

Integrating health planning and primary care infrastructure for COVID-19 and tuberculosis care in India: Challenges and opportunities

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Abstract

Tuberculosis (TB) is the leading cause of death from a single infectious agent worldwide. The COVID-19 pandemic has overburdened healthcare services around the world especially in resource constrained settings. It has shaken already unstable foundation of TB control programs in India and other high burden states. A 25% decline is expected in TB detection while estimates suggest 13% increase in TB deaths due to the impact of the pandemic. However, the significant intersections between the two diseases perhaps offer potential opportunities for consolidating the efforts to tackle both. The widespread implementation and acceptance of universal masking and social distancing in India has helped limit transmission of both diseases. Integrating the capacity building strategies for the two diseases, optimizing the existing the surveillance and monitoring systems which have been achieved over the years will result in a single vertically integrated national program addressing both, rather than multiple parallel program which utilize the already sparse primary care manpower and infrastructure. In this article, we explore the impact of the COVID-19 pandemic on tuberculosis in India and offer suggestions on how effective health planning can efficiently integrate infrastructure and manpower at primary level to provide care for both COVID-19 and tuberculosis.

KEYWORDS

COVID-19, health-planning, health infrastructure, primary care, tuberculosis

Highlights

- Tuberculosis deaths are on the rise for the first time in more than a decade due to the COVID-19 pandemic.
- There is an urgent need to evolve an integrated service delivery addressing both diseases.
- This article highlights the challenges that COVID-19 has posed for TB care in India.
- We propose a unified inclusive primary care delivery model which integrates care for both TB and COVID-19 at the level of surveillance, diagnosis, management, and preventive care. The challenges in implementing this model and possible solutions are discussed.

1 | INTRODUCTION: DUAL BURDEN OF COVID-19 AND TUBERCULOSIS IN INDIA

Tuberculosis (TB) is the leading cause of death from a single infectious agent with more than 10 million people being infected each year and nearly 1.5 million deaths worldwide annually.¹ India is the highest TB burden country in the world having an estimated incidence of 2.69 million cases in 2019 – an increase of 12% from year 2018.²

The current Coronavirus-2019 (COVID-19) pandemic has overburdened the healthcare services around the world. Global rise in cases of COVID-19 has diverted attention from other diseases leading to a significant rise in deaths from non-COVID-19 related causes. This has particularly impacted the middle- and low-income countries (LMICs) where limited health-resources are being diverted from disease programs like tuberculosis, HIV and malaria towards COVID-19.⁴ In high burden countries, disruptions during COVID-19 pandemic are estimated to increase in deaths by as much as 10% due to HIV, 20% due to TB and 36% due to malaria over next 5 years compared with if no COVID-19 pandemic had occurred.⁵

Since April 2021, India reeled in the grip of a devastating second wave of COVID-19 pandemic resulting in unprecedented mortality and morbidity.⁶ The risk for future waves of the pandemic looms large while COVID-19 is expected to settle into annual epidemic patterns similar to influenza and other respiratory viruses.⁷ This calls for a rapid integration of COVID-19 related services with routine healthcare services so that disruptions can be minimised, however it is reasonable to suppose that there is still a long road in restabilising the routine care to that in pre-COVID days. As per a modelling analysis in three countries (India, Kenya and Ukraine), an estimated 3 month lockdown followed by 10 months to restore to pre lockdown levels will result in an additional 1.19 million TB cases and 361,000 TB deaths in India, 24,700 TB cases and 12,500 deaths in Kenya, and 43,500 cases and 1340 deaths in Ukraine.⁸

In India and other high burden countries, COVID-19 has shaken foundations of TB control programmes. Even before the pandemic, progress was slower than optimal in ending TB. As per World Health Organisation (WHO) report in 2019, of 46,500 people diagnosed with drug resistant TB only 40% were able to access treatment. For the year 2018–2019 only one-third of the target of 40 million people treated for TB, was fulfilled. Similarly, only one-fifth of the target for TB preventive treatment was met in the same year. According to WHO, only half of the total fund of US \$13 million agreed by world leaders was being allotted to TB programmes worldwide in 2020.⁹ The impact of the current COVID-19 pandemic has placed this in further precarious state. According to a WHO report, there was 21%

reduction in people receiving care for tuberculosis in 2020 compared to 2019 and this will result in estimated half a million excess deaths.¹⁰

In this perspective article, we summarize the current evidence, prediction models and recommendations regarding the impact of COVID-19 on various aspects of tuberculosis care. Concurrently, we focus on workable solutions of how effective health planning can efficiently integrate infrastructure and manpower at primary care level to provide integrated care for both COVID-19 and tuberculosis.

2 | IMPACT OF COVID-19 ON TB DIAGNOSIS AND CARE

COVID-19 pandemic has adversely impacted diagnosis, management, and prevention of tuberculosis. This has led to the speculation that the pandemic might result in dramatic increase in tuberculosis incidence. A 25% decline is expected in TB detection.¹¹ WHO estimates a rise of at least 13% in TB related deaths in coming years resulting in a major setback for tuberculosis care and control programs.¹¹ In high burden countries this rise in TB related deaths may be more than 20% over next 5 years due to the COVID-19 pandemic.⁴ Apart from direct TB deaths, tuberculosis related deaths in HIV patients due to similar disruption in HIV care is also predicted.¹²

2.1 | Impact on new case finding

New case finding of tuberculosis has been hampered amidst the pandemic. According to a report by Stop TB partnership, India reported 80% decrease in daily TB notifications since the start of the COVID-19 pandemic.¹³ According to 'NI-KSHAY' database, a mobile application based reporting system in use in India, there is a sharp fall in TB case notifications for April to August 2020 period as compared to 2019.¹⁴ Other high tuberculosis burden regions of Africa have also reported nearly 50% decline in new TB cases.¹⁵ Decline in TB cases is also seen in developed countries like United States with annual decrease reported in 2020 being far greater than in last decade.¹⁶ It is unclear if this represents a true decline in incidence owing to COVID-19 control measures. However higher percentage of Latent Tuberculosis Infection (LTBI) and active TB among children and household contacts of patient were diagnosed in 2020 which can be attributed to lockdown and stay at home orders.^{1,17} In a multicentric study during first four months of 2020, there were reductions in TB related hospital discharges, newly diagnosed cases of active TB, total active TB outpatient visits and new LTBI and LTBI outpatient visits reflecting a drastic impact on case detection.¹⁸

The reasons for decline in reporting of new TB cases can be attributed to the deployment of TB field workers in COVID-19 contact tracing teams, the drift of diagnostic services including rapid molecular testing machines in many cases and preoccupancy of laboratories to test large numbers of samples received for SARS-CoV-2 detection, importantly shutting of outpatient clinics, and public movement restrictions. All of these contribute to the delay in presentation and hence diagnosis.¹⁴ COVID-19 related lockdown and stay at home orders have also resulted in a considerable delay in TB diagnosis. As per a report by Stop TB partnership, there will be 232,665 excess TB cases for every month of lockdown and excess TB deaths by 71,290 for drug sensitive TB and 11,663 for multi drug resistant (MDR) TB.¹³

2.2 | Access and drug availability

The shift in focus of healthcare services has also severely affected the ongoing national programmes for managing tuberculosis. The travel restrictions and lack of transportation facilities have hampered the drug supply of anti-tubercular drugs. In a survey from 64 countries the most common barriers reported to affect patients from seeking TB treatment were: fear of getting infected with COVID-19, transport disruptions and movement restrictions.¹⁹ The

Detect-Treat-Prevent-Build (DTPB) approach of TB elimination in countries such as India is hampered where T stands for Treat-initiating and sustaining TB treatment, from wherever care is sought. The deploying of frontline health workers in COVID-19 field duties has greatly impacted keeping a track of the existing TB patients, home delivery of medicines and directly observed therapies to ensure continuity of treatment and follow-up. The conversion of TB wards into COVID-19 wards in peak of the pandemic has impacted the patients who require hospital admission especially MDR TB patients.²⁰ Though the healthcare resources are slowly being reclaimed to usual care as the pandemic appears to recede, the impact over last few months has resulted in consequences which need to be faced over a long term.

2.3 | Socio-economic burden and impact

The social and economic burden of COVID-19 disease has led to increase in poverty with addition of more than half billion people. According to report by World Bank, additional 88 million people, accounting to 1.4% of world population, have been added to extreme poverty group by 2021 due to COVID-19 pandemic. This will have impact in achieving goal of ending poverty by 2030. Also, the average global shared prosperity will remain stagnant or even contract over 2019–2021 due to the current pandemic.²¹ According to Modelling International Relationships under Applied General Equilibrium for African growth and developmental policy projections LIMCs have seen a decrease in gross national income per capita by an average of 7.9% relative to pre COVID-19 projections.²² Rise in poverty is expected due to loss of work due to enforcement of lockdown during COVID-19 pandemic. COVID-19 pandemic has also led to rise in food insecurities due to halt in production and commercialisation of agriculture, closure of point of sale, limitations on transportation and lack of labour due to restricted movement.^{23,24} This rise in poverty, food insecurities and malnutrition will hamper proper nutrition and care for tuberculosis patients. A systematic review showed that with every one unit decrease in body mass index across the range of 18.5–30 kg/m², there will be 14% increase in TB incidence.²⁵

The overcrowding due to stay at home orders and delayed diagnosis due to inability to access healthcare facilities may also result in increased transmission among family members. This is expected to increase cases with latent tuberculosis and the rate of conversion to active tuberculosis.²⁶ This has particularly important in disadvantaged social groups and those living in states with higher levels of poverty, under nutrition and migrants population due to interaction of social, economic, structural and political factors.^{25,27} Tuberculosis and COVID care in India is particularly a double health crisis for women due to gender disparities in how men and women seek and access healthcare in public and private sectors, making them a vulnerable group even in pre-COVID times.²⁸

Thus, COVID-19 is a double-edged sword for tuberculosis. On one hand the universal masking, social distancing, self-quarantine has led to a decrease in transmission; while on the other hand, disruption of routine TB programmes, inability to access health care and TB drugs has led to an exacerbation of the already ongoing TB epidemic in high burden countries like India. As per the global estimates by US-CDC (United States-Centre for Disease Control) slow return to services even after lockdowns could lead to additional 6.3 million cases of TB and additional 1.4 million TB deaths. This will set the world back 5–8 years in global fight for TB.²⁹

3 | OPPORTUNITIES AND THE PATH AHEAD

The significant intersections between the two diseases perhaps offer the potential opportunity for consolidating the efforts to tackle both diseases. Although mode of transmission is different in details, universal masking and social distancing can help in decreasing transmission of both diseases. Also, the scale of infection at present makes it prudent to integrate services at a community level for better care. We can integrate the primary care infrastructure and capacity

building strategies for the two diseases, including the surveillance, monitoring systems and field level management systems which have been achieved over the years.

3.1 | Primary healthcare manpower capacity building for integration

The field workers deployed for COVID-19 screening and contact tracing can be trained to differentiate between the symptoms and duration for the two diseases in order to complement the active case finding measures for both. All the healthcare workers should necessarily be re-trained in universal safety precautions and infection prevention and control measures keeping in mind the need for aerosol transmission of COVID-19. The already in place National tuberculosis elimination program (NTEP) which is an integral part of National Rural Health Mission (NRHM) can be utilised for COVID-19 services.³⁰ Dedicated TB facilities under NTEP can be utilised for active case finding of both tuberculosis and COVID-19.

A good example in this continuum is of US CDC in Namibia with the help of Ministry of health and social services. It links each patient with specific community health workers (CHWs) who act as a focal point for providing TB care to TB patients by providing information, drugs and healthcare screening for TB and other illnesses.²⁹ Thus, reducing the risk of COVID-19 in patients with tuberculosis by reducing the hospital visits. CHWs also help in identifying human immunodeficiency virus (HIV) patients who may need tuberculosis preventive therapy.

Another example is of Zero TB teams in Karachi, Pakistan which screens patient in emergency department of a tertiary care private sector hospitals for both COVID-19 and TB with an artificial intelligence (AI) based application.³¹

Loveday et al. suggest that combining COVID-19 and TB services by fast tracking coughing patients for diagnosis, minimising health care facility visits by implementing 2-month minimum dispensing of ART and ATT, transitioning injectable to oral regimens, establishing mental health support groups and helplines, and exploring the use of community health workers to deliver drugs, support retention in care and collect sputum will help address the efforts the tuberculosis care in South Africa.³²

3.2 | Integration of web-based services for diagnosis and management

As per a WHO report, 108 countries including 21 high burden countries the expanded the use of digital technology in fight against TB which is a good step in TB care.⁷ The existing and widely used web enabled TB management system 'NI-KSHAY'³³ in India is utilized for registering and managing patients can also be utilised for managing patients with COVID-19. Similarly, mobile phone-based applications like 'Arogya Setu' which have proven useful in COVID-19 contact tracing and case finding can be utilised for TB management. In fact, there was increased use of telehealth during first 4 months in 2020 in TB centres survey in Australia, India, Russia and United Kingdom.¹⁸

Strengthening primary health care system by integrating these web-based applications can be helpful in the long run for both diseases in distributing and shifting the load from already overburdened tertiary care centres. Utilisation of telemedicine services in video-supported treatment or home-based care will ensure treatment compliance and completion without risk of exposure due to hospital visits. This can be utilized for directly observed therapies in TB (DOTS). Further Malik et al., suggest that integrating telehealth services with home based healthcare worker visits for better follow up and management of TB and Post COVID-19 care.³¹ In fact, such a recommendation was envisioned by an advisory issued to the state TB officers by Ministry of Health & Family Welfare (MoHFW) in early days of the pandemic.³⁴ Financial incentives can be transferred directly to bank accounts using mobile based applications and public distribution of rations to ensure proper nutrition can also be implemented.²⁵

3.3 | Recommendations for an integrated inclusive community based TB-COVID-19 surveillance and management programme

As suggested by Shrinivasan et al., increased funding under NTEP to implement bidirectional TB-Covid screening, utilisation of innovative apps and artificial intelligence based systems for diagnosis, management and tracking of TB and COVID-19 patients, strengthening of national TB helpline, enhanced food rations through India's public distribution system to mitigate malnutrition are the key to tackle the dual pandemic.¹⁴

We recommend that an integrated program-based approach can be implemented in India, wherein the MoHFW, can link the already present NTEP related resources in the primary healthcare structure in India to optimize the care of both COVID-19 and tuberculosis effectively.

The vision of NTEP is a TB free India with zero deaths, TB disease and poverty due to tuberculosis by 2025.³⁵ An integrated programme which addresses and integrates COVID-19 care can help accelerate the progress towards this goal. NTEP announced rapid response plan to mitigate the impact of COVID-19 pandemic on TB epidemic and NTEP activities in India under which all ILI/SARI/COVID cases will be screened for TB. There will be integration TB-COVID labs. Introducing Lung health concept in which diagnostic services will be provided for all priority acute/chronic respiratory diseases with support of free diagnostic initiatives and providing free drugs are also planned. This will help in diagnosing other lung conditions like lung cancer, COPD, asthma, etc along with the two infections. Replacement of smear microscopy by NAAT testing will help in preventing spread of TB.³⁶

There is also an urgent need to reduce false positive or clinical TB cases. According to WHO, empirical diagnosis for TB accounts to 43% of all TB cases. The current situation is an opportunity to address this wherein the diagnostic facilities have been strengthened and availability of RT-PCR and CBNAAT services have been expanded to primary and district levels.³⁷ A reframing of mindset with the refrain 'if COVID testing can be available for everyone, why not TB?' is the need of the hour. This can be implemented at primary care level by focussing on microbiological diagnosis for TB treatment under NTEP.

We suggest integrating the recommendations of NTEP under rapid response plan with already existing infrastructure and services under primary health care in India. Figure 1 summarizes our suggestions for diagnosis of new TB and COVID-19 cases and management of already diagnosed tuberculosis patients using already established health-care structure in India. A patient with presumptive TB/COVID-19 can be linked to Accredited Social Health Activist (ASHA) via one of the existing mobile based applications.

This will prove simple as the existing 'NI-KHSAY' based application has resulted in good public-private partnership where it is mandatory by all private doctors, care givers and clinics to report every case of TB to the government. We suggest that the NIKHAY ID/COVID ID of the patient can be linked to a specific health care worker in a fashion like that implemented in Namibia. The ASHA can assess if the patient requires testing for either disease based on pre-defined checklists and home visit if required. If patient requires testing, patient can be linked to the nearest Primary Health Centre (PHC) or subcentre wherein either the Auxiliary Nurse Midwife (ANM) or medical officer can register patient for sampling and follow-up for further care. The sample can then be processed at PHC/Community Health Centre (CHC) level using the 600 plus existing nucleic acid-based amplification facilities all over the nation. As per NTEP rapid response plan directive, NAAT testing should be preferred over smear testing. Use of NAAT will also lead to decrease in the rate of error notification of suspected PTB cases, avoidance of unnecessary use of anti-TB treatments and accelerated initiation of appropriate treatment.³⁸ If patient found positive further management is advised by CHC medical officer. For patients with already diagnosed TB, patient can be linked to ASHA or ANM based on drug sensitivity as well. Drug can be made available to the patients from PHC via ASHA/ANM. ASHA/ANM can be used to monitor drug therapy for both TB and COVID-19 and spreading awareness about unnecessary use of antibiotics. Physicians at PHC/CHCs level should be trained about microbial resistance to avoid prescription of unnecessary antimicrobials and anti-tubercular therapy.

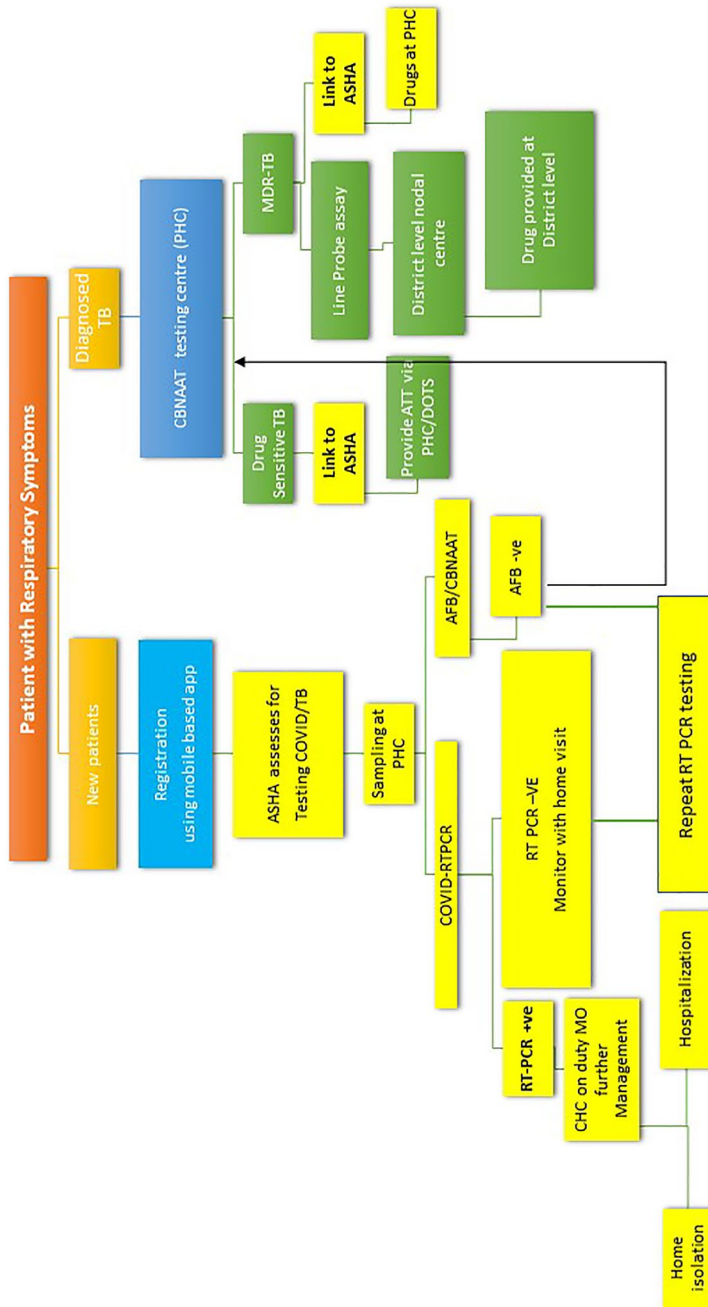


FIGURE 1 Integrating services for tuberculosis and COVID-19 care at primary level in India. Green boxes show already existing TB care facilities. Yellow boxes show the proposed TB and COVID integrated health care plan. ASHA, Accredited Social Health Activist; ATT, Anti-Tubercular Treatment; CBNAAT, Cartridge Based Nucleic Acid Amplification Test; CHC, Community Health Centre; DOTS, Directly Observed Treatment, Short-course; MDR, Multi-Drug Resistant; MO, Medical Officer; PHC, Primary Health Centre; RT-PCR, Reverse transcriptase Polymerase Chain Reaction [Colour figure can be viewed at wileyonlinelibrary.com]

3.4 | Planning integrated surveillance

Web and mobile based platform for example, NI-KSHAY, Nikashay Aushadhi, Aarogya setu or other state level information and communication technology based applications can be used to intensify TB care and can be utilised in early case finding and management of COVID-19-suspect patients. NTEP call centre can be used to support both TB and COVID-19 patients. CHWs can be utilised in spreading awareness about COVID-19 and TB. Integration of COVID-19 in addition tuberculosis in Integrated disease Surveillance program (IDSP) will help mitigating future peaks of COVID-19. Utilisation of telemedicine services in follow up of tuberculosis patients and screening of patients and family members for COVID-19 can be done.

3.5 | Vaccinating TB patients and post COVID care

More than a billion vaccine doses have been administered in India as on 20th November 2021. A new mobile based application named CoWIN has been launched to track and collect data for this.³⁹ Now that the next phase of vaccination which involves the general population >18 years have been implemented, case finding in MDR patients who can be prioritized for early vaccination using mobile applications can be done. But there have been multiple reports of facing server problems since the start of registration of >18 years. It also faces OTP issues, unavailability of slots and other technical glitches.⁴⁰ Also this has faced criticism as majority of India's rural population are unable to register due to lack of technological advancement.⁴¹ Furthermore implementation of social distancing, masking and hand sanitisation at vaccination site should also be taken care of.⁴²

To mitigate these problems, we suggest use of ASHA and ANM for registration and door to door vaccination of the population. Anganwadi workers and ASHA can also be utilised to combat with vaccine hesitancy especially in rural India.

Recent data has shown significant rise in subacute and long-term effects of COVID-19 affecting multiple organ system ranging from mild symptoms like fatigue, dyspnoea, chest pain to thromboembolism, COVID-19 associated pulmonary aspergillosis, COVID-19 associated mucormycosis, neuropsychiatric disorders, etc.⁴³⁻⁴⁵ Multidisciplinary care is essential for management of Post COVID manifestations. ASHA and ANM along with guidance from CHCs can be utilised for early detection, screening and referral of patients who require prioritization in care for post-acute COVID-19 manifestations based on high risk factors.

4 | LIMITATIONS AND CHALLENGES

The vision for integrating COVID and TB detection as outlined above though appealing, it is to be realised that the scale of the challenge differs greatly: it is easier to diagnose COVID than TB and the management differs substantially. TB services need integration with nutritional and HIV support, whereas COVID patients need rapid isolation and immediate contact tracing, as well as hypoxia documentation. However, with emerging needs for population-based vaccination strategies and post COVID care, integration is still deemed beneficial.

Other limitations and challenges to implementation exist at present. First, funding to primary care must be augmented so that a designated primary healthcare worker can be allocated for tackling of COVID-19 pandemic and TB. Second, implementing this will require employing additional community health workers. Thirdly, though there has been a rapid increase in availability and functioning of diagnostic laboratory equipment at the PHC/CHCs level, there is a need to further invest in infrastructure, quality control and training to implement this in a nationwide manner.

Limited availability of telemedicine and mobile phones will hamper reaching cases. Since majority of Indian population is in rural areas, acceptance by rural population of technology-based solutions is also an issue.

5 | CONCLUSION

Integrated efforts, patient centred and community-based approach will lead to better TB and COVID-19 and post COVID care. Despite all the limitations in implementing a community-based system for TB and COVID-19 care, diversion of funding to primary health care system would result in relieving a significant load off the tertiary care institutes. This will also benefit in carrying out effective research and planning in tackling the current and any future peaks of COVID-19 and other pandemics. Increasing manpower will also play an essential role in implementation and success of community-based care.

It has been recommended that refocus on rebuilding of stronger, more inclusive health systems by advancing equitable access is the key to achieving the targets of eliminating TB as a public health problem by 2025.⁴⁶ One of the key factors in implementing this inclusive strategy is having a community led and community-based approach. Our solutions of utilising the services of ASHA workers are in line with these mandates as the frontline health worker is usually from the community and has an intimate and intuitive knowledge of needs as well as challenges for the community. By letting them lead the two-pronged approach with sufficient funds and infrastructural support will allow India to make strides in TB elimination in these tough times.

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CONFLICT OF INTEREST

The authors declare no conflict of interests.

ETHICS STATEMENT

This perspective article does not contain any patient information or primary data. Hence, ethical clearance is not applicable.

DATA AVAILABILITY STATEMENT

The paper contains no primary patient data.

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