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Original Research Article

Impact of the COVID-19 pandemic on implementation of national tuberculosis elimination programme (NTEP) in Goa: A mixed method study

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Abstract

Background: The National Tuberculosis Elimination programme suffered major setback during the COVID-19 pandemic. The lockdown, restrictions and COVID scare severely affected programme implementation at the Peripheral Health Institution (PHI) level. This study quantified the impact of the COVID-19 Pandemic on implementation of NTEP in Goa, identified key challenges and key modifications by the Peripheral Health Institutions (PHIs) in Goa to address these challenges.

Materials and Methods: A mixed method study was conducted with prior approval of the Institutional Ethics Committee. In the quantitative component, NTEP programmatic indicators obtained from Nikshay portal were compared between pandemic (2020-21) and non-pandemic years (2018-19 & 2022-23). For the qualitative component, an open-ended questionnaire was used to collect narrative, descriptive in-depth information from NTEP nodal officers at Peripheral Health Institutions (PHI) on challenges faced and modifications or innovations implemented to alleviate the challenges. Quantitative data was analysed using R programming. For the qualitative data a descriptive thematic analysis was conducted and codes and themes were generated.

Results: There was a decrease in TB notification rates, notification achievement rates, Active Case Finding and an increase in TB death rates. Sentiment analysis was predominantly negative. Thematic analysis identified staff shortages, challenges in TB testing/diagnosis, Challenges in active case findings, challenges in TB notifications and modification and innovations to alleviate challenges as the main themes.

Conclusion: COVID 19 pandemic severely disrupted the NTEP programme implementation. Resilience shown by PHIs to implement the NTEP despite the pandemic was a remarkable and an excellent case study.

Keywords: Tuberculosis, Programme, COVID-19, Impact, Mixed-methods

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1. Introduction

India had made a commitment to meeting the SDG targets of reducing TB incidence by 80% and TB deaths by 90% by 2025, a full five years before the global deadline in 2030.[1] However, the National Tuberculosis Elimination Programme (NTEP) suffered a major setback during the COVID-19 pandemic in the year 2020-21. The lockdown and other restrictions severely affected the implementation of the programme at the Peripheral Health Institution (PHI) level. The COVID related scare and stigma further affected timely diagnosis, notification and treatment. A reduction in TB detection is believed to have either occurred because of reduction in diagnosis or due to lack of time for the nodal health programme staff to update the electronic information management system.[2] A rather drastic reduction in TB notification was reported during the COVID pandemic.[3] The reduction in diagnosis was also reflective of the restricted movement, increased time spent indoors and fear of travelling to health facilities during lockdown.[2] Follow up and care of

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patients already on TB treatment was also compromised, which included non-dispensing of anti-TB drugs, improper management of adverse drug reactions etc.[4] The entire healthcare setup, including TB diagnostic technology, was diverted to COVID-19 crises; this lead to deprioritized and delayed TB diagnosis as well as care and follow up of TB patients.[3] This study was conducted to quantify the impact of the COVID-19 pandemic on implementation of NTEP in Goa by comparing key programmatic indicators during the pandemic years 2020 and 2021 with non-pandemic years and to identify key challenges faced as well as key modifications and innovations made in implementation of NTEP during the pandemic years by the nodal officers at Peripheral Health Institutions (PHIs) in Goa.

2. Materials and Methods

A convergent mixed-method design was used where quantitative and qualitative findings were analysed independently and then integrated during interpretation to provide comprehensive insights. We achieved this integration by mapping themes from the qualitative analysis against corresponding trends in programmatic indicators.

For the quantitative component, NTEP programmatic indicators, namely, Presumptive case examination rate, Notification rate, Treatment success rate, Death rate, percentage achievement in notification and percentage achievement in Active Case Finding were compared between pandemic (2020 & 2021) and non-pandemic years (2018, 2019, 2022, 2023). The data on the various indicators was obtained from the Nikshay Portal.

For the qualitative component, an open-ended questionnaire requiring narrative responses was used to collect information from NTEP nodal officers at Peripheral Health Institutions (PHI) on challenges faced during the pandemic, modifications and innovations implemented to alleviate the challenges. NTEP nodal officers who were working at the PHI during the COVID pandemic were eligible to participate in the study. Out of the 33 PHIs in Goa, NTEP nodal officers from 24 PHIs who were eligible responded and provided the detailed and in-depth information.

Quantitative data was analysed using R programming software[5]. Trends in various NTEP indicators were analysed over the six-year period. The non-parametric Mann-Kendall trend test was applied to assess the presence of monotonic trends over time in key NTEP indicators from 2018 to 2023. Sen's slope estimator was used to quantify the magnitude of change per year.

For the qualitative analysis, a deductive thematic analysis approach was applied using Braun & Clarke's framework[6]. Initial codes were derived from open-ended responses to the structured qualitative questionnaire, with some inductive codes added during transcript review. Two researchers independently read all transcripts and developed initial codes. These were reviewed and grouped into sub-themes and broader themes through iterative discussions. Coding was performed manually in Microsoft Excel. A structured codebook was developed and refined. To enhance consistency, coding discrepancies were resolved through consensus meetings. Although a formal kappa coefficient was not calculated, high thematic convergence was observed.

Triangulation was performed by cross-referencing narrative responses on challenges like reduced TB notifications and staff shortages with declines observed in notification rates and ACF data in the Nikshay portal. Sentiment analysis was conducted manually by two independent coders using a three-point scale (positive, neutral, negative). Coders evaluated narrative tone regarding service disruption, innovation, and adaptation. Disagreements were resolved by consensus. Written informed consent was taken from all the study participants. Data was stored in password protected computers. Data was anonymized, and the identifiers removed during transcription. The study was approved by the Institutional Ethics Committee (approval No: GMCIEC/2022/174).

3. Results

There was a significant decrease in the Presumptive case examination rate, Notification rate, percentage achievement in notification and percentage achievement in Active Case Finding in the pandemic years 2020 & 2021 (**Figure 1**). Death rate increased during the pandemic years whereas, the trend in treatment success rate appeared to show a slight increase. Most of the parameters appeared to return back to pre-pandemic levels by the year 2023 however, TB death rate continued to be high (**Figure 1**).

As far as the results of the Mann-Kendall trend test and Sen's Slope estimator was concerned, among percentage-based indicators, a statistically significant increasing trend was observed only for the TB Death Rate ($Z = 2.34$, $p = 0.0194$), with a Sen's slope of +1.20% per year, indicating a concerning rise in mortality over the period. The Treatment Success Rate demonstrated an increasing but non-significant trend ($Z = 1.51$, $p = 0.1309$) with a Sen's slope of +2.20% per year. Similarly, ACF Screening Rate showed a non-significant upward trend ($Z = 1.22$, $p = 0.2225$; Sen's slope = +1.95%), suggesting progressive post-pandemic recovery in screening activities. Conversely, Failure Rate displayed a slight non-significant declining trend ($Z = -1.41$, $p = 0.1581$; Sen's slope = −0.25%), while Lost to Follow-Up Rate showed fluctuating values without a significant trend ($Z = 1.28$, $p = 0.1996$).

For rate-based indicators (per 100,000 population), the Presumptive Case Examination Rate exhibited a non-significant increasing trend ($Z = 1.44$, $p = 0.1494$; Sen's slope = +82/year), indicating gradual restoration of diagnostic activity. The TB Notification Rate, however, showed a non-

significant declining trend ($Z = -0.46$, $p = 0.6441$; Sen's slope = −5/year), suggesting a potential under-detection or under-reporting that persisted post-COVID.

Of the 33 PHIs in Goa, only 24 had NTEP nodal officers available to participate. The remaining 9 were either not operational during the study period or lacked continuity of the officer during the pandemic. Hence only 24 NTEP nodal officers were included in the qualitative study.

In the qualitative component it was found that almost all of staff involved in NTEP work at the PHIs were re-deployed for COVID duties leading to staff shortage for TB related work leading to disruption in the NTEP implementation. At most PHIs Out Patient Clinics were shut further affecting NTEP services in particular, screening and diagnosis of TB. In addition, follow up of patients on anti-TB treatment was affected which included decrease in follow up sputum examination, screening for drug adverse effects etc. Household contact screening was also severely affected.

Sentiment analysis of the narratives provided by the NTEP nodal officers at PHIs was predominantly negative, reflecting challenges like patient reluctance, staff shortages, delays in diagnosis, and disruption of ACF activities. Trend analysis indicated that in Early COVID Period, services were heavily disrupted, with delays in TB diagnosis, suspension of Active Case Finding, and decreased TB notification. Later in Mid-Pandemic some recovery occurred as centres adopted teleconsultation, restructured staff duties, and expanded bidirectional testing. In Later Period partial stabilization took place, but with persistent challenges in ACF and community engagement.

Thematic analysis identified staff shortages, challenges in TB-COVID bidirectional testing, Challenges in Active Case Finding, Challenges in TB notifications and modification and innovations to alleviate challenges as the main themes (Table 1). As far as staff shortages were concerned, since all staff was redeployed for COVID duties the resultant shortage of staff led to disruption of all activities under the NTEP programme. Although TB-COVID bidirectional testing was started to increase TB detection rates, this approach was counterproductive. The sample load increased leading to overburdening of the labs at the PHIs. Bidirectional testing was not widely availed by the general population due to COVID related fear. Increased TB testing due to parallel testing during COVID testing did not lead to increased TB detection rates (**Table 1**).

Active Case Finding came to a standstill during lockdowns and continued even later due to redeployment of staff for COVID duties. TB notification suffered reversals due to poor OPD attendance, reluctance by symptomatic individuals to undergo TB testing, delays in diagnosis due to system related delays.

The thematic analysis also brought out the positives in form of adaptation, modification and innovation in the NTEP implementation by the PHIs to address the challenges. These included teleconsultation for follow up of patients on anti-TB treatment, home delivery of Anti-TB drugs, drug dispensing for longer duration, separate Flu OPDs etc.

Table 1: Thematic analysis depicting COVID pandemic related challenges faced and modifications made to NTEP implementation at PHI level in Goa.

Theme	Codes	Verbatim
Staff Shortages	Increased Workload	"Shortage of staff led to increased workload on the staff working in primary health centres."
	Delays in TB care cascade	"Treatment card updation and initial home visits were delayed."
TB-COVID bidirectional Testing Challenges	Patient reluctance-fear of COVID exposure	"Patients were reluctant to get tested for TB or COVID due to fear of infection."
	Overburdened labs	"Laboratories were overwhelmed by excessive sample testing, leading to inefficiency and delays."
	Expanded bidirectional testing	"Screening drastically increased for TB as all cough cases were tested for both TB and COVID."
Active Case Finding (ACF) challenges	No house-to-house surveys for ACF	"Active case finding came to a standstill during COVID lockdowns."
	Redeployment for COVID duty	"Field staff involved in NTEP were reassigned to COVID duties, limiting ACF efforts."
Effects on TB Notification	Lower OPD attendance thus reduced Referrals	"Low patient attendance at OPDs resulted in reduced TB detection and notification."

	Prioritization of COVID testing- Delayed TB Diagnosis	"Chest symptomatic patients were first tested for COVID, leading to delays in TB diagnosis."
	Data entry	"TB patient data was not regularly entered in Nikshay, so was showing low notification rates"
Modifications & innovations in TB Care	Separate parallel OPDs	"Flu OPD was started separately from routine OPD to avoid COVID exposure."
	Innovative Telematic consultations	"Patients were followed up through teleconsultation and telephone calls to reduce hospital visits."
	Longer duration TB drugs supply	"TB medicines were provided for 28 days instead of the usual 14 days."
	Home delivery of TB drugs	"Through health workers we delivered TB drugs to the home of the TB patients"

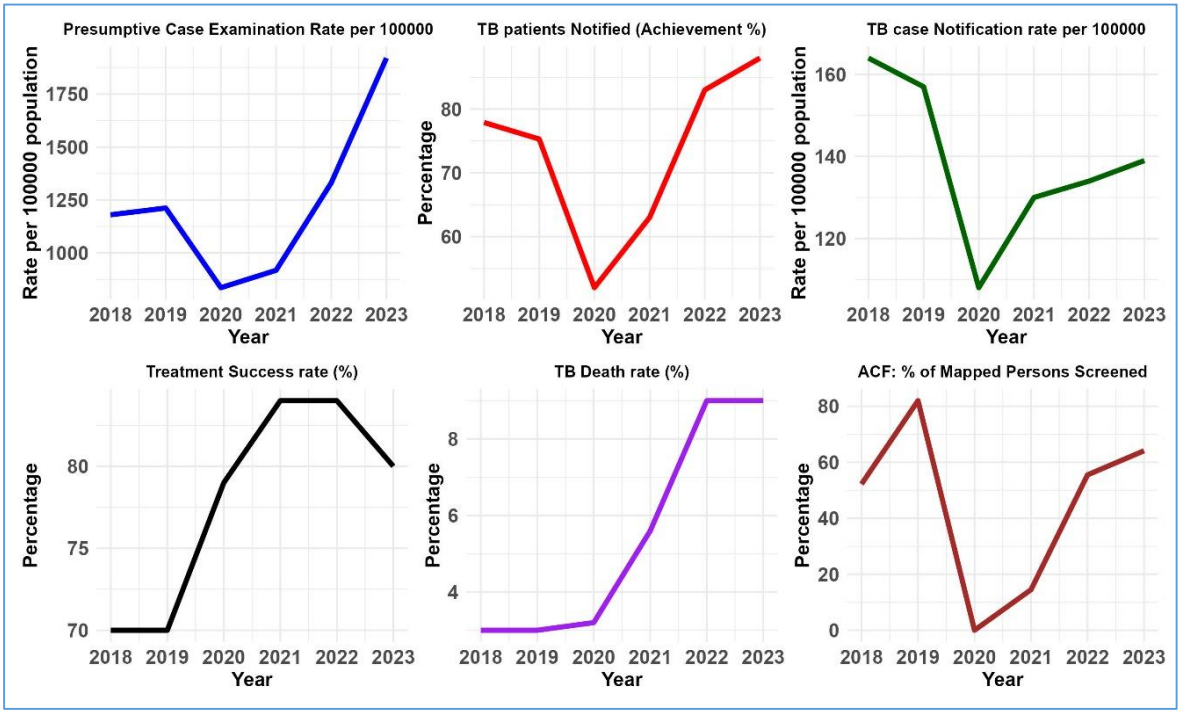

Figure 1: Trends in key NTEP programmatic indicators in pandemic and non-pandemic years

4. Discussion

The COVID pandemic negatively impacted the NTEP implementation in Goa as reflected in the poor performance across all the programmatic indicators. At the national level a 78% drop in TB notification was reported in the year 2020 compared to pre pandemic year 2019.[7] Aggarwal AN et al.[8] in their forecasting study, reported that large number of TB cases were being missed by the programme due to COVID related disruptions. In a study conducted in Puducherry, Yadav AS et al.[9] reported decline in TB notification, slight increase in treatment completion and an increase in death rate in later part of the pandemic. Similar impact on NTEP was also reported by Garg K et al[10] in their mixed method study in Uttarakhand. Our findings of increased TB mortality, diagnostic delays, and programmatic disruption during the COVID-19 pandemic are consistent with global cohort data. The Global Tuberculosis Network's international study of 788 TB/COVID-19 coinfected patients reported a TB mortality of 11%, with significantly worse outcomes in patients diagnosed with COVID-19 before or during TB treatment. These findings underscore the need for integrated TB-COVID-19 surveillance and follow-up strategies at both national and local levels.[11] Semnani K et al.[12] in their recent review have reported that populations with poor access to public health services, high TB burden, and weak public health infrastructure suffered greatly during the pandemic with long delays in diagnosis, which ensued increased TB morbidity and mortality. Hogan AB et al[13] have modelled a 20% increase in TB mortality high-burden settings, compared with if there was no COVID-19 pandemic. Arentz M et al[14] reported that 1,320,203 expected cases of TB (95% uncertainty interval (UI) 1,309,612 to 1,330,693) were not reported during the period from March 2020 through April

2021 and this was believed to represent a 63.3% difference (95% UI 62.8 to 63.8) in reporting of TB in India.

As far as impact on implementation of NTEP at PHI level was concerned; staff shortages, challenges in TB-COVID bidirectional testing, Challenges in Active Case Finding, Challenges in TB notification were the main themes that emerged in our mixed methods study. teleconsultation for follow up of patients on anti-TB treatment, home delivery of Anti-TB drugs, drug dispensing for longer duration, separate Flu OPDs were the key modifications/innovations done to face the challenges. In their mixed methods study in Uttarakhand, Garg K et al[10] identified closed OPDs, redeployment of staff, re-allocation of laboratory services, fear and stigma of COVID as the main challenges affecting TB diagnosis, notification and management and setting up of a parallel system, increasing laboratory services, increasing Active Case Finding (ACF) and using media for creating awareness as main solutions. Yadav AS et al[9] reported system related challenges (staff shortages, staff redeployment, delay in testing, reduced frequency in drug dispensing), patient related challenges (social stigma, lockdown restriction, fear of getting COVID) in their study in Puducherry district. Use of telemedicine and smartphone technology applications have been suggested as solutions by Iyengar KP et al[7] to overcome COVID related challenges in NTEP implementation. Awasthi AK et al.[15] Have suggested ensuring up skilling, motivation and safety of workers, use of digital technology for patient monitoring, teleconsultation for monitoring complications and adverse drug effects and ensuring provision of uninterrupted supply of drugs to TB patients as possible solutions to obviate the effect of COVID pandemic on NTEP implementation. Unlike previous studies from Puducherry and Uttarakhand, this study highlights unique innovations such as home delivery of TB drugs, telematic consultations, and Flu OPDs that were implemented at PHI level in Goa.

5. Limitations

As the study was confined to PHIs in Goa, findings may not be generalizable to other regions. However, the context provides valuable insights for similar settings.

6. Conclusion

COVID 19 pandemic severely disrupted the NTEP programme implementation causing setback to the goal of TB elimination by 2025. Resilience shown by PHI staff to implement the NTEP through suitable modifications and innovations despite the pandemic was a remarkable feat and serves as an excellent case study.

7. Source of Funding

None.

8. Conflict of Interest

None.

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