

A cross-sectional study to determine the psychological distress among pulmonary tuberculosis patients during COVID-19 pandemic

Ankita Mandal¹, Ajay Kumar Verma¹, Sujita Kumar Kar², Jyoti Bajpai¹, Surya Kant¹, Santosh Kumar¹, Ram Avadh Singh Kushwaha¹, Rajiv Garg¹, Anand Srivastava¹, Darshan Kumar Bajaj¹, Sanjeev Kumar Verma¹, Shyam Chand Chaudhary³

¹Department of Respiratory Medicine; ²Department of Psychiatry; ³Department of Internal Medicine, King George's Medical University, Lucknow, UP, India

Abstract

COVID-19 pandemic had adversely affected the services of the National Tuberculosis (TB) Elimination Programme, resulting in

psychological distress among pulmonary tuberculosis patients (PTB). This cross-sectional, hospital-based study included 361 PTB patients. Three pre-defined questionnaires were used for the analysis, a questionnaire to evaluate anxiety related to COVID-19, a patient health questionnaire (PHQ-9) for depression, and a fear of COVID-19 scale (FCV-19S) questionnaire. Among 361 PTB patients, 13% (n=47) had COVID-19 infection. Out of the total patients, 69% (n=250) were DR-TB (drug resistance-tuberculosis) cases. Proportion of anxiety, fear and depression due to COVID-19 was found in 49% (n=177), 23% (n=83), 67% (n=247) respectively. Delay in the initiation of anti-tubercular treatment was found in 58% (n=210) of the cases, among which the majority, i.e., 69% (n=172, p=0.011), were DR-TB. This pandemic has led to a sudden step-down of PTB. Trend analysis of the psychological distress showed a peak following the COVID-19 pandemic. Most DR-TB patients had delayed initiation of the anti-tubercular treatment during the pandemic. The preponderance of the younger age group was seen in the pulmonary tuberculosis patients, and a majority of them had DR-TB. Depression was the predominant psychological distress among the study subjects during the pandemic.

Correspondence: Dr. Ajay Kumar Verma, Department of Respiratory Medicine, King George's Medical University, Lucknow, UP, India. Tel.+91.9919788862. E-mail: drajay21@gmail.com

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Introduction

Tuberculosis (TB) is one of the oldest airborne pathogens. It can reside in human remains aging 10,000 years or more [1]. TB remains the number one infectious disease killer on the planet (WHO report), with an estimated 10 million people developing TB every year, resulting in nearly 1.5 million deaths annually [2]. It is often called the «silent epidemic» because of its relatively slow spread, and affected populations often lack health-seeking behavior [3]. *Mycobacterium tuberculosis*, the causative organism of tuberculosis, has approximately 50 times slower replication times than another bacterial pathogen. As a result, TB disease develops slowly, even more than high profile viral epidemics such as Ebola or coronavirus 2 (COVID-19) [4].

The novel corona virus disease (COVID-19), which originated in China, has quickly spread over the world, infecting people [5]. As a result, the World Health Organization declared COVID-19 a Public Health Emergency of International Concern on January 30, 2020 [6]. It can manifest itself in a variety of ways, from a simple cough, fever, or sore throat to pneumonia, acute respiratory distress syndrome, and even death. Patients with co-morbidities are more likely to develop severe illnesses. According to the data on February 14th, 2022, there were 416,614,051 confirmed cases of COVID-19 and 5,844,097 fatalities worldwide. On September 23,

2020, India had the second-highest number of confirmed cases, with 16,263,695 confirmed cases and 186,920 deaths [7]. According to the WHO report, the mortality rate is between 3 and 4%; nevertheless, it appears that the mortality data are understated. Because COVID-19 infection is highly contagious and has spread to a vast population, the overall number of deaths caused by this virus has surpassed any of its predecessors [8].

COVID-19 pandemic has led to outstretched anxiety and concerns in society and influenced every person to various degrees worldwide. According to new findings, people who were placed in isolation or quarantine reported severe distress, including anxiety, anger, bewilderment, and post-traumatic stress [9,10]. The major health system shifted towards COVID-19, aggravated by poor health systems and ill-equipped healthcare facilities, hampering health target sets, including the End of TB [11]. CBNAAT (Cartridge-based nucleic acid amplification test)/TRUENAT (Taqman Real-Time Reverse Transcription Polymerase Chain Reaction), a universal drug susceptibility testing is used to detect *Mycobacterium tuberculosis* (MTB) and its resistance pattern toward Rifampicin is shown to be an equally useful diagnostic tool for COVID-19 as well and thus, was preoccupied with diagnosing COVID-19 during the pandemic [12].

The above-stated conditions posed psychological distress among pulmonary tuberculosis patients. This study has been conducted to address these domains in the Indian population. Mental health issues are other major health concerns expected to increase exponentially during this pandemic. Therefore, there is a need to intensify awareness and address the mental health issues during this COVID-19 pandemic. It is also required to show the adverse effect of COVID-19 on other ongoing health programs so that they can be rectified accordingly [10].

Methods

A single-centered, cross-sectional, observational study was done from April 2020 to April 2021 in the Department of Respiratory Medicine, collaborating with the Department of Psychiatry in a tertiary care teaching hospital in North India. The study was approved by the Institutional Ethical Committee of our University (Ref. code: -104th ECM 11 B-Thesis/P34). A questionnaire-based interview and retrospective analysis of records was undertaken after taking verbal and written consent of the concerned patients to study their psychological distress among them during the COVID-19 pandemic. A total of 361 cases of Pulmonary TB coming to the DOTS center of the Department of Respiratory Medicine were included in the study. All clinically stable adult pulmonary tuberculosis patients, who visited the DOT (Directly Observed Treatment, Short-course) centre on an outpatient basis or were admitted to the Drug Resistance TB ward for treatment initiations were included in this study, as per the inclusion criteria. Written informed consent was explained and signed by the study. But patients with co-morbidity that was expected to limit survival to <12 months (principally metastatic malignancy) were excluded from the study. Also, patients with a known case of diagnosed psychiatric illness or patients already on treatment with anxiety disorders were excluded. Also disseminated and extra-pulmonary tuberculosis patients or HIV seropositive patients were not taken in this study.

Three pre-defined questionnaires were used for the analysis, as stated below:

1. Questionnaire to evaluate anxiety related to COVID-19.

The fourth section of this questionnaire measures the anxiety related to coronavirus infection. It measures the anxiety, considering the past week. It contains 18 questions. It has been rated on a 5-point Likert scale ranging from never (1), occasionally (2), sometimes (3), often (4), and always (5). This tool has been validated and was used in various studies, as in Alrubaiee *et al.* [13].

2. Patient Health Questionnaire (PHQ-9) was used to assess depression among the study population. This questionnaire has also been used in similar studies associated with the COVID-19 pandemic, as in Shevlin *et al.* [14].
 3. The fear of COVID-19 scale (FCV-19S) questionnaire. It is a four-point Likert scale, used to test whether the individuals have the fear of acquiring COVID-19 infection [15].
- Figure 1 depicted the flow pattern of the enrolled subjects.

Statistical analysis

Statistical analysis was carried out with SPSS ver 21. A χ^2 test was used to compare and analyze various characteristics of drug-resistant and drug-susceptible pulmonary tuberculosis; p-values <0.05 were considered significant.



Figure 1. Flow pattern of the enrolled patients.

Results

In our study, 361 PTB patients were included from April 2020 to April 2021. Primarily, all the patients are broadly categorized according to their drug susceptibility and resistance pattern. Out of the total subjects, 69% (n=250) were drug-resistant. Among the total PT patients, 13% (n=47) had COVID-19 infection. The study population was segregated into different age groups as follows: 18-

30 years; 31-40 years; 41-50 years; 51-60 years; and more than 60 years. The younger age group (18 to 30 years) was the predominant population, i.e., 61% (n=220) out of which 66% (n=165, p=0.0003) had drug-resistant tuberculosis (DR-TB). About 56% (n=140, p=0.006) of the total DR-TB patients were females. Delay in the initiation of anti-tubercular treatment was found among 58% (n=210) of the study population, out of which majority i.e., 69% (n=172, p=0.011) had drug resistance tuberculosis (Table 1). On analyzing the psychological distress (Figure 2) the proportion of

Table 1. Basic demographic characteristics and delay of treatment initiation among Drug susceptible and drug-resistant pulmonary tuberculosis patients were analyzed *via* the χ^2 test.

Categories	Drug susceptible-TB (n=111)	Percentage	Drug resistance-TB (n=250)	Percentage	p-value
Gender					
Male	66	59%	110	44%	0.006
Female	45	41%	140	56%	
Age					
18-30 years	55	50%	165	66%	0.0003
31-40 years	17	15%	35	14%	
41-50 years	21	19%	28	11%	
51-60 years	12	11%	14	6%	
More than 60 years	6	5%	8	3%	
Delay					
Patients who sought treatment after the prescribed time frame	38	34%	172	69%	0.011
Patients who sought treatment within the prescribed frame	73	66%	78	31%	

χ^2 test was used to compare and analyze various characteristics of drug-resistant and drug-susceptible pulmonary tuberculosis; p<0.05 was considered to be significant.

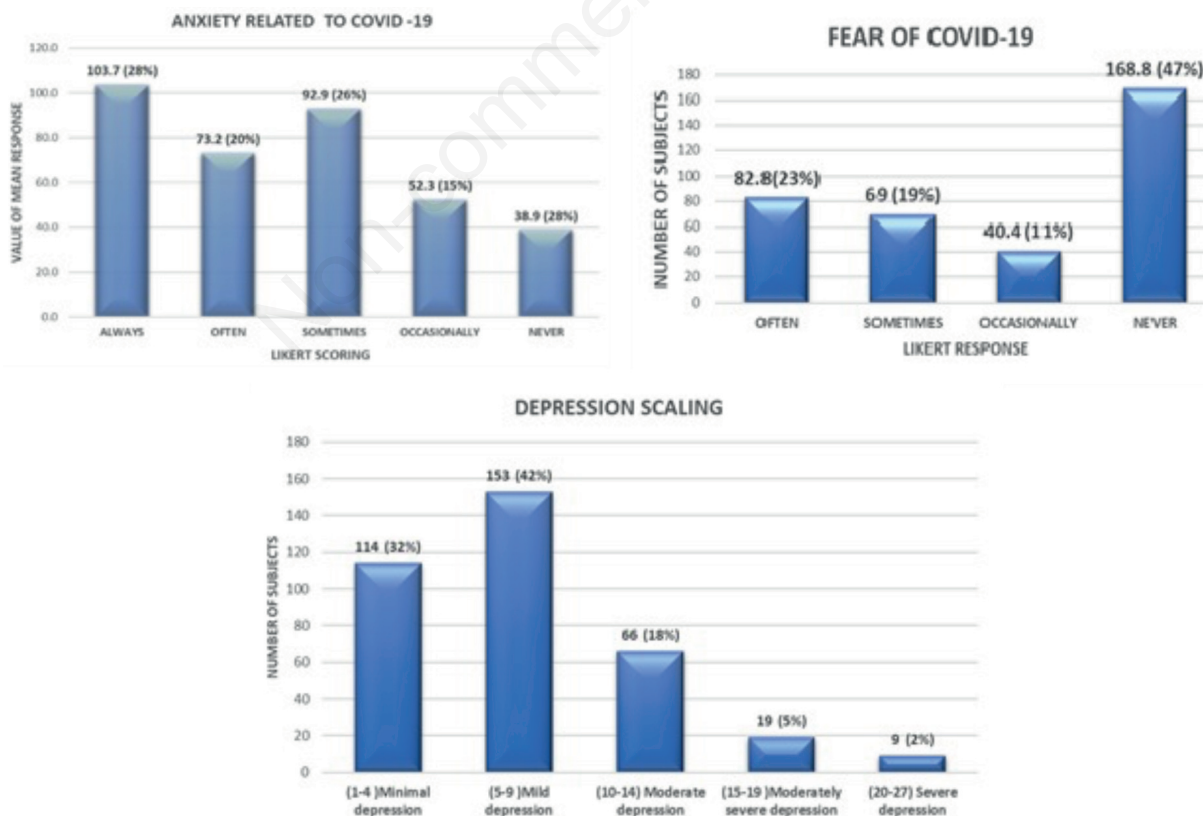


Figure 2. Level of anxiety, fear, and depression among PT patients during the study period.

anxiety, fear, and depression due to COVID-19 was found in 49% (n=177), 23% (n=83), and 67% (n=247) of the cases respectively. Fear was observed among 26% (n=29, p=0.004) of DR-TB patients. Among 131 patients who had a history of COVID-19 infection among them or in their acquaintances, 98% (n=129, p=0.0005) of them had significant anxiety about COVID-19 infection. On the other hand, depression was significantly found in patients who never had any history of COVID-19 infection, i.e., in 64% (n=158, p=0.021) of the study population. This study showed that due to COVID-19 fear was more prevalent among the male

pulmonary tuberculosis patients, 60% (n=105, p=0.005), while depression of COVID-19 was more prevalent, 71% (n=132, p=0.013) among female subjects. On analyzing quarterly data of TB cases notification from April 2019 to March 2021 (Figure 3), a huge shortfall in case notification was seen in our study center, from 600 cases in the 1st quarter (before the COVID-19 pandemic) to only 17 cases in the 8th quarter (midst of the COVID-19 pandemic – second wave). The trend analysis of the psychological distress had concordance with the peaks of the COVID-19 pandemic (Table 2).

Table 2. Psychological distress among drug susceptible and drug-resistant pulmonary tuberculosis patients were analyzed *via* χ^2 test.

Categories	Drug susceptible-TB (n=111)	Percentage	Drug resistance-TB (n=250)	Percentage	p-value
Fear of COVID-19					
Often	28.9	26%	53.9	22%	0.004
Sometimes	18.3	16%	50.7	20%	
Occasionally	14.4	13%	26	10%	
Never	49.4	45%	119.4	48%	
Depression during COVID-19					
Minimal depression	36	32%	78	31%	0.845
Mild depression	42	38%	111	44%	
Moderate depression	21	19%	45	18%	
Moderately severe depression	8	7%	11	4%	
Severe depression	4	4%	5	2%	
Anxiety-related to COVID-19					
Always	37.3	34%	69.1	28%	0.92
Often	16.6	15%	56.6	23%	
Sometimes	27.4	25%	65.3	26%	
Occasionally	15.8	14%	55.4	22%	
Never	13.8	12%	27.4	11%	

χ^2 test was used to compare and analyze various characteristics of drug-resistant and drug-susceptible pulmonary tuberculosis; p<0.05 was considered to be significant.

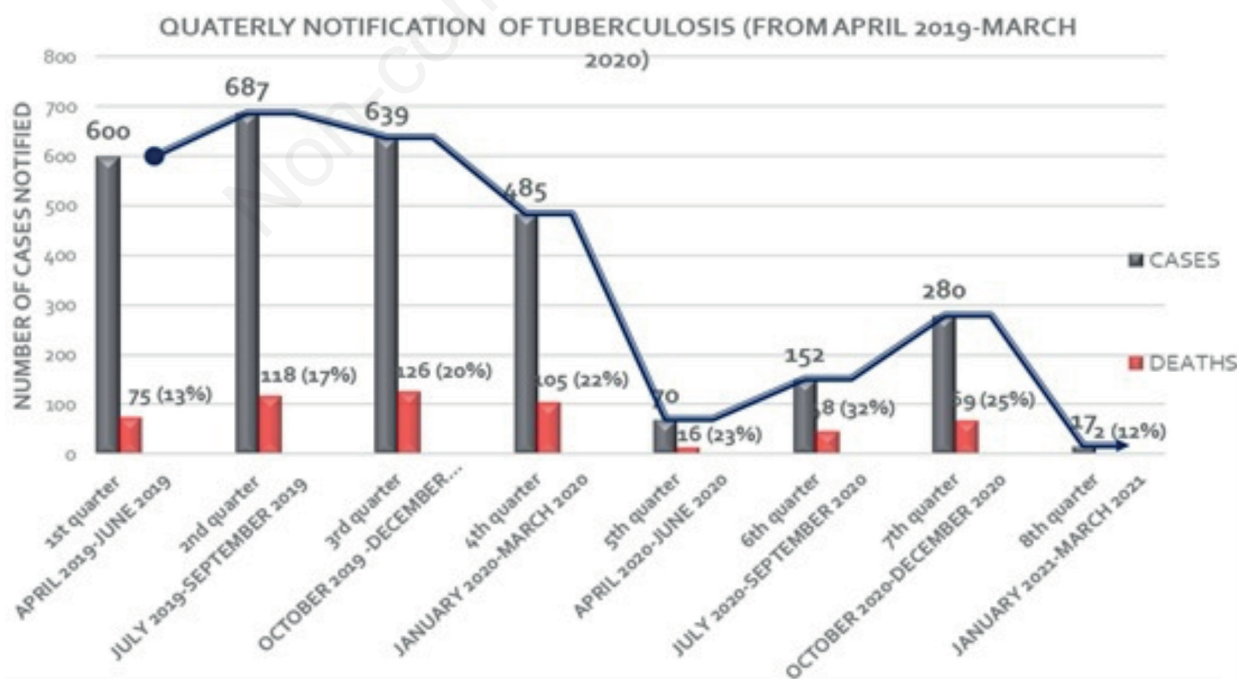


Figure 3. Quarterly number of case notifications of tuberculosis and its fatality from April 2019 to March 2021 (Source: Data provided by Nodal Tuberculosis Center, Lucknow).

Discussion

The study was a cross-sectional observational study conducted over a month 12 months period from April 2020 to April 2021. The present study was undertaken to study the psychological distress in PT patients during the COVID-19 pandemic. The secondary objective is to compare the quarterly notification of cases of Tuberculosis during the study period as compared to last year i.e., the pre-COVID period. The tertiary objective is to estimate the delay in initiation of treatment for PT during the COVID-19 pandemic.

On comparing the incidence of drug-resistant pulmonary tuberculosis, it was seen that 56% of the female population recruited in the study belonged to this group. This can be explained by the improved notification rate among women living in low-income countries in recent times. This hypothesis is supported by a study in Eastern Nepal that utilized active and passive case findings methods where passive case findings in females constituted only 28% of the cases who referred themselves to the clinic, but with active case findings, the percentage rose to 46% [16].

In our study majority (61%) of the subject belonged to the productive age group, i.e., 18-30 years, thus endangering the country's economy. Furthermore, 66% of them had DR-TB. A similar study on the demographic parameters of tubercular patients showed the retrospective analysis of 552 patients having extrapulmonary tuberculosis (EPTB) and pulmonary tuberculosis (PTB), where 300 were PTB cases. Out of 552 subjects, 252 were of population, between 20-40 years of age [17]. Another study showed that household contacts with LTBI in the productive age groups appear to be at a slightly higher risk of progressing to active TB in this population than in the elderly. This is in contrast to observations from countries with a low TB burden where the older age group was found to be at higher risk of developing TB [18].

Students (29%) and homemakers (19%) constituted a significant proportion of the overall study subjects. Household contacts can be emphasized in this context. This group of the population spends most of their time indoors and thus is prone to latent TB infection, which later developed into active tuberculosis on exposure to favorable risk factors. On the other hand, most of the students are still dependent on the head of the family (guardian). The health-seeking behaviors of the guardian led to an increase in the case notification. A review article showed the country-level estimations of 35 high TB burden and 88 low TB burden countries, where the total numbers of child household contacts eligible for LTBI (latent tuberculosis infection) were 3.7 million and 80 thousand in high and low TB burden countries, respectively [19].

An original article has arbitrarily defined delay as a period of more than 15 days from the date of sputum collection for DST to the date of admission. It is considered of two parts, one due to lapse in the system regarding implementation of the program and the other due to the lapses on the part of the patient [20]. In considering this, we have analyzed our data. In a similar study on PTB patients, 85% of MDR-TB experienced a delay in initiation of their treatment patients with a median of 100 days [21].

The incidence of COVID-19 among Pulmonary Tuberculosis patients was 13% in this study. The relative risk factor of COVID-19 infection with a different variant of PTB was calculated, and it revealed the fact that the relative risk for COVID-19 infection was more with DS-TB (1.2) cases than with DR-TB (0.83) cases. This has illustrated the fact that DR-TB MTB can act as a shield for COVID-19 infection. In a cohort study of 49 patients, it was seen that 53.0% of patients had a history of TB, 28.5% developed

COVID-19 first and 18.3% of patients were diagnosed with TB and COVID-19 simultaneously [22].

Out of the total subject, 23% (n=83) developed a fear of COVID-19. Among these 83 subjects, 65% (n=54) of the patients had drug resistance tuberculosis, suggesting the DR-TB patient had a significant fear of acquiring COVID-19 infection. The researchers discovered that MDR-TB is linked to poverty, susceptibility, non-availability of drugs, and social risk. A study revealed the supply chain disruptions leading to medication shortages. It is more likely to occur when there is limited diversification in the development and distribution of required active pharmaceutical ingredients (APIs). The problem is further exacerbated when the manufacturing process is arduous or lengthy, or the supply of raw materials is disrupted [23].

The proportion of depression was highest (93%) among patients with age more than 60 years, followed by 70% of 18-30 years, 62% of 31-40 years of age group, 61% of 41-50 years of age group had depression while 69% of 51-60 years of age group had depression. In one study of 63 TB patients, the rate of moderate/severe levels of anxiety and depression was 65%, significantly higher than in healthy individuals (11%, $p < 0.05$). The prevalence of anxiety and depression, which are independent predictors of poor treatment adherence, is very high in TB patients [24].

About 98% (129) of patients with a history of COVID-19 infection among them or acquaintances have significant anxiety about COVID-19 infection. On the other hand, depression was significantly found in patients who never had any history of COVID-19 infection, i.e., in 64% (158) of the study population. In a study conducted in north India, the prevalence rate of depression in MDR-TB and XDR-TB was 68% and 78% respectively while the prevalence of anxiety is 54% in MDR-TB and 66% in XDR-TB respectively [25].

Our study showed that psychological distress during the COVID-19 second wave was more severe than during the first wave in India. This could be attributed to unexpected spikes in infection and death toll during this time. Oxygen shortages and unavailability of patient beds during the second wave could also have caused increased psychological distress, that negatively affected life satisfaction and wellbeing. Previous studies done in this domain supported our findings with analogous results [26].

This study has shown a drastic fall in the number of quarterly notifications from April 2019 to March 2021, i.e., from 600 to only 17 cases in our study. This shows how the COVID-19 pandemic has shattered the TB elimination program. According to the Global TB report 2021, monthly and quarterly notifications of people newly diagnosed with TB in 2020 and the first half of 2021 were substantially below the average for 2019 in most of the high TB burden countries. The largest relative reductions in annual notifications between 2019 and 2020 were seen in Gabon (80%), the Philippines (37%), Lesotho (35%), Indonesia (31%), and India (25%) [27].

Limitations

We have assessed the patients at one point in time, thus the natural history of psychological distress could not be interpreted. As we all are aware of the fact the second wave of COVID-19 was much more devastating, exhausting, and fatal than the 1st wave. So, most of the study subjects who did not acquire the infection in the first wave could have acquired it afterward, accordingly, the psychological distress would have varied. Various DR-TB regimen drugs, especially cycloserine is a potent agent causing drug-induced psychosis. Further investigations or follow-up visits are

not included in my study to differentiate COVID-19 associated depression from drug-induced psychosis. The proportion of DR-TB cases is much higher than DS-TB cases as the study was conducted in the nodal TB center therefore it does not coincide with the national data. DR-TB drugs are quite expensive and unavailable in the private sector as compared to DS-TB drugs. Basic data like area of residence, religion, and smoking status which were included in this study are only descriptive ones, no inferential statistical analyses were conducted.

Conclusions

Based on our study, we arrived at the following conclusions. Most drug-resistant pulmonary tuberculosis patients had delayed initiating anti-tubercular treatment during the pandemic. The preponderance of the younger age group was seen in the pulmonary tuberculosis patients, and the majority of them had drug-resistant pulmonary tuberculosis. Depression was the predominant psychological distress among the study subjects during the pandemic. Moreover, it was found more prevalent among females (71%) subjects. This study showed that 98% of the study patients who were exposed to COVID-19, whether affected or had a history of COVID infection among their acquaintances developed psychological distress irrespective of their pulmonary tuberculosis pattern. Out of the 83 subjects who feared acquiring COVID-19 infection, 65% (54) of the patients had drug resistance tuberculosis, suggesting the DR-TB patient had significant fear. In addition, the study concluded that fear of COVID-19 was more among the male patients, i.e., in 60% (n=105, p=0.005) of males recruited in this study. This shows how the COVID-19 pandemic has shattered the TB elimination program.

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