

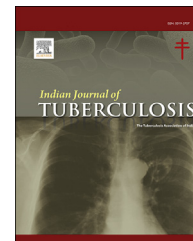


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Original article

Effect of pandemic on DOTS treatment during COVID-19 lockdown- A cross-sectional study

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ABSTRACT

Background: Tuberculosis (TB) is still the most common infectious disease globally, affecting 1.5 million people per year. Prior to COVID-19 outbreak, India was struggling with a rampant attack of Tuberculosis. With the surge of COVID-19 implementation of all national health programs including NTEP was disrupted. Prioritization of services, the challenges to reaching all types of communities and the role of stigmatization, and the possibility of increased disease transmission were few problems in the implementation of DOTS during the lockdown.

Aim: To assess effect of pandemic on DOTS treatment during COVID-19 lockdown.

Methods: A cross-sectional study was conducted among 254 tuberculosis patients who were under DOTS during Covid-19 lockdown in Belagavi district. Participants who were on DOTS during 2019–2021 period.

Result: Of 254 participants, only 5 (2.0%) were supervised while taking drugs, 67 (26.4%) of subject's empty blister packs were taken back by health personnel and 106 (41.7%) participants were regularly followed up for treatment by health department. The variables like gender, literacy status, socioeconomic status, and occupation were all significantly associated with hampered access to DOTS during the lockdown period at $p < 0.05$.

Conclusion: This study concluded that the participants had hampered accessibilities to DOTS during lockdown.

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1. Introduction

Tuberculosis (TB) is still the most common infectious illness in the world, affecting 1.5 million people per year.¹ India is the world's largest TB burden country.² Before COVID-19 becoming a global pandemic, India was struggling with an

outbreak of TB, which had infected 2.64 million Indians in 2019 and killed almost 4,50,000 individuals. That's approximately 1000 TB mortality every day.³

China first disclosed a group of instances of uncommon pneumonia associated with SARS-CoV-21 on Dec 31, 2019. The incidence of COVID-19 cases across India had begun to rise

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since Mar 2020. India declared a lockdown to control it from Mar 25, 2020.⁴

India had achieved tremendous effort toward its goal of eliminating tuberculosis until March 24, 2020. When the country-wide lockdown was imposed due to COVID-19, it disrupted all important strategic interventions, resulting in a nearly 60% reduction in TB case detection during lockdown time.⁵ Similarly, about 5.7 lakh instances (62% decline in notifications) were unable to be notified against the expected objective of NTEP from January to June 2020.⁵

During lock-down times, health facilities observed a reduction in the proportion of patients undergoing treatment on time due to the fear of getting SARS-CoV-2 virus infection. This might have had serious difficulties for tuberculosis control, particularly drug-resistant TB. The re-allocation of testing facilities and health care services to combat COVID-19 may have affected TB detection and treatment unintentionally. Other difficulties may have arisen under the TB program as a result of the pandemic, including a shortage of finance for Tuberculosis intervention, disruptions in utilization, and accessibility to drugs and supply.⁶ Reduced availability of conventional modes of transportation and increased transportation expenses constituted hurdles to accessing health-care centers for both healthcare practitioners and patients.⁷ Lockdown has caused delays in diagnosis, treatment, and disease transfer to household contacts. It also has created disruption in treatment as many employees migrated back to their native places.³ Even routine activities like TB case detection, active case finding, contact tracing, etc were held up not only in India but also in other countries. Different virtual approaches were considered to provide services.⁵ The World Health Organization (WHO) recently released statistics from more than 80 nations that revealed a 21% drop in treatment during the 1st year of the pandemic compared to 2019. More than 469 million people had been infected with COVID-19 as of March 22, 2022, with over 6 million deaths. (WHO Report 2022) The COVID-19 pandemic has now surpassed all other health concerns around the planet. Hence this aims to assess the Effect of pandemic on DOTS treatment during COVID-19 lockdown.

2. Methodology

The present study was cross-sectional study conducted between November 2021 to April 2022. This study was conducted in 3 talukas of Belagavi (Hukkeri, Gokak & Belagavi). The sample size was calculated using the formula $n = Z^2 pq/d^2$ where p = drop of TB case notification during covid-19,⁵ with precision of 10% and 95% of CI. Assuming 5% attrition the calculated sample size was 254.

Proportionate sampling technique was used to select participants from 3 talukas and from each taluka participants were recruited using simple random sampling after line listing. Data collection carried out by using a semi-structured questionnaire. Data obtained were tabulated, chi-square test was used to assess the effect of pandemic on DOTS treatment during lockdown.

2.1. Inclusion criteria

- Patients enrolled for treatment under NTEP (RNTCP) programme.
- Tuberculosis patients who were above 18 years above and willing to give informed consent.

2.2. Exclusion criteria

- Patients who were seriously ill.
- Patients who were not under DOTS during the lockdown period.

2.3. Ethical committee

- Ethical clearance was obtained from the Institutional Ethical Committee (I.E.C) of J.N. Medical College, KAHER, Belagavi. Ref no: MDC/DOME/263
- Permission was taken from State Task Force Operational Research Committee, NTEP to conduct a study. Ref no: LWSTC/NTEP/PPM/07/2021-22

3. Results

This present study was conducted between November 2021 to April 2022. Study included total 254 participants. [Table 1](#) shows that the participant's ages ranged from >18 to 83 years. Most of the participants 147 (57.9%) were males and 107 (42.1%) were females. The majority of them, that is 83 (32.7%) had completed their primary education, 30 (11.8%) participants had completed their graduation, 94 (37%) of them had completed their higher secondary education, and 47 (18.5%) were illiterate. 105 (41.3%) were from joint families, and 149 (58.7%) were from nuclear families, majority were from rural region 175 (68.9%) and 79 (31.1%) inhabited urban regions.

Out of 254 participants 241 received DOTS treatment, only 5 (2.0%) of the all participants were supervised by a DOTS provider while taking drug, only 5 (2.0%) were supervised during the lockdown, 67 (26.4%) of participants empty blister packs were collected by health personnel, 97 (38.2%) of participants skipped their course one or more days, 119 (46.9%) of participants said that they were disappointed due to inaccessibility, 136 (53.5%) had been communicated by health personnel, Regular follow-up of treatment from the health department was 106 (41.7%) ([Table 2](#)).

- There were 7 questions related to hampered access to DOTS, mean of these 7 questions was considered to categorize in to three categories based on the mean and standard deviation (SD)
- Among 254 participants, the mean and SD of hampered access to DOTS was 4.6 and 1.27 during lockdown.
- Among all participants 15 had low hampered access to DOTS during lockdown. Similarly, 225 participants during

Table 1 – Demographic details of the study participants.

| Variable | Category | Frequency | % |
|-----------------------|---------------------|-----------|------|
| Age | ≤ 30 | 93 | 36.6 |
| | 31–42 | 59 | 23.2 |
| | 43–54 | 42 | 16.5 |
| | 55–66 | 45 | 17.7 |
| | 67–78 | 14 | 5.5 |
| Gender | Male | 147 | 57.9 |
| | Female | 107 | 42.1 |
| Literacy status | Illiterate | 47 | 18.5 |
| | Primary | 83 | 32.7 |
| | Secondary | 94 | 37 |
| | Graduate and above | 30 | 11.8 |
| Occupation | Labour | 21 | 8.3 |
| | Agriculture | 74 | 29.1 |
| | Private employee | 42 | 16.5 |
| | Government employee | 8 | 3.1 |
| | Others | 109 | 42.9 |
| Socio economic status | Upper class | 15 | 5.9 |
| | Upper middle class | 82 | 32.3 |
| | Middle class | 91 | 35.8 |
| | Lower middle class | 61 | 24.0 |
| | Lower class | 5 | 2.0 |
| Type of Family | Joint Family | 105 | 41.3 |
| | Nuclear Family | 149 | 58.7 |
| Residency | Rural | 175 | 68.9 |
| | Urban | 79 | 31.1 |
| Type of house | Pucca | 71 | 28.0 |
| | Kaccha | 183 | 72.0 |

lockdown were in the category of average hampered. Similarly, 14 were high hampered.

During lockdown gender, occupation, literacy status, and socioeconomic status are the variables that are statistically significantly associated with hampered access to DOTS at $p < 0.05$ (Table 3). The remaining variables like age, type of family, type of house, and residency status were not statically significant.

4. Discussion

This chapter provides an insight into the discussions of the study's major findings while comparing it to the findings proposed in the previous studies.

4.1. Socio-demographic variables of participants

In the present study, the age of participants was in the range of 18–83 years. Surveys conducted in Brazil, Italy reported that study participants' age was between 18 and 60 years.^{8,9}

In our study majority are males, similarly a study conducted in Zambia had 53% male participants and 47% females,¹⁰ but a study in Brazil had 57% female participants and the remaining were male.⁸

The present study revealed that majority had completed primary and secondary education (32.7%, 37%), few studies had similar findings.^{8,11}

In this study 8.3% were laborers, 29.1% were agriculturists, 16.5% were private employees and 3.1% were government employees. Another study conducted in Ethiopia shows that 19.8% were laborers by occupation, 17.0% were government employees and 0.9% were agriculturists.¹²

4.2. During lockdown variable

In our study, 69.5% of patients or their family members feared to reach the hospital during lockdown, according to the other study carried out by Alexandra J. Zimmer et al 55% of participants expressed that they had fear for to visit the hospital.¹⁰ Study conducted in Ethiopia shows that 81.6% of participants expressed they were treated differently during Covid time.¹²

Among all 5.1% of participants experienced challenges in accessing DOTS TB treatment in our study, but 49% of participants had difficulty to access of TB treatment in a study conducted by Alexandra J. Zimmer et al.¹⁰

In the present study, most of the patients underwent Chest X-rays (33%) to confirm their TB, but a study conducted by the WHO European region expressed that, six countries used GeneXpert machines for COVID-19 testing instead of diagnostic testing for TB.¹³

In the current study, 86.2% of participants expressed they were panicked about being infected with coronavirus. In other studies, most of the participants feared contracting Coronavirus.^{9,10}

In the current study, 9.85% of participants missed their follow up test at the end of their treatment course, which is less as compared to study conducted in Ethiopia where 41% of their participants missed their follow up test.¹²

Table 2 – Distribution of participants experiences during lockdown.

| Sl No | Questions | During lockdown | | | |
|-------|---|-----------------|------|-----|------|
| | | Yes | | No | |
| | | Fq | % | Fq | % |
| 1) | Did you receive DOTS treatment? | 241 | 94.9 | 13 | 5.1 |
| 2) | Did the DOTS provider come to supervise while taking drugs? | 5 | 2.0 | 249 | 98.0 |
| 3) | Have empty blister packs been taken back by health personnel while giving medicine? | 67 | 26.4 | 187 | 73.6 |
| 4) | Did you ever discontinue taking TB drugs? | 97 | 38.2 | 157 | 61.8 |
| 5) | Due to the inaccessibility of DOTS drugs were you depressed/ disappointed? | 119 | 46.9 | 135 | 53.1 |
| 6) | Is there any Regular communication with health personnel? | 136 | 53.5 | 118 | 46.5 |
| 7) | Is there any Regular follow up treatment from the health department | 106 | 41.7 | 148 | 58.3 |

Table 3 – Association between Socio-demographic data with During Lockdown variables of Hampered access.

| Sl no | Variables | During Lockdown | | | Chi-square | p-Value | |
|-------|-----------------------|---------------------|---------|------|------------|---------|---------|
| | | Low | Average | High | | | |
| 1 | Age in years | ≤ 30 | 3 | 81 | 9 | 10.010 | 0.440 |
| | | 31–42 | 4 | 52 | 3 | | |
| | | 43–54 | 2 | 40 | 0 | | |
| | | 55–66 | 5 | 39 | 1 | | |
| | | 67–78 | 1 | 12 | 1 | | |
| | 79+ | 0 | 1 | 0 | | | |
| 2 | Gender | Male | 8 | 133 | 6 | 14.563 | 0.021* |
| | | Female | 7 | 92 | 8 | | |
| 3 | Occupation | Labor | 1 | 19 | 1 | 13.481 | 0.006** |
| | | Agriculture | 3 | 71 | 0 | | |
| | | Private employee | 3 | 35 | 4 | | |
| | | Govt employee | 2 | 5 | 1 | | |
| | | Others | 6 | 95 | 8 | | |
| 4 | type of family | Joint | 6 | 92 | 7 | 2.463 | 0.793 |
| | | Nuclear | 9 | 133 | 7 | | |
| 5 | type of house | Pucca | 4 | 62 | 5 | 3.449 | 0.799 |
| | | Kaccha | 11 | 163 | 9 | | |
| 6 | Residence | Rural | 9 | 155 | 11 | 1.166 | 0.558 |
| | | Urban | 6 | 70 | 3 | | |
| 7 | literacy status | Illiterate | 1 | 45 | 1 | 16.973 | 0.001** |
| | | Primary Education | 9 | 72 | 2 | | |
| | | Secondary education | 1 | 85 | 8 | | |
| | | Degree and above | 4 | 23 | 3 | | |
| 8 | socio economic status | Upper class | 4 | 10 | 1 | 19.844 | 0.011* |
| | | Upper middle class | 6 | 70 | 6 | | |
| | | Middle class | 4 | 84 | 3 | | |
| | | Lower middle class | 0 | 57 | 4 | | |
| | | Lower class | 1 | 4 | 0 | | |

Bold values are statistically significant values (<0.005).

5. Recommendation

It can be recommended that there should be a doorstep supply of medicines or special transportation facility for the vulnerable population like pregnant women, bedridden, and elderly people during a special situation like pandemic lockdowns.

Contribution details

Satish Kabbur: Concepts, Design, Definition of intellectual content, Literature search, Data acquisition, Data analysis, Statistical analysis, Manuscript preparation, Manuscript editing, Manuscript review, Guarantor.

Bhagyashree Patil: Concepts, Design, Definition of intellectual content, Literature search, Manuscript preparation, Manuscript editing, Manuscript review, Guarantor.

Mubashir Angolkar: Concepts, Design, Definition of intellectual content, Literature search, Manuscript preparation, Manuscript editing, Manuscript review, Guarantor.

Ashwini Narasannavar: Concepts, Design, Definition of intellectual content, Literature search, Data analysis, Statistical analysis, Manuscript preparation, Manuscript editing, Manuscript review, Guarantor.

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Conflict of interest

The authors have none to declare.

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REFERENCES

1. The Impact of COVID-19 on the TB Epidemic: A Community Perspective. <https://www.stoptb.org/file/9318/download> assessed on 23/02/2022.
2. Mandal S, Chadha VK, Laxminarayan R, Arinaminpathy N. Counting the lives saved by DOTS in India: a model-based approach. *BMC Med.* 2017 Dec;15(1) 1-0.

3. Shrinivasan R, Rane S, Pai M. India's Syndemic of Tuberculosis and COVID-19.
4. Aznar ML, Espinosa-Pereiro J, Saborit N, et al. Impact of the COVID-19 pandemic on tuberculosis management in Spain. *Int J Infect Dis*. 2021 Apr 27;108:300–305. <https://doi.org/10.1016/j.ijid.2021.04.075>.
5. Ministry of Health & Family Welfare-Government of India. Rapid Response Plan to Mitigate Impact of COVID-19 Pandemic on TB Epidemic and National Tuberculosis Elimination Program (NTEP) Activities in Indian-Reg. <https://tbcindia.gov.in/showfile.php?lid=3551> Assessed on 15/07/2021.
6. Khan MS, Rego S, Rajal JB, et al. Mitigating the impact of COVID-19 on tuberculosis and HIV services: a cross-sectional survey of 669 health professionals in 64 low and middle-income countries. *PLoS One*. 2021 Feb 2;16(2), e0244936.
7. Hore R. The Devastating Effect of the COVID–19 Pandemic on the TB Response: A Minimum of 5 Years of Progress Lost and 6 Million Additional People Ill with TB.
8. Mwamba C, Kerkhoff AD, Kagujje M, Lungu P, Muyoyeta M, Sharma A. Diagnosed with TB in the era of COVID-19: patient perspectives in Zambia. *Public Health Action*. 2020 Dec 21;10(4):141–146.
9. Chapman HJ, Veras-Estévez BA. Lessons learned during the COVID-19 pandemic to strengthen TB infection control: a rapid review. *Glob Health: Science and Practice*. 2021 Dec 31;9(4):964–977.
10. Zimmer AJ, Heitkamp P, Malar J, et al. Facility-based directly observed therapy (dot) for tuberculosis during COVID-19: a community perspective. *Journal of clinical tuberculosis and other mycobacterial diseases*. 2021 Aug 1;24, 100248.
11. Santos FL, Souza LL, Bruce AT, et al. Patients' perceptions regarding multidrug-resistant tuberculosis and barriers to seeking care in a priority city in Brazil during COVID-19 pandemic: a qualitative study. *PLoS One*. 2021 Apr 9;16(4), e0249822.
12. Chilot D, Woldeamanuel Y, Manyazewal T. Real-time impact of COVID-19 on clinical care and treatment of patients with tuberculosis: a multicenter cross-sectional study in addis ababa, Ethiopia. *Annals of Global Health*. 2021;87(1).
13. Dara M, Kuchukhidze G, Yedilbayev A, et al. Early COVID-19 pandemic's toll on tuberculosis services, WHO European Region, January to June 2020. *Euro Surveill*. 2021 Jun 17;26(24): 2100231.