Original Article

A Cross-Sectional Descriptive Study to Ascertain Factors Influencing Delay in Diagnosis among Newly Diagnosed Pulmonary Tuberculosis Patients

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Abstract

Introduction: Tuberculosis (TB) is a communicable disease. The management, as well as the outcome, depends upon the early detection and diagnosis of the disease. Delay in diagnosis leads to worsening of the patient's condition as well as the emergence of multi-resistant bacilli. **Objectives:** The objectives were to know how many persons had diagnostic and treatment delays, as well as the factors that were linked to delayed care-seeking (patient delay) and diagnosis by health-care professionals (health-care system delay) among newly diagnosed pulmonary TB patients. **Methodology:** A cross-sectional study of 115 diagnosed pulmonary TB patients was done. The time between the initial symptoms and the first encounter with a hospital institution was referred to as the patient's delay. The time between first contact with a health-care facility and diagnosis confirmation was referred to as the diagnostic delay. A cutoff threshold of 4 weeks was used to determine the diagnostic delay. A patient delay of more than 2 weeks and a health-care system delay exceeding 2 weeks were also evaluated. **Results:** In this study, 94 (81.7%), 69 (60%), and 100 (87%) subjects had patient, health system, and diagnostic delays, respectively. **Conclusion:** The majority of the participants in the study experienced a diagnostic delay, followed by patient and health-care system delays. The educational status, income status, distance to a health care facility, cost, initial consultation with the type of health-care personnel in the health-care system, and frequency of consultations were associated with the delays.

Keywords: Diagnostic delay, health system delay, patient delay, tuberculosis

Introduction

Tuberculosis (TB) is a disease caused by the bacteria *Mycobacterium tuberculosis*, which usually destroys the lungs. TB is spread to other people by respiratory droplets. It is estimated that one-quarter of the world's population is infected with TB, indicating that not everyone infected with the bacteria becomes ill. Infected with TB bacilli, people have a 5%-to-10% lifetime risk of developing TB. Those with a suppressed immune system, such as those living with HIV, those who are malnourished, diabetics, or who smoke, have an increased risk of developing the disease.[1]

Early detection of TB and timely treatment initiation are critical components of an efficient TB control program. Patients with undetected pulmonary TB (PTB) serve as transmission reservoirs, and a delay in diagnosis can worsen the disease, increase the risk of mortality, and increase the likelihood of TB transmission in the community, as each infectious case produces 10–15 secondary infections.[2]

The delay in diagnosis and treatment can trigger many complications; the spread of infection from one person to another (initiation of treatment can prevent the spread within 48 h of starting the drugs), the prolonged time of infectivity in the community, the chance of spread of multidrug-resistant TB,

Access this article online	
Quick Response Code:	**Website:** www.ijrc.in
	DOI: 10.4103/ijrc.ijrc_74_22

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How to cite this article: Thomas N, Rajalingam R, Vallabhaneni V, Varghese J. A cross-sectional descriptive study to ascertain factors influencing delay in diagnosis among newly diagnosed pulmonary tuberculosis patients. Indian J Respir Care 2022;11:341-8.

Received: 03-04-2022 **Revised:** 27-06-2022
Accepted: 21-07-2022 **Published:** 12-11-2022

the increased severity of disease, the cost as well as expenditure increase, the adverse treatment outcome, the permanent lung damage and increased chance of mortality.[3-7]

Previous studies which involved these factors in the diagnostic delay of TB did not comprise all the aspects in a detailed manner in the questionnaire. In this study, we tried to incorporate most of the factors involved in diagnostic delay, and it was also conducted in the below-poverty line Indian population where the corresponding studies are rare. This study was done to determine the factors associated with the delay in diagnosis among newly diagnosed pulmonary TB patients in a rural tertiary center among people who are below the poverty line.

Methodology

Patients with newly diagnosed pulmonary TB (PTB) who were admitted to a tertiary care hospital were included in the study. It was a cross-sectional research study. The study setting was a tertiary care hospital, Ammapettai, Kanchipuram district, including five primary health centers (Sembakkam, Tiruporur, Mahabalipuram, Kelambakkam, and Tirukazhukundram). The study subjects were selected through convenient sampling by considering inclusion and exclusion criteria. Inclusion criteria included newly diagnosed PTB patients, both males and females, smokers, and nonsmokers. Exclusion criteria included only extrapulmonary TB. The sample size was determined by the study of Paramasivam *et al*.,[8] considering the standard deviation (SD) of mean patient delay as 23.5 with a precision of 5% and a 95% confidence interval, the sample size is calculated as $N = Z^2_{1-\alpha/2} \times \sigma^2/d^2$ $Z_{1-\alpha/2}$ – two two-tailed probability for a 95% confidence interval = 1.96, σ – SD of mean delayed arrival = 23.5, d – accuracy (or permitted error) for the average delayed arrival = 5, $n = 1.96^2 \times 23.5^2/0.05^2$, $n = 85$. With a nonresponse rate of 30%, the total sample size required for the study was 115. The subjects were interviewed with a WHO questionnaire-diagnostic and treatment delay in TB[9] after getting informed consent.

The time between the start of symptoms and the diagnosis of TB in a patient is known as the diagnostic delay. This encompasses both patient and health-care system delays. Patient delay: the time between the emergence of the initial pulmonary TB symptoms, including cough, pyrexia, and chest pain, and the first medical appointment. Delay in the health-care system: the time between the initial consultation and the diagnosis. A cutoff value of 4 weeks was used to classify diagnostic delay, which was determined by taking into account an admissible patient delay and a health-care system delay of 2 weeks, respectively.

Before the start of the trial, the institutional ethical committee gave their consent. The research took place over 18 months (December 2019–August 2021), which includes data collection from December 2019–May 2021 (16 months) and write-up from June 2021 TO August 2021 (2–3 months).

Descriptive statistics

The mean, median, mode, and SD are used to represent numerical variables such as age and TB stigma score. Sexual identity, education, occupation, household members, number of rooms, smoking characteristics, health-seeking behavior, and other categorical data are expressed as frequencies and percentages.

Inferential statistics

When a categorical variable is linked to another categorical variable, both tables and bar diagrams are used to illustrate the variables. The Chi-square test is used to determine significance. When more than 20% of the cell values have an anticipated cell value of <5, Fisher's exact test is applied. The association of different variables and delays is done using Chi-square or Fisher's exact test. The association of age and TB stigma score with various delays was done using an independent *t*-test**.** Statistical significance was defined as a $P < 0.05$. The information was imported into a Microsoft Excel spreadsheet and analyzed with IBM Corp. Released 2015. IBM SPSS Statistics for Windows, Version 23.0. Armonk, NY: IBM Corp.

Results

Descriptive statistics

The mean (SD) age in years in our study was 45.63 (14.89). The minimum and maximum ages were 18 and 76, respectively. The median age was 48, with a mean age of 60. Most of the subjects in the study were males–88 (76.5%), and 27 (23.5%) were females. Our study showed that 43 subjects (37.4%) were illiterate, 33 subjects (28.7%) had middle school education, 17 subjects (14.8%) had primary education, 14 subjects (12.2%) had senior education, and 8 subjects (7%) had university or higher education. In our study, only 1 subject (9%) was a teacher by profession, 9 subjects (7.8%) were students, 3 subjects (2.6%) had a technical job, 33 subjects (28.7%) were unemployed, and 69 subjects (60%) were daily wagers. Our study showed that 58 subjects (50.4%) had no savings, or no debt, and 40 subjects (30.8%) were in debt. In our study, the majority of the study population, 108 subjects (93.9%), resided in rural areas. In our study, 48 subjects (41.7%) consulted health care practitioners doing private practice, 23 subjects (20%) in a medical college hospital; 13 subjects (11.3%) in the primary health center, 11 subjects (9.6%) in a chest hospital; 10 subjects (8.7%) to a government hospital; and 8 subjects (7%) to TB centers. In our study, 59 subjects (51.3%) had availed of free service, 38 subjects (33%) had spent < 100 rupees, and 18 subjects (15.7%) had spent >100 rupees. In our study, 44 subjects (38.3%) were diagnosed on their first visit, while 68 subjects (59.1%) were consulted 1–3 times, and 3 subjects (.6%) had to consult more than 3 times before diagnosis. In our study, the majority of the subjects, 94 (81.7%), were diagnosed by a chest specialist, while 16 subjects (14%) were diagnosed by an internist and only 5 subjects (4.3%) by general practitioners. The mean (SD) of the stigma score was 30.11 (5.24). The minimum and maximum were 19 and 43. The median was 30 and the mode was 28. In our study, 75 subjects (65.2%) had less than half an hour's travel to a nearby PHC and 33 subjects (28.7%) had ½ h-1 h travel. 26 subjects (22.6%) had ≤5 km distance, 47 subjects (40.9%) had 6–10 km, 31 subjects (7%) had 11–20 km and 11 subjects (9.5%) had >20 km. The mean (SD) of the patient, health system, and diagnostic delay were 51.17 (45.21), 34.26 (39.48), and 87.05 (62.99), respectively. The maximum patient, health-care system, and diagnostic delay days were 235, 208, and 359 days, respectively. The median patient, health-care system, and diagnostic delays were 41, 26, and 71 days, respectively. Delays were experienced by 94% (81.7%), 69% (60%), and 100% (87%) of patients, health systems, and diagnoses in our study.

Inferential statistics

Patient delay was consistently related to educational status, as shown in Table 1. In our study, 93% of illiterates and 76.5% of subjects who had primary education showed patient delay. Furthermore, 100% of students and 90.9% of unemployed subjects showed patient delay. In the income status, 95% of subjects with debt showed patient delay. Furthermore, 90.3% of subjects whose distance to a nearby PHC was 11–20 km and 100% of subjects with a >20 km distance showed patient delay. Subjects who spent more than 100 rupees for consultation (88.9%) had more patient delays. Concerning health-seeking behavior, subjects with multiple consultations before diagnosis had more patient delays.

Table 2 reveals that educational attainment was significantly linked to health-care system delays. In the study, 72.1% of illiterates showed health system delays in comparison to 66.7% of subjects who had middle school education. 84.6% of subjects who presented initially to the Primary Health Centre showed health system delay in comparison to 60% of subjects who presented to government hospitals. In the study, 83.3% of subjects who spent >100 rupees showed health system delay in comparison to 68.4% of subjects who spent <100 rupees. Furthermore, 100% of subjects who consulted ≥4 practitioners showed health system delays in comparison to 86.8% of subjects who consulted 1–3 practitioners. Unemployed subjects 21 (63.6%) and daily wagers 43 (62.3%) experienced more health-care delays.

In our study, Table 3 shows that educational status had a significant association where 95.3% of illiterates and 82.4% of subjects who completed primary education showed diagnostic delay. Furthermore, 93.8% of subjects who presented to a private practitioner showed diagnostic delay. In our study, 94.4% of subjects who spent >100 rupees on consultation had diagnostic delays in comparison to 92.1% of those who spent <100 rupees. In our study, 100% of subjects who consulted ≥4 health care practitioners before initial diagnosis had a diagnostic delay in comparison to 95.6% of subjects who had 1–3 visits and 72.7% with one visit. Our study showed that 100% of subjects who consulted internists had a diagnostic delay in comparison with 86.2% who consulted a chest specialist and 60% who consulted a general practitioner.

Discussion

The mean (SD) age in years in our study was 45.63 (14.89). There were 27 girls (23.5%) and 88 males (76.5%) among the subjects. In a study done in Odisha, the average age of newly diagnosed subjects was 46.7 years, and about 75% were males.[10] Another study conducted in Iran showed the mean age was 38.9 (12.3) years with 60% of males.[11] Another study done in India showed that 79% of the population were males with a median age of 39 years.[12] The variation in mean age can be due to the disparity in study settings and access to information via records or direct interviews.

In our study, 94 subjects (81.7%), 69 subjects (60%), and 100 subjects (87%) had patient, health system, and diagnostic delays, respectively. Patient delay was associated with educational status, income status, seeking care from health practitioners, and distance to the hospital in our study. In our study, 93% of illiterate subjects and 76.5% of subjects with only primary education showed patient delay. Furthermore, 100% of students and 90.9% of unemployed subjects showed patient delay. Concerning income status, 95% of subjects with debt showed patient delay. 93.8% of subjects who sought care from an internist showed patient delay. Furthermore, 90.3% of subjects whose distance to a nearby PHC was 11–20 km and 100% of subjects with >20 km distance showed patient delay. Delays in the health-care system were associated with the educational level, marital status, approach to the hospital, financial expenditure, and the number of health practitioners consulted. In our study, 72.1% of subjects who were illiterate, and 66.7% of subjects who had middle school education showed health system delays. Furthermore, in marital status, 63.1% of subjects who were married and 100% of subjects who were widowed showed health system delay. In the hospital approach, 84.6% of subjects who consulted the primary health center and 60% of subjects in any government hospital consulted had health system delay. In our study, 83.3% of subjects who spent >100 rupees showed health system delay in comparison to 68.4% of subjects who spent <100 rupees. Furthermore, 100% of subjects who consulted ≥4 practitioners and 86.8% of subjects who consulted 1–3 practitioners had health system delays. Diagnostic delay was associated with educational status, hospital of initial health-seeking, spending of money, the number of visits to a medical center, and the person who was first contacted. In our study, educational status had a substantial relationship with diagnostic delay, with 95.3% of illiterate participants and 82.4% of those who finished elementary education showing a diagnostic delay. Furthermore, 93.8% of subjects who initially consulted private practice and 90.9% of subjects who consulted a chest hospital showed diagnostic delay. In our study, 94.4% of subjects who spent >100 rupees had a diagnostic delay in comparison with 92.1% of those who spent <100 rupees. In our study, 100% of subjects who consulted ≥4 health care practitioners had a diagnostic delay in comparison to 95.6% of subjects with 1–3 visits and 72.7% with one initial visit. In our study, 100% of subjects who consulted internists had a diagnostic delay in

Table 1: Association of different variables and patient delay among the population

	Delay present (%)	Delay absent (%)	Table value	*P*
Gender				
Male	72 (81.8)	16 (18.2)	0.002	0.97[f]
Female	22 (81.5)	5 (18.5)		
Education				
Illiterate	40 (93)	3 (7)	10.42	0.02*,[f]
Middle	24 (72.7)	9 (27.3)		
Primary	13 (76.5)	4 (23.5)		
Senior	9 (64.3)	5 (35.7)		
University or higher	8 (100)	0		
Occupation				
Professional teacher	0	1 (100)	9.93	0.03*,[f]
Student	9 (100)	0		
Technical	2 (66.7)	1 (33.3)		
Unemployed	30 (90.9)	3 (9.1)		
Daily wagers	53 (76.8)	16 (23.2)		
Residence				
Rural	89 (82.4)	18 (17.6)	0.61	0.76
Suburban	3 (75)	1 (25)		
Urban	2 (66.7)	1 (33.3)		
Income				
In debt	38 (95)	2 (5)	7.27	0.014*,[f]
Income = expenses	43 (74.1)	15 (25.9)		
Saving	13 (76.5)	4 (23.5)		
The hospital consulted about the symptoms				
Self-medication	1 (50)	1 (50)		
Chest hospital	8 (72.7)	3 (27.3)	2.79	0.87[f]
PHC	10 (76.9)	3 (23.1)		
Medical college hospital	19 (82.6)	4 (17.4)		
Private practice	41 (85.4)	7 (14.6)		
TB center	7 (87.5)	1 (12.5)		
Government hospital	8 (80)	2 (20)		
Money spends				
Free	47 (79.7)	12 (20.3)	0.79	0.41[f]
<100	31 (81.6)	7 (18.4)		
>100	16 (88.9)	2 (11.1)		
Number of health-seeking before initial diagnosis				
0	34 (77.3)	10 (22.7)	1.46	0.26[f]
1–3	57 (83.8)	11 (16.2)		
≥4	3 (100)	0		
The specialty of health care practitioner at initial diagnosis				
Chest specialist	77 (81.9)	17 (18.1)	7.38	0.04*, [f]
GP	2 (40)	3 (60)		
Internist	15 (93.8)	1 (6.3)		
Time to reach from home to nearest PHC				
Less than half an hour	59 (78.7)	16 (21.3)	1.38	0.48[f]
½h–1 h	29 (87.9)	4 (12.1)		
>1 h	6 (85.7)	1 (14.3)		
Distance to the PHC (km)				
≤5	20 (76.9)	6 (3.1)	6.06	0.04*, [f]
6–10	35 (74.5)	12 (25.5)		
11–20	28 (90.3)	3 (9.7)		
>20	11 (100)	0		
TB stigma score	29.71 (5.18)	31.90 (5.28)	0.39	0.08a

Mean from an independent *t*-test (SD), Chi-square test expressed as a percentage and frequency, [f]Fisher's exact test as a percentage and frequency, **P*-value of <0.05 is significant. SD: Standard deviation, PHC: Primary health center, TB: Tuberculosis, GP: General practitioner

Table 2: Association of different variables and health system delay among the population

	Delay present (%)	Delay absent (%)	Table value	P
Gender				
Male	56 (63.6)	32 (36.4)	2.07	0.15[f]
Female	13 (48.1)	14 (51.9)		
Education				
Illiterate	31 (72.1)	12 (27.9)	11.52	0.02*[,f]
Middle	22 (66.7)	11 (33.3)		
Primary	7 (41.2)	10 (58.8)		
Senior	4 (28.6)	10 (71.4)		
University or higher	5 (62.5)	3 (37.5)		
Occupation				
Professional teacher	1 (100)	0	4.56	0.31[f]
Student	3 (33.3)	6 (66.7)		
Technical	1 (33.3)	2 (66.7)		
Unemployed	21 (63.6)	12 (36.4)		
Daily wagers	43 (62.3)	26 (37.7)		
Residence				
Rural	66 (61.1)	42 (38.9)	2.15	0.34[f]
Suburban	1 (25)	3 (75)		
Urban	2 (66.7)	1 (33.3)		
Income				
In debt	24 (60)	16 (40)	1.53	0.47[b]
Income = expenses	37 (63.8)	21 (36.2)		
Saving	8 (47.1)	9 (52.9)		
The hospital consulted about the symptoms				
Self-medication	0	0		
Chest hospital	5 (45.5)	6 (54.5)	24.53	<0.001[f,]*
PHC	11 (84.6)	2 (15.4)		
Medical college hospital	5 (21.7)	18 (78.3)		
Private practice	37 (77.1)	11 (22.9)		
TB center	4 (50)	4 (50)		
Government hospital	6 (60)	4 (40)		
Money spends				
Free	28 (47.5)	31 (52.5)	9.07	0.003*[,b]
<100	26 (68.4)	12 (31.6)		
>100	15 (83.3)	3 (16.7)		
Number of health-seeking before initial diagnosis				
0	7 (15.9)	37 (84.1)	57.94	<0.001*[,f]
1–3	59 (86.8)	9 (13.2)		
≥4	3 (100)	0		
The specialty of health care practitioner at initial diagnosis				
Chest specialist	50 (62.8)	35 (37.2)	3.73	0.15[f]
GP	1 (20)	4 (80)		
Internist	9 (56.3)	7 (43.8)		
Time to reach from home to nearest PHC				
Less than half an hour	42 (56)	33 (44)	3.58	0.16[f]
½ h–1 h	24 (72.7)	9 (27.3)		
>1 h	3 (42.9)	4 (57.1)		
Distance to the PHC (km)				
≤5	12 (46.2)	14 (53.8)	3.52	0.56[f]
6–10	32 (68.1)	15 (31.9)		
11–20	19 (61.3)	12 (38.7)		
>20	6 (54.5)	5 (45.5)		
TB stigma score	29.86 (5.19)	30.50 (5.35)	0.002	0.52a

[a]Independent t-test expressed as mean (SD), [b]Chi-square test expressed as frequency and percentage, [f]Fisher's exact test expressed as frequency and percentage, *P<0.05 is significant. SD: Standard deviation, PHC: Primary health center, TB: Tuberculosis, GP: General practitioner

Table 3: Association of different variables and diagnostic delay among the population

	Delay present (%)	Delay absent (%)	Table value	*P*
Gender				
Male	76 (86.4)	12 (13.6)	0.12	0.73f
Female	24 (88.9)	3 (11.1)		
Education				
Illiterate	41 (95.3)	2 (4.7)	7.93	0.049f,*
Middle	27 (81.8)	6 (18.2)		
Primary	14 (82.4)	3 (17.6)		
Senior	10 (71.4)	4 (28.6)		
University or higher	8 (100)	0		
Occupation				
Professional teacher	1 (100)	0	3.56	0.33f
Student	9 (100)	0		
Technical	2 (66.7)	1 (33.3)		
Unemployed	30 (90.90)	3 (9.1)		
Daily wagers	58 (84.1)	11 (15.9)		
Residence				
Rural	95 (88)	13 (12)	1.69	0.52f
Suburban	3 (75)	1 (25)		
Urban	2 (66.7)	1 (33.3)		
Income				
In debt	37 (92.5)	3 (7.5)	1.71	0.39f
Income = expenses	49 (84.5)	9 (15.5)		
Saving	14 (82.4)	3 (17.6)		
Previous exposure to TB				
Yes	34 (82.9)	7 (17.1)	0.91	0.35b
No	66 (89.2)	8 (10.8)		
The hospital consulted about the symptoms				
Self-medication	1 (50)	1 (50)		
Chest hospital	10 (90.9)	1 (9.1)	10.98	0.04*,f
PHC	11 (84.6)	2 (15.4)		
Medical college hospital	16 (69.6)	7 (30.4)		
Private practice	45 (93.8)	3 (6.3)		
TB center	7 (87.5)	1 (12.5)		
Government hospital	10 (100)	0		
Money spends				
Free	48 (81.4)	11 (18.6)	3.41	0.049*,f
<100	35 (92.1)	3 (7.9)		
>100	17 (94.4)	1 (5.6)		
Number of health-seeking before initial diagnosis				
0	32 (72.7)	12 (27.3)	11.77	0.001*,f
1–3	65 (95.6)	3 (4.4)		
≥4	3 (100)	0		
The specialty of health care practitioner at initial diagnosis				
Chest specialist	81 (86.2)	13 (13.8)	5.25	0.03*,f
GP	3 (60)	2 (40)		
Internist	16 (100)	0		
Time to reach from home to nearest PHC				
Less than half an hour	64 (85.3)	11 (14.7)	0.76	0.71f
½ h–1 h	30 (90.9)	3 (9.1)		
>1 h	6 (85.7)	1 (14.3)		
Distance to the PHC (km)				

Contd...

Table 3: Contd...

	Delay present (%)	Delay absent (%)	Table value	P
≤5	23 (88.5)	3 (11.5)	0.48	0.88[f]
6-10	41 (87.2)	6 (12.8)		
11–20	26 (83.9)	5 (16.1)		
>20	10 (90.9)	1 (9.1)		
TB stigma score	29.91 (5.15)	31.47 (5.88)	0.15	0.29[a]

[a]Mean from an independent t-test (SD), [b]Chi-square test expressed as a percentage and frequency, [f]Fisher's exact test as a percentage and frequency, *P-value of less than 0.05 is significant. SD: Standard deviation, PHC: Primary health center, TB: Tuberculosis, GP: General practitioner

comparison with 86.2% who consulted chest specialists and 60% of general practitioners.

According to Rajeswari *et al*., 29% of individuals delayed seeking treatment for more than a month, with 40% blaming the delay on a lack of knowledge regarding TB. Men put off seeking medical help for longer than women. Patient delays were also longer if the affected person had gone to a government provider first, lived more than 2 km from a health facility, or was an alcoholic. 69% of patients experienced a health-care system delay of more than 7 days. Initial consultation with a private physician, a shorter length of cough, drunkenness, and a patient's domicile more than 2 km from a health institution were all factors linked to health system delays.[13] According to Sreeramareddy *et al*., the median estimated measures of the patient, diagnostic, and treatment delays were 18.4, 31.0, and 2.5 days for participants having TB, respectively. In total, there was a median delay of 55.3 days. The predictable predictors for delay were increased frequency of contact and the type of practitioner first accessed.[14] According to Gebreegziabher *et al*., the median measure of the delay in patients was 18 days, and the median measure of the delay in health-care systems was 22 days as well. Patients' age, poor understanding of TB, and the first visit to a nonformal health practitioner were all independent variables in their delay (more than or equal to 45 years).[15] According to Paramasivam *et al*., the mean (SD) diagnostic delay was 43.5 (29.1) days, and the median patient and health system delays were 16 and 15 days, respectively. Patient delays (55.6%) were more important than health-care system delays (44.4%). Diagnostic delay was found to be linked to a lack of information about TB, seeking treatment from a private physician first, and having a higher number of consultations.[8] The median values for delays, according to Ebrahimi Kalan *et al*., were 53 days for health care system delays and 13 days for patient delays. Patient delay was linked to being jobless, visiting public health facilities more than or equivalent to three times before receiving an accurate diagnosis, and being male. Health system delays were linked to three or more visits to health services before an accurate diagnosis, inadequate access to TB diagnostic tests, and being misdiagnosed as a cold or viral infection.[16] According to Seid and Metaferia, the median total patient and health system delays were 36, 30, and 6 days, respectively. Approximately 41% and 47% of patients were affected by the patient and total delay, respectively. Self-medication, having more than three family members in the house, being older (≤55 years), and having smear-negative PTB and extra-PTB were all independent predictors of patients' delays. Initial visits to general practitioners and several health-care visits were both independent contributors to the health-care system's delay. Patients who were widowed or divorced had a shorter wait time. A lower education level (grades 1–8) and a diagnosis of TB using a chest radiograph greatly reduce the time it takes for the health system to respond.[17] According to Asres *et al*., the median patient, provider, and total delays were 25, 22, and 55 days, respectively, in 2019. The health system was blamed for more than half of the overall delay (54.6%). Prior self-treatment, HIV co-infection, and extra-PTB were all linked to a higher risk of patient delay. Early presentation to medical services or private clinics, as well as patient delays, predicted a lengthier provider wait time. The presence of extrapulmonary TB, earlier consultation with a traditional healer, and the use of holy water all predicted a longer overall delay.[18] According to Alene *et al*., the median period of patient delay was 24.6 days. Patients who live in rural areas, have little understanding of TB and contact non-formal health practitioners have a longer wait time. Age, level of education, financial burden, and travel distance to the nearest health center were all associated with a patient's TB diagnostic delay.[19] The median patient, diagnostic, and therapy initiation delays, according to Datiko *et al*., were 21, 4, and 2 days, respectively. The overall delay was 33 days on average. After 21 days from the onset of the first symptom, 72.3% of the patients began treatment. Delay was linked to poverty, the cost of seeking care, the length of time between diagnosis and treatment, limited community-based TB care, and a lack of knowledge.[20] According to Getnet *et al*., the median patient, health-care system, and overall delays were 30, 14, and 50 days, respectively. Mild symptoms, smear negativity, first visit to health centers, and multiple clinician contacts were all linked to a 15-day health system delay.[21] According to Ayalew *et al*., the median overall delay was 23 days. The average patient and health-care system wait times were 20 and 4 days, respectively. Patients who lived in a remote region had a 1.14 times chance of being delayed, patients who couldn't read or write had a nearly two-fold chance of being delayed, and those with a low monthly income had a six-fold chance of being delayed for TB treatment. Patients with TB who visited nontraditional healers before seeking treatment at a health facility were 2.7 times more likely to delay treatment.[22] According to Kunjok *et al*., approximately 57% of TB diagnoses were delayed for more than 21 days. The delay was 27.6 days on average, with a median of 37.3 ± 57 days. The use of dispensaries and private medical centers, as well as self-employment and working people, and upper secondary and tertiary education, were all linked to delayed diagnosis (more than 21 days).[23]

The limitations were the noninclusion of behavioral factors such as alcoholism or substance abuse; the lack of data on health workers' knowledge of TB diagnosis; recall bias from the subject on the correct sequencing of days from which symptoms started; and the lack of prospective nature in collecting data that would have affected the correct causality of the results.

Conclusion

In our research, the patient delay was found to be inversely related to educational qualifications and financial status. Patients who sought care from multiple health practitioners, as well as those with more distance to the nearest hospital, had patient delay. Health system delays were associated with educational status, approach to the hospital, spending of money, and several health practitioners consulted. Subjects who consulted multiple practitioners had health system delays. The diagnostic delay, which includes both patient delay as well as health system delay, was inversely related to one's educational standing.

Increasing general public awareness of TB and its symptoms will result in fewer patient delays, which will reduce community spread and the development of drug-resistant TB. Patients with respiratory complaints should be educated to visit the chest hospital for an early diagnosis of TB. General practitioners should be sensitized regarding early identification of TB and early referral to a TB center or a chest hospital. The multi-disciplinary approach between the general public, private, and public health sectors will ensure the prevention of delay and, in turn, a TB-free community in the future.

Ethical clearance

The study was approved by the institutional Ethics Committee of Shri Sathya Sai Medical College and Research Institute, Approval No.2019/533.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

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