ORIGINAL ARTICLE

Patient and Health System Delay among New Pulmonary TB patients: A cross-sectional study in Eastern India

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ABSTRACT

Introduction: The burden of TB is increased by delays in diagnosis and treatment, which are frequently brought on by inefficiencies in the patient and health system. Reducing mortality and transmission rates requires early detection and treatment. **Objectives:** This study aimed to estimate patient and health system delays among new pulmonary TB patients in Khordha district, Odisha. **Methodology:** A community-based, cross-sectional study was conducted among 420 pulmonary TB patients registered under the NTEP between June 2022 and July 2024. Multistage cluster sampling was used to select participants. Data on delays were collected using a semi-structured, pre-validated questionnaire. Statistical analysis, including chi-square tests, was performed using SPSS version 21. **Results:** 50.47% of patients experienced diagnostic delays longer than 15 days, and 8.8% of patients experienced delays longer than 14 days. 6.19% experienced treatment delays longer than seven days. Long-term delays were substantially correlated with factors like self-medication, trips to traditional healers, female gender, and age >30 years. **Conclusion:** Due to delays caused by systemic and sociodemographic factors, timely TB diagnosis and treatment are still difficult to achieve. Effective TB control requires addressing these through focused awareness efforts, early referrals, and reducing inefficiencies in the health system.

KEYWORDS

Pulmonary Tuberculosis; Patient Delay; Health System Delay; Diagnostic Delay; Treatment Initiation

INTRODUCTION

One of the infectious diseases that kills people all over the world and is a major cause of ill health is tuberculosis (TB). When TB patients cough or otherwise release bacteria into the air, the bacillus Mycobacterium tuberculosis, which causes TB, spreads. Extra pulmonary TB can affect other parts of the body, even though it mostly affects the lungs (pulmonary TB). (1) It is the leading cause of death for both adults and children worldwide and is in the top ten causes of death worldwide. (2)

In high-burden nations, the time between diagnosis and the start of therapy is longer due to variables that affect both the patient and the healthcare system. (3,4) When there is less time between the onset of symptoms and seeking medical assistance, infected individuals who are exhibiting symptoms have a reduced window of opportunity to spread the disease to others.

Since patients are more likely to develop chronic illness and pass away the longer they go without treatment, delays in diagnosis may also lead to higher rates of morbidity and death. (5,6,7) Therefore, the key to controlling tuberculosis is to eliminate diagnostic delays, or the time between the onset of symptoms and the diagnosis.

Aims and objectives:

(i) Primary objective of the study was to estimate patient and health system delays among newly diagnosed pulmonary tuberculosis patients in Khordha district, Odisha, India.

(ii) Additionally, the study aimed to identify the contributing factors to these delays as a secondary objective.

MATERIAL & METHODS

Study design and setting: From June 2022 to July 2024, a community-based cross-sectional study was carried out in Khordha district among newly registered pulmonary TB patients under the National Tuberculosis Elimination Program.

Study population: Khordha District is composed of private and public health facilities. Public sector includes 13 TB Units with 36 Designated Microscopy Centres. Private health sector includes highly specialized Private practitioners, people who practice modern medicine without any official training like pharmacists, vendors to informal providers. Drugs are frequently dispensed over-the-counter by retail private chemists. TB units and DMCs provide free sputum smear microscopy services, free NTEP TB drugs and assure the completion of treatment.

Study participants and sampling: Multistage Cluster Sampling Technique was used and all thirteen TB units of Khordha District were selected taking each TB unit as a cluster. Eligible cases were identified from the notification register of each Tuberculosis Unit.

Inclusion criteria: All sputum smear positive pulmonary TB patients aged >15 years residing in Khordha for more than one year and registered on Intensive Phase Treatment under NTEP in Tuberculosis Units of Khordha

Exclusion criteria: Pediatric TB patients, extra pulmonary TB patients, Non TB mycobacterial infection, seriously and terminally ill patients who are not in the condition to give interview, pregnant women.

Operational definitions

Patient delay: Time interval between the onset of symptoms and presenting before a health care practitioner. (8)

Diagnosis delay: Time interval between presentation to a HCP and the diagnosis of TB. (8)

Treatment delay: Time interval between the diagnosis of TB and the initiation of treatment for tuberculosis. (8)

Health system delay: Time interval between the date of presentation to a HCP and the initiation of treatment for Tuberculosis. (8)

Total delay: It is the sum of patient delay and health care system delay. (8)

To dichotomize the data into two depending on presence or absence of delay, cut of points for acceptable delay was fixed based on literature review. (9,10)

Acceptable Patient delay = 14 days, Acceptable diagnostic delay = 15 days, Acceptable treatment delay = 7 days, Acceptable Health system delay = Acceptable diagnostic delay + Acceptable treatment delay = 22 days, Acceptable total delay = Acceptable Patient delay + Acceptable Health System delay = 36 days

Sample size: According to a study conducted in India by Rathi N et al. (11) there is a 43% prevalence of TB with delayed diagnosis and treatment. The following statistical formula (12) was used to determine the minimum sample size for cross-sectional studies, and the result was 376. The formula parameters are as follows: P (prevalence) at 43% (0.43), Z (reliability coefficient) at 1.96 at a 95% confidence level, and an acceptable error (d) of 0.05. $N = Z^2 P(1-P)/d^2$

After adjusting for a 10% non-response rate, 414 was the final sample size. 13 TB units were used, and the number of instances per unit was determined to be 414 ÷ 13 = 31.84, rounded to 32. 32 cases per unit × 13 TB units = 416, further rounded to 420, was the final sample size. Adjustments were done by adding cases from neighbouring units if any TB unit had fewer than 32 cases.

Ethical issues & informed consent: The study was approved by the Institutional Ethics Committee of KIMS, Bhubaneswar. Approval was also obtained from State Task Force and State Operational Research Committee of RNTCP, State TB cell, Directorate of Public Health, Odisha.

Data collection: Data was gathered using a semi-structured, pre-validated questionnaire that was developed from a USAID study and a WHO Multi-Country study, with consent from the ethical review committee and the State Task Force and State Operational Research Committee of RNTCP, State TB cell, Directorate of Public Health, Odisha. Verbal consent was taken from every case prior to data collection.

The researcher himself performed the 45–60 minute in-person interviews in Odia, and a semi-structured questionnaire was used to record all the information about the patient and health system delays, demographics, and associated factors.

These findings were obtained as part of a larger study that looked into the patient pathway and delays associated with pulmonary TB in Khordha district of Odisha state.

Statistical analysis: SPSS version 21 from IBM Corp. was utilized for data entry and analysis. While frequency and percentage were employed to describe qualitative elements, the mean and standard deviation were utilized to indicate quantitative factors. To draw findings and make inferences, statistical tests such as the Chi-square test and percentages and proportions were used. A p-value of 0.05 was regarded as statistically significant.

RESULTS

There was a 100% response rate among the 420 participants in this study. The 420 patients had an average age of 40.85 ± 13.56 years, 67.1% (282) were men, 37.9% (159) had a post-secondary or intermediate degree, and 83.6% (351), were employed at the time of the interview. Urban areas accounted for 31% (130), suburban areas for 15% (63), and rural areas for 54% (227). Treatment delays more than 7 days impacted 6.19% of patients, whereas patient delays longer than 14 days and diagnostic delays longer than 15 days were noted in 8.8% and 50.47% of patients, respectively. The median delays were as follows: 5 days for patients (IQR: 2–7), 20 days for diagnostics (IQR: 10–30), 3 days for treatments (IQR: 1–5), 21.5 days for health system (IQR: 12–37), and 27 days for overall delay (IQR:17–44). (Table 1)

Patient delays were caused by a number of factors, including being older than thirty, female, uneducated, working, traveling more than five kilometres to the medical facility, seeing a private practitioner first, having a cough, self-medicating, and seeing traditional healers. With p-values below 0.05, each of these factors was statistically significant. Patients who initially sought treatment from private institutions, self-medicated, or saw traditional healers had longer diagnostic wait times, as indicated in Table 2.

There were fewer delays in diagnosis and treatment for patients who told family members or other people about their condition and sought more than three visits.

Table 1: Relation between Delays and socio-demographic factors

	Characteristics	Patient Delay			Diagnostic Delay			Treatment Delay		
		Absent	Present	OR (95% CI) P value	Absent	Present	OR (95% CI) P value	Absent	Present	OR (95% CI) P value
Age	≤ 30	115(27.4)	4(1)	3.540 (1.226-	87(20.7)	32(7.6)	4.04(2.53 - 6.44)	113(26.9)	6(1.4)	1.340 (0525-3.425)
	> 30	268(63.8)	33(7.9)	10.222) 0.013	121(28.8)	180(42.9)	0.000	281(66.9)	20(4.8)	0.539
Sex	Male	266(63.3)	16(3.8)	2.984 (1.503-	148(35.2)	134(31.9)	1.436(0.953-	263(62.6)	19(4.5)	0.740 (0.303-1.804)
	Female	117(27.9)	21(5)	5.924) 0.001	60(14.3)	78(18.6)	2.163) 0.83	131(31.2)	7(1.7)	0.506
Marital	Married	295(70.2)	32(7.6)	0.524 (0.198-	142(33.8)	185(44.9)	0.314(0.191-	307(73.1)	20(4.8)	1.059 (0.412-2.718)
Status	Single & Divorced	88(21)	5(1.2)	1.385) 0.186	66(15.7)	27(6.4)	.517) 0.000	87(20.7)	6(1.4)	0.906
Education	Educated	382(91)	31(7.4)	73.93 (8.626-	206(49)	207(49.3)	2.488 (0.47-	387(92.1)	26(6.2)	0.493
	Uneducated	1(0.2)	6(1.4)	633.719) 0.000	2(0.5)	5(1.2)	12.96) 0.264	7(1.7)	0	
Occupation	Employed	319(76)	32(7.6)	0.779 (0.292-	167(39.8)	184(43.8)	0.620 (0.367-	329(78.3)	22(5.2)	0.920 (0.307-2.759)
	Unemployed	64(15.2)	5(1.2)	2.075) 0.616	41(9.8)	28(6.7)	1.047) 0.072	65(15.5)	4(1)	0.882
Socio-	I & II	234(55.7)	16(3.8)	2.061 (1.042-	148(35.2)	102(24.3)	2.660(1.777-	231(55)	19(4.5)	0.522 (0.215-1.271)
economic	III to V	149(35.5)	21(5)	4.077) 0.035	60(14.3)	110(26.2)	3.981) 0.000	163(38.3)	7(1.7)	0.146
Class										
Residence	Urban	119(28.3)	11(2.6)	1.065 (0.510-	66(15.7)	64(15.2)	1.075(0.711-	120(28.6)	10(2.4)	0.701 (0.309-1.589)
	Non-Urban	264(62.9)	26(6.2)	2.227) 0.866	142(33.8)	148(35.2)	1.626) 0.733	274(65.2)	16(3.8)	0.392

Table 2: Factors associated with delays

Factors associated	Patient Delay			Diagnostic Delay			Treatment delays		
	Absent	Present	OR (95% CI) P value	Absent	Present	OR (95% CI) P value	Absent	Present	OR (95% CI) P value
Distance to diagnosing Health care facility			1.163			1.297			1.353(0.497-3.685)

Factors associated	Patient Delay			Diagnostic Delay			Treatment delays		
	Absent	Present	OR (95% CI) P value	Absent	Present	OR (95% CI) P value	Absent	Present	OR (95% CI) P value
≤ 5 Kms	93(22.1)	8(1.9)	(0.514-2.631)	55(13.1)	46(11)	(0.828-2.032)	96(22.9)	5(1.2)	0.553
> 5 Kms	290(69)	29(6.9)	0.718	153(36.4)	166(39.5)	0.255	298(71)	21(5)	
Health facility visited First			1.310			2.716			3.391(1.511-7.608)
Public	159(37.9)	13(3.1)	(0.648-2.652)	110(26.2)	62(14.8)	(1.816-4.060)	160(38.1)	12(2.9)	0.578
Private	224(53.3)	24(5.7)	0.451	98(23.3)	150(35.7)	0.000	234(55.7)	14(3.3)	
Symptoms that made the patients approach the doctor			0.117 (0.028-0.492)			0.850 (0.561- 1.289)			3.391(1.511-7.608) 0.002
Cough	257(61.2)	35(8.3)	0.001	141(33.6)	151(36)	0.444	281(66.9)	11(2.6)	
Other than cough	126(30)	2(0.5)		67(16)	61(14.5)		113(26.9)	15(3.6)	
Self-Medication			0.158(0.072-0.349)			0.234			2.669(0.352-
Present	27(6.4)	12(2.9)	0.000	8(1.9)	31(7.4)	(0.105-0.521)	38(9)	1(0.2)	20.249)
Absent	356(84.8)	25(6)		200(47.6)	181(43.1)	0.000	356(84.8)	25(6)	0.324
Total Consultation before diagnosis			0.530			6.413			1.284(0.556-2.965)
≤ 3	266(63.3)	30(7.1)	(0.227-1.242)	183(43.6)	113(26.9)	(3.90-10.54)	279(66.4)	17(4)	0.557
> 3	117(27.9)	7(1.7)	0.139	25(6)	99(23.6)	0.000	115(27.4)	9(2.1)	
Disclosing illness to family			2.541			3.040			0.805(0.315-2.058)
Yes	287(68.3)	20(4.8)	(1.279-5.049)	174(41.4)	133(31.7)	(1.917-4.820)	287(68.3)	20(4.8)	0.650
No	96(22.9)	17(4)	0.006	34(8.1)	79(18.8)	0.000	107(25.5)	6(1.4)	
Disclosing illness to other people			5.723			2.894(1.945-4.308)			1.942(0.860-4.385)
Yes	219(52.1)	7(1.7)	(2.453-13.353)	139(33.1)	87(10.7)	0.000	216(51.4)	10(2.4)	0.105
No	164(39)	30(7.1)	0.000	69(16.4)	125(29.8)		178(42.4)	16(3.8)	
Visit to Traditional Healer			0.261			0.067(0.016-0.284)			0.883(0.198-3.935)
Yes	7(1.7)	22(5.2)	(0.103-0.661)	2(0.5)	27(6.4)	0.000	2(0.5)	27(6.4)	0.870
No	361(86)	30(7.1)	0.003	206(49)	185(44)		367(87.4)	24(5.7)	

DISCUSSION

In order to lower early death rates and fulfil India's goal of eradicating tuberculosis (TB) by 2025, delays in diagnosis and treatment must be addressed. The care pathway for patients with pulmonary tuberculosis (TB) in Khordha district, Odisha, is described in this paper. The results are presented in comparison with similar surveys carried out in other parts of the world and India as well, given the limited data available from Odisha.

This study found a median patient delay of 5 days, shorter than those in Chennai (18.3 days) (13), Bangalore (21 days) (14,15), and southern India (16), likely due to better awareness and healthcare access in our study area. However, the median diagnostic delay remained 20 days—an improvement over Italy (66 days) and Pakistan (91 days) (15) but higher than Beijing, China (8 days) (17) and Patna (9 days). (18)

The median treatment delay was 3 days, which was longer than Patna's 0 days but close to Ethiopia's 2 days and Himachal Pradesh, India's 1 day. (4, 13, 18,19) In this study area, delays longer than seven days were not deemed significant, although Karnataka had the longest (7 days). (20) Although Montenegro reported larger delays (27 days), the average health system delay was 21.5 days, which is comparable to Southern India (22 days) and Aligarh (21 days). (16, 21, 22)

Our study's median overall delay was 27 days, which is similar to Patna but much less than the delays seen in Tamil Nadu (45 days), Karnataka (40 days), Aligarh (37 days), Norway (63 days), and Montenegro (84 days). These findings suggest that timely TB care has improved in these regions. (20, 21, 22, 23,24, 25)

While a Tanzanian study indicated lengthier delays for those over 45 years, this study found that patients over 30 years had larger patient delays (7.9% vs. 1%) and diagnostic delays (42.9%), similar to Sumana M et al. According to Selvam et al., elder individuals (>45 years) experienced shorter delays. (10, 23, 26) These delays are a result of the working population's propensity to put work before health. In contrast to Mubina et al. (27) males experienced fewer patient delays (3.8%) than females (5%) While males typically seek care earlier due to larger health concerns, women may experience a greater delay because of family duties.

In line with Paramasivam et al. (28), self-medication (2.9%) was associated with a smaller patient delay but a greater diagnostic delay (80%, $p<0.01$). Self-medication may cause a false perception of symptom relief, delaying professional care. In addition to reducing diagnostic delays (10.7% vs. 33.1%, $p<0.01$), disclosing illness also significantly decreased patient delays (1.7% vs. 7.1%).

According to C.K., 75.8% of people who saw traditional healers experienced patient delays. Similar to findings in Pakistan and Botswana, Liam et al.'s research from Nepal and Pakistan similarly showed increased diagnosis delays (93%, $p<0.01$). (17,24,27,29)

In order to improve the timely identification and treatment of tuberculosis, our findings highlight the necessity of ongoing efforts to decrease delays for patients and the healthcare system.

CONCLUSION

Longer patient waits were caused by a number of characteristics, including age (over 30), gender (female), employment status, lower levels of education, distance to medical facilities, and the initial consultation with private physicians. Patients who self-medicated or sought guidance from traditional healers also experienced significant delays in diagnosis. However, the diagnostic delay was decreased by several consultations or informing family members about the illness. Reducing patient and health system delays is not just a clinical issue, but a public health priority. For the NTEP, addressing these delays is essential to reach 2030 TB elimination targets, Improve case detection and treatment outcomes, Minimize drug-resistant TB emergence & Optimize resource utilization.

RECOMMENDATION

While early diagnosis and treatment can prevent disease and save patient costs, creative IEC efforts should promote early medical consultation in nations with high TB burdens. To encourage prompt referrals and deter the sale of over-the-counter cough remedies that postpone necessary treatment, medical store staff workshops are also crucial.

LIMITATION OF THE STUDY

The absence of medical records for verification could lead to recollection bias in the study. Patients with extra-pulmonary tuberculosis and patient referral information were not included. Furthermore, because patients receiving treatment at private institutions were not included in the study, the results cannot be applied to all TB patients in the Khordha district.

RELEVANCE OF THE STUDY

In order to develop strategies to lower tuberculosis prevalence, every effort and study must focus on

the disease's risk factors, as the Indian government aims to eliminate tuberculosis by 2025.

Authors Contribution

All authors have contributed equally.

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Conflict of Interest

There are no conflicts of interest.

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Declaration of Generative AI and AI Assisted Technologies in the Writing Process

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