

# Reasons and extent of delay in the diagnosis of pulmonary tuberculosis after the appearance of symptoms

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## ABSTRACT

**Objective:** Delay in the diagnosis of tuberculosis (TB) is a significant problem at both individual and community levels. Delayed diagnosis of TB contributes to more severe disease manifestations, higher risk of death, and higher disease transmission in the community. We conducted this study to assess the extent and associated reasons for delay in diagnosis of pulmonary TB. **Methods:** This study was conducted in the Department of TB and Respiratory Diseases, J. N. Medical College, Aligarh, from June 2020 to May 2022. A total of 2053 new pulmonary TB patients, who first consulted any private healthcare provider (HCP) for treatment, were enrolled in the study. The required information was collected by interview technique using a predesigned questionnaire. **Results:** A total of 2053 patients were enrolled in the study. There was a significant delay of more than 2 weeks in the diagnosis of pulmonary TB after the onset of symptoms in 94% of patients. The extent of delay ranged from 8 days to 240 days with a mean of 36.33 days. The delay in visiting the HCPs by the patient was not significant. Only 5.85% of patients had a significant delay of more than 2 weeks in seeking any health care after the appearance of symptoms. A delay by HCP contributed to a greater portion of the total delay, with a mean of 31.77 days. The main reason for the delay by HCPs was not investigating TB. The hospital delay was not significant. The mean hospital delay was 5.82 days. **Conclusion:** The delay in the diagnosis of TB in India is very high. A delay by HCPs contributes to a greater portion of the total delay. Information, Education and Communication (IEC) activities will play an important role in reducing the delay. All HCPs should be actively involved in subjecting the suspects to TB diagnosis at the earliest possible as per National Tuberculosis Elimination Programme (NTEP) guidelines.

**Keywords:** Delay in diagnosis, HCPs, NTEP, pulmonary tuberculosis, total delay

## Introduction

India continues to have the highest tuberculosis (TB) burden in the world. As per the Global TB Report 2022, India, with 28% of cases and 36% of global TB-related deaths, was among the eight countries accounting for more than two-thirds (68.3%) of the total TB patients' count.<sup>[1]</sup> As per the World Health

Organization (WHO) report, 10.6 million people fell ill with TB worldwide in 2021, which is an increase of 4.5% from 10.1 in 2020, reversing many years of slow decline. Similarly, the TB incidence rate is estimated to have increased by 3.6% between 2020 and 2021, following declines of about 2% per year for most of the past two decades.<sup>[2]</sup> Each person with active TB disease, if left untreated, can infect an average of 10–15 people in a year, and this continues the TB transmission.<sup>[3]</sup> The main factors that determine the risk of becoming exposed to tubercle bacilli include the number of incident infectious cases in the community, the duration of their infectiousness, and the number and nature of the interactions between a case and a susceptible

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contact.<sup>[4,5]</sup> Therefore, the duration of infectiousness of an incident infectious case is of crucial importance with regard to the risk of the general population becoming exposed to such a case. The WHO launched the End TB Strategy, which advocates the importance of early diagnosis in TB control.<sup>[6]</sup> Anti-TB treatment initiated on time not only helps to cure the disease but also prevents the spread of mycobacterium TB in the community.<sup>[7]</sup> Despite widespread Directly Observed Therapy Short Course (DOTS) coverage in India, the diagnosis of TB is delayed in many patients and this delay contributes to higher disease transmission in the community.

Our study aimed to assess the duration of diagnostic delay from the appearance of TB symptoms to the confirmed diagnosis of TB and identify independent factors influencing diagnostic delay in TB patients. This study will not only assist health policymakers in devising suitable interventions to increase case detection and reduce transmission of infection in the community but also encourage healthcare providers (HCPs) to consider and investigate TB as early as possible.

## Material and Methods

This study was conducted in the Department of TB and Respiratory Diseases, J.N. Medical College, Aligarh, from June 2020 to May 2022. A total of 2053 pulmonary TB patients, 15 years of age and older, diagnosed in the Department of Tuberculosis and Respiratory Diseases were consecutively enrolled in the study. Only those patients who first consulted any private healthcare provider (HCP) for treatment and either then referred to us or visited us by themselves were enrolled in the study. Information was collected by interview technique. A predesigned questionnaire was used for the interview. Before proceeding with the interview, the purpose of the study was fully explained and informed consent was obtained from the study subjects. The extent and reasons for delay in diagnosis were assessed by interviewing the patients and reviewing the relevant documents, that is, previous consultation documents and outpatient department cards. The data thus collected were analyzed using Statistical Package for the Social Sciences (Windows version 16.0; SPSS Inc., Chicago, IL, USA) software. Statistical tests in the form of percentages and proportion, Chi-square test, and analysis of variance (ANOVA) were applied for drawing inferences and obtaining conclusions. This study was approved by Institutional Ethics Committee on 10-10-2020.

The following definitions were formulated in accordance with National Tuberculosis Elimination Programme (NTEP) guidelines for analysis:

- Patient delay: A time interval between the onsets of symptoms to seeking advice from HCP.
- HCP delay: A time interval between first consultations with HCP till date of attending J.N. Medical College Hospital.
- Hospital delay: A time interval after a visit to the hospital till diagnosis of pulmonary TB.

- Total delay in diagnosis: A time interval between onsets of symptoms till the diagnosis of pulmonary TB. A time interval of 14 days was considered significant delay, as considered by other investigators as well.<sup>[5,8]</sup>

## Results

A total of 2053 patients were enrolled in the study, of whom 1114 (54%) were male and 939 (46%) were female. More than half, that is, 1211 (59%) patients, were from 15 to 44 years of age group. Four hundred thirty-one (21%) patients were smokers, and 103 (5%) patients were alcoholics. The first reported symptom was cough in 1240 (60%) patients, fever in 732 (36%), and hemoptysis in 63 (3%) patients [Table 1].

### Patient delay

The mean patient delay was 7.5 days, and the median patient delay was 7 days. Only 120 (5.85%) patients had a significant delay of more than 14 days in seeking any health care. More than a one-month delay was found in 1% of patients only. The majority of the patients (50.66%) consulted the HCP within a week of starting symptoms. The major causes of the significant delay were a lack of awareness and some busy schedules of patients. Other sociodemographic factors, such as age, sex, literacy status, occupation, annual family income, area of residence, and distance of home from the nearest healthcare facility of the patients, had no significant association with the patient delay.

### HCP delay

The mean and median delay in the diagnosis of TB by HCPs was 31.77 and 21 days, respectively. There was a significant delay of more than 14 days in 86% of patients. A delay of more than a month was present in 853 (41.55%) patients [Table 2]. The major cause of delay by HCPs was not considering TB as a possible ailment.

### Hospital delay

In 541 (26.35%) patients, there was no delay in diagnosis (i.e.,  $\leq 3$  days) at J.N. Medical College Hospital. A delay of up to 1 week was found in 1097 (53.43) patients and up to 2 weeks in 334 (16.27%). A significant delay of more than 14 days was found in 51 (2.48%). The mean and median delays at our hospital (tertiary care hospital) were 5.82 and 5 days, respectively [Table 3]. The main cause of delay, 1 week or more, was due to the late turning up of the patients after investigations.

### Total delay

The mean and median total delays in the diagnosis of pulmonary TB were 36.33 and 37 days, respectively. The extent of the delay ranged from 8 days to 240 days. There was a significant delay of more than 14 days in 94% of patients [Table 4]. Thirty percent of patients had a delay of up to 1 month, and 61% had a delay of 1–2 months. In 3%

**Table 1: First symptom reported by patients**

Symptom	No. of patients	Percentage
Cough	1240	60.4
Fever	732	35.65
Hemoptysis	63	3.07
Night sweats	6	0.29
Others*	12	0.58

\*Weakness, lassitude, loss of appetite, loss of weight, etc

**Table 2: Delay caused by HCPs**

Delay period (days)	Number of patients	Percentage
<7	79	3.85
8–14	211	10.28
15–30	910	44.33
>30	853	41.55

**Table 3: Delay in tertiary care hospital**

Delay period	Number of patients	Percentage
≥3 days	541	26.35
4–7 days	1097	53.43
8–14 days	334	16.27
>14 days	81	3.95

**Table 4: Extent of total delay**

Extent of delay	Number of patients	Percentage
<15 days	124	6.04
15–30 days	623	30.35
31–45 days	845	41.16
46–60 days	401	19.53
>60 days	60	2.92

of patients, the delay was more than 2 months. Nine patients had a delay of more than 6 months.

### Reasons for delay

Very few (5.85%) patients had a significant delay in seeking health care. The main cause of delay by the patients (36.82%) in visiting the HCP was misconception of the cause of the cough. They thought that eating certain food items, such as rice, banana, and guava, causes cough. Others (18.51%) thought that cough and fever were due to the effect of the weather. Patients in both of these groups thought that symptoms would subside by themselves. About 16% of patients thought that cough was due to smoking. The busy schedule was the other important reason for delay in 14.71% of patients [Table 5].

The most important reason for delay in the diagnosis of TB by HCPs was misdiagnosis in more than 76% of patients. They treated the patients for other diseases, such as typhoid, malaria, pneumonia, and viral infections, without giving any due consideration to TB. About 21% of patients refused investigations because of financial constraints. The financial status of the patients was the other major reason for the delay.

The major reasons for delay in the diagnosis in our hospital were either the late receipt of results of investigations or the late turnout of patients due to the distance of hospital from their residence. A fair number of patients come from other nearby districts; they usually come at their convenience.

## Discussion

Early diagnosis and prompt treatment of TB are extremely important to reduce the transmission of the disease and to reduce morbidity and mortality. A delay in the diagnosis may worsen the disease, increase the risk of death, and enhance TB transmission in the community.<sup>[9]</sup> Sougat Ray and Kavita Anand also wrote correspondence in the Journal Lancet that delay in the diagnosis might enhance TB transmission in the community and worsen the disease.<sup>[10]</sup> Our study shows that the delay in the diagnosis is considerable and may partially explain the current epidemiology as reported by other investigators as well<sup>[11,12]</sup> In the present study, the extent of delay from the onset of symptoms to the diagnosis ranged from 8 days to 240 days. In 94% of patients, there was a significant delay of more than 14 days [Table 4]. A delay by HCP contributed to a greater portion of the total delay. A delay in visiting the HCP by the patients was not significant. Only 5.85% of patients had a significant delay of more than 14 days in seeking any health care after the appearance of symptoms. The majority of the patients (50.66%) consulted the HCP within a week of starting symptoms [Table 2]. However, Yadav and Mathur<sup>[13]</sup> and Pardeshi<sup>[14]</sup> reported a mean patient delay of more than 1 month. This difference might be due to better health consciousness by the patients and also due to better accessibility to the HCPs. Secondly, following the outbreak of coronavirus disease 2019 (COVID-19), people might be cautious in care seeking. The major causes of the significant delay by the patients were a lack of awareness and some busy schedules of the patients. Tamhane *et al.*<sup>[15]</sup> and Dhingra *et al.*<sup>[16]</sup> in India also found lack of awareness as the main cause of delay in the majority of patients. Other investigators have also reported longer patient delays in their studies; Demissie *et al.*<sup>[17]</sup> in their study at Addis Ababa, Ethiopia, found that the mean patient delay was 78.2 days. They found that the main reason for the delay was a lack of awareness. Lienhardt *et al.*<sup>[18]</sup> also reported a longer median patient delay of 8.6 weeks (range 5–17 weeks). The extent of patient delay was not significantly associated with the age or sex of the patient. Literacy status, place of residence, and distance of residence from the nearest healthcare facility were also not significantly associated with a delay in the diagnosis. Similar results were also obtained in a study by Pardeshi in India<sup>[14]</sup>

In the present study, we found that HCPs were the major contributors in causing significant delay. The mean delay by HCPs was 31.77 days. For 86% of patients, there was a significant delay of more than 14 days. A delay of more than a month was found in about 42% of patients. A long healthcare system delay has also been reported in other countries, such as Vietnam (49.7 days of median healthcare system delay

Table 5: Reasons for delay

Delay type	Reason for delay	Number of patients	Percentage
Patient delay	Symptoms due to cough-causing food items	756	36.82
	Symptoms due to the effect of weather	380	18.51
	Cough due to smoking	320	15.59
	Busy working schedule	302	14.71
	Fear of loss of wages	74	3.6
	Home remedies	54	2.6
	Treatment from the chemist shop	51	2.48
	Others (financial, unawareness of TB, etc.)	116	5.65
HCP delay	Wrong diagnosis	1565	76.23
	Patients' refusal of investigation	421	20.51
	Non-turnup of patients	67	3.27
Hospital delay	Investigational	876	42.67
	Distance of hospital	865	42.13
	Others	312	15.20

vs. 21.7 days of median patient delay),<sup>[19]</sup> Ghana (56 days vs. 28 days),<sup>[20]</sup> and Botswana (35 days vs. 21 days).<sup>[21]</sup> The major cause of delay by HCPs was not considering TB as a possible ailment. They treated the patients for other diseases, such as typhoid, malaria, pneumonia, and viral infections, without giving due consideration to TB. Many patients report to nonqualified allopathic and Ayurveda, Yoga, Unani, Siddha, Homoeopathic (AYUSH) practicing doctors, rather than to well-trained, qualified doctors. These doctors might not follow the standard protocol of NTEP. Seeking treatment in the unorganized health sector can delay the diagnosis of TB.<sup>[10]</sup>

Significant hospital delay of more than 14 days in our study was found in 2.48% of cases. The mean and median delays at our hospital were 5.82 and 5 days, respectively. The main causes of delay, 1 week or more, were overburdened microscopy and Cartridge-Based Nucleic Acid Amplification Test (CBNAAT) laboratories causing delayed results, obtaining a negative smear result for acid-fast bacilli, or late turning up of the patients after investigations as a fair number of patients come to the hospital from other far-away districts. Some extent of delay was due to the date for the next consultation also. In a pilot study conducted by the WHO in different countries, the mean hospital delay was also not significant, ranging between 1.2 and 4.5 days<sup>[5]</sup>

In this study, we found that a total of 1929 (93.96%) patients had a delay in diagnosis. The mean and median total delay in diagnosis was found to be 36.33 and 37 days, respectively. The extent of delay ranged from 8 days to 240 days. In this study, delay by the HCPs was the main reason. Selvam Paramasivam *et al.*<sup>[8]</sup> in Kerala, India, also reported the mean diagnostic delay as  $43.5 \pm 29.1$  days (median: 37 days, range: 3 days to 170 days). Similar delays were reported in other studies by Gosoniu *et al.* in Malawi (33.5 days)<sup>[22]</sup> and a multicountry study by Bassili *et al.*<sup>[23]</sup> in Yemen (35 days) and in Iraq (36 days). Basnet *et al.*<sup>[24]</sup> in Nepal found that the median total delay was 60 days. On the contrary, Leung *et al.*<sup>[25]</sup> found 49 days of median total delay in diagnosis. Lawn *et al.*<sup>[20]</sup> in their study in Ghana found that the median total

delay in diagnosis was 4 months (mean = 7.7 months), and the total delay exceeded 6 months in 44% of patients.

This study provides baseline information about delays in the diagnosis of TB. The long delay in the diagnosis of TB observed in this study can be reduced by 1) increasing public awareness about chest symptoms of TB; 2) doctors working in different levels of health care need to be reemphasized and actively involved in subjecting the suspects to sputum examination at the earliest possible, as per NTEP guidelines; and 3) to prevent the avoidable delay in diagnosis, the suspected patient should be allowed to attend the outpatient department (OPD) on all days, instead of following a fixed OPD day pattern at the tertiary care hospitals.

## Conclusion

The delay in the diagnosis of TB in India is very high. The existing strategies and efforts under implementation did not appear to improve the desired early diagnosis and prompt treatment initiation. Information, Education and Communication (IEC) activities are very important. These activities will help in decreasing the delay in the diagnosis of TB. All HCPs should subject the suspects to sputum examination at the earliest possible time, as per NTEP guidelines.

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## Conflicts of interest

There are no conflicts of interest.

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