)	1.3 (0.9–1.8)	0.17	1.1 (0.7–1.8)	0.68
Total cost incurred with first HCP ⩾INR1000	29 (63)	1.8 (1.3–2.5)	<0.001	1.9 (1.4–2.5)	<0.001

* Adjusted for all other variables with data in this column.
† Patients were classified as having ⩽2 visits to the first HCP if the number of visits was unknown.
TB = TB; RR = risk ratio; CI = confidence interval; aRR = adjusted RR; HCP = health care provider; INR = Indian rupee.

recent systematic review on the quality of TB care in India,[22] which showed that approximately half of HCPs knew that persons with cough lasting 2–3 weeks should be evaluated for TB. A recent study of standardized patients seeking care for TB symptoms in the private sector found that only 5% of private practitioners prescribed sputum testing.[23] While improved diagnostic tests, including Xpert® MTB/RIF (Cepheid, Sunnyvale, CA, USA), are being scaled up in both the public[24] and private sectors,[16] their use is still limited. A parallel study of private practitioners in Chennai found that only 15% had ordered an Xpert first for TB diagnosis in the past year (submitted).

Our findings highlight the need to improve diagnostic capacity to reduce delays in the private sector as the first point of patient care. Our study was not designed to evaluate specific interventions for reducing delays, but modeling analyses suggest that both increased access to improved diagnostic tests, such as Xpert, and increased cross-sector referrals could substantially reduce the number of visits by TB patients that fail to result in TB diagnosis and treatment in India.[6] A demonstration study implementing Xpert as the initial TB diagnostic test in decentralized public health settings throughout India increased case-notification rates of all bacteriologically confirmed TB cases.[24] The RNTCP and the Initiative for Promoting Affordable Quality TB Tests are working to increase the availability of World Health Organization (WHO) approved TB diagnostic tests in both public-sector microscopy centers and private laboratories used by formal HCPs.[7,25] The RNTCP is also seeking to engage the private sector through innovative PPM schemes, which have increased TB case notification by 12–98% in previous studies in India.[26–28] By implementing a referral system for informal HCPs and giving formal private HCPs access to WHO-approved diagnostics, it may be possible to reduce diagnostic delays and thus reduce TB transmission in the community. Future studies should investigate the impact of specific interventions.

As an early investigation into patient pathways to TB diagnosis in the Indian private sector, this study has a number of limitations. First, the patient population may not be representative of other patients who access the private sector for TB care but are not referred to PPM. Furthermore, we limited inclusion to patients referred to PPM by private practitioners, although REACH receives referrals from other sources. Our findings may also not be generalizeable to patients diagnosed in the public sector.[9] Second, similar to most other studies of diagnostic delay, our study relied on patient recall for data collection.[4] We conducted patient interviews within 6 months of starting anti-tuberculosis treatment, and also used calendars and interview reference cards to reduce recall bias in our data. Finally, we did not collect data on smoking or alcohol usage, two known confounders of delay. Future studies should address the challenges in accessing the private sector to gather more representative data on this patient population.

CONCLUSION

Our study provides insight about delays in TB diagnosis and treatment among patients who received TB care in the Indian private sector. The pathways to care for TB in India are diverse, but most patients treated in PPM are linked to care after visiting two or fewer HCPs in the private sector. However, total delay to diagnosis remains substantial. Patients who first seek care in the informal private sector do so quickly after symptoms develop, but then experience prolonged health system delays. Engaging informal and formal private HCPs to improve their capacity to rapidly diagnose TB is critical to reduce total symptomatic time and thus TB transmission.

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RESUME

CONTEXTE : Le diagnostic et le traitement de la tuberculose (TB) en Inde sont caractérisés par une implication majeure du secteur privé, mais les délais d'accès au traitement des patients sollicitant des soins dans le secteur privé sont mal connus.

OBJECTIF : Evaluer les délais d'accès au diagnostic et à la mise en route du traitement de la TB chez les patients diagnostiqués dans le secteur privé et l'accès aux soins dans un contexte urbain.

SCHÉMA : Une enquête transversale auprès de 289 patients consécutifs qui ont eu un diagnostic de TB dans le secteur privé et ont été référés pour traitement antituberculeux à travers un programme conjoint public-privé à Chennai de janvier 2014 à février 2015.

RÉSULTATS : Parmi 212 patients atteints de TB pulmonaire, 90% ont d'abord contacté un prestataire de soins formel et 78% ont été diagnostiqués par le premier ou le deuxième prestataire vu après une médiane de trois consultations par prestataire. Le délai médian total a été de 51 jours (moyenne 68). Le fait de consulter en premier un prestataire informel (plutôt qu'un prestataire ayant eu une formation officielle) a été associé avec une augmentation significative du délai total (augmentation absolue 22,8 jours ; IC95% 6,2–39,5) et un risque de délai prolongé de >90 jours (risque relative ajustée 2,4 ; IC95% 1,3–4,4).

CONCLUSION : Même parmi les patients sollicitant des soins dans le secteur privé formel (par opposition au secteur informel) à Chennai, les délais de diagnostic sont substantiels. De nouvelles stratégies sont requises pour obtenir l'engagement des prestataires de soins privés, qui sont souvent le premier point de contact.

RESUMEN

MARCO DE REFERENCIA: El diagnóstico y el tratamiento de la tuberculosis (TB) en la India se caracterizan por una fuerte proporción de participación del sector privado de la salud. Aun no se han evaluado plenamente los retrasos en el comienzo del tratamiento de los pacientes que acuden al sector privado en busca de atención de salud.

OBJETIVO: Examinar los retrasos en el diagnóstico y el comienzo del tratamiento de la TB de los pacientes cuyo diagnóstico se establece en el sector privado y definir las trayectorias hacia la obtención de atención de salud en un entorno urbano.

MÉTODOS: Se llevó a cabo una encuesta transversal a 289 pacientes consecutivos, en quienes se diagnosticó TB en el sector privado y se habían remitido para tratamiento a un programa mixto de colaboración publicoprivada en Chennai de enero del 2014 a febrero del 2015.

RESULTADOS: De los 212 pacientes con diagnóstico de TB pulmonar, el 90% acudió en primer lugar a un profesional del sector privado y en el 78% de los casos, el diagnóstico lo estableció el primero o el segundo profesional consultado, después de una mediana de tres consultas por profesional. La mediana del retraso total fue 51 días (promedio 68 días). El hecho de consultar primero a un proveedor de atención informal (en lugar de un profesional plenamente capacitado) se asoció con un aumento considerable del retraso total (aumento absoluto 22,8 días; IC95% 6,2–39,5) y con un riesgo de un retraso prolongado superior a 90 días (riesgo relativo ajustado 2,4; IC95% 1,3–4,4).

CONCLUSIÓN: Los retrasos en el diagnóstico de la TB fueron considerables, incluso en los pacientes que acudieron a un profesional capacitado del sector privado (en comparación con un proveedor de atención informal) en Chennai. Se precisan estrategias novedosas que vinculen a los profesionales del sector privado, quienes suelen ser los primeros puntos de contacto de los pacientes.