

National Tuberculosis Elimination Programme (NTEP) in India: Achievements, Ongoing Challenges, and the Expanding Role of Pharmacists

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ABSTRACT

India bears the highest global burden of Tuberculosis (TB), accounting for nearly one-quarter of worldwide cases, with persistent challenges related to Multidrug-Resistant TB (MDR-TB) and healthcare access. In alignment with the WHO End TB Strategy, India committed to eliminating TB by 2025, five years ahead of the global Sustainable Development Goals target. The National TB Elimination Program (NTEP), evolved from the Revised National Tuberculosis Control Programme (RNTCP), serves as the central strategic framework guiding this ambition. This review critically evaluates the achievements and ongoing challenges of NTEP and examines the expanding clinical and public health role of pharmacists within India's TB elimination strategy. A narrative review of peer-reviewed literature and national policy documents published between 2010 and 2026 was conducted using databases including PubMed and Scopus, alongside government and programmatic reports. Studies addressing TB epidemiology, MDR-TB prevalence, program implementation, and health system barriers in India were included. Evidence was synthesized qualitatively to assess progress toward elimination targets. NTEP has strengthened case notification systems, expanded molecular diagnostic capacity, implemented Universal Drug Susceptibility Testing, and enhanced digital case notification and patient management through the Nikshay platform. Nutritional support initiatives and structured private sector engagement have improved treatment accessibility. However, MDR-TB remains a substantial obstacle, with notable prevalence among both new and previously treated cases. Persistent challenges include underreporting, treatment adherence gaps, socioeconomic vulnerabilities, and incomplete private sector integration. Pharmacists are increasingly recognized as potentially valuable contributors through medication therapy management, adverse drug reaction monitoring, adherence counselling, antimicrobial stewardship, and community-based referral. Although NTEP demonstrates substantial structural progress aligned with global TB control frameworks, achieving the 2025 elimination target required intensified system strengthening and multidisciplinary collaboration. Formal integration of pharmacists into clinical and public health components of NTEP can enhance treatment safety, adherence, and overall program effectiveness.

Keywords: Directly Observed Treatment, Medication Therapy Management, Multidrug-Resistant, Public-Private Sector Partnerships, Short-Course (DOTS), Tuberculosis Control, Tuberculosis, Universal Drug Susceptibility Testing, World Health Organization End TB Strategy.

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Received: 13-07-2026;

Revised: 28-08-2026;

Accepted: 05-10-2026.

INTRODUCTION

The World Health Organization estimates that Tuberculosis (TB) remains among the leading infectious causes of morbidity and mortality worldwide, with persistent transmission in low- and middle-income regions despite effective chemotherapeutic regimens (World Health Organization, 2023). The WHO End TB

Strategy frames elimination as a multi-faceted effort that extends beyond biomedical treatment to include intensified case-finding, social protection, and health-system strengthening, and it emphasises the need for country-level adaptation of these pillars to achieve steep declines in incidence and mortality (World Health Organization, 2015). Although global TB incidence has shown slow declines over two decades, recent disruptions including the COVID-19 pandemic have reversed progress in many settings, underscoring the fragility of gains and the importance of sustained programmatic vigilance (World Health Organization, 2024).

At the national level, India carries the largest absolute TB burden, accounting for a substantial fraction of global cases and deaths.



DOI: 10.5530/jpccm.20270072

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The epidemiological landscape in India is characterised by a high incidence of both drug-sensitive and drug-resistant disease, heterogeneous subnational patterns of transmission, and sizeable care-seeking in the private sector that complicates surveillance and standardized treatment delivery (Central TB Division, 2023; Udwadia *et al.*, 2010). Meta-analytic and programmatic estimates indicate non-trivial prevalence of Multidrug-Resistant TB (MDR-TB) among both new and previously treated patients, a factor that materially increases programmatic complexity and resource requirements (Prasad *et al.*, 2018). Moreover, the confluence of social determinants (poverty, malnutrition, overcrowding) and comorbidities (diabetes, HIV) amplifies vulnerability and attenuates treatment outcomes, thereby elevating the risk of onward transmission and emergence of resistance (World Health Organization, 2024; Prasad *et al.*, 2018).

India's national response has evolved in form and ambition. The erstwhile Revised National Tuberculosis Control Programme (RNTCP) introduced the DOTS strategy and established the foundations of standardized treatment and programmatic management; however, changing epidemiology and policy priorities motivated an organisational transition to the National TB Elimination Program (NTEP) (Revised National Tuberculosis Control Programme, 2016). The reconstituted program articulates a sharper elimination focus, integrating expanded diagnostic capacity (including molecular tests), digital case notification and management platforms, and patient-centred support mechanisms. Notably, the new strategic goal - to eliminate TB by 2025 - set an accelerated timeline relative to global targets and necessitated intensified, evidence-driven program adaptations, though the target was not achieved due to challenges such as the COVID-19 pandemic, underreporting, and socioeconomic barriers (Central TB Division, 2017; Sharma, 2017). While these structural and policy shifts are notable, the translation of inputs into sustained reductions in incidence at scale requires critical assessment.

Evaluating NTEP's achievements and persistent gaps is therefore essential for several reasons. First, objective appraisal helps distinguish program elements that produce measurable gains (e.g., expanded molecular diagnostics, digital notification systems) from those with more limited impact in real-world conditions (e.g., private-sector case management). Second, critical evaluation illuminates operational bottlenecks - diagnostic delays, under-reporting, adherence failures, and supply-chain vulnerabilities - that, if unresolved, perpetuate reservoirs of infection and resistance. Third, given constrained public health resources, a rigorous synthesis enables prioritisation of interventions likely to yield the greatest epidemiological return on investment, particularly in retrospect of the missed 2025 target horizon and for future sustained TB control (Central TB Division, 2023; Udwadia *et al.*, 2010).

Within this context, the pharmacy profession has emerged as an under-utilised but potentially high-value cadre in TB control. Pharmacists operate at the interface of communities and clinical services and possess competencies in medication therapy management, drug-safety surveillance, counselling, and supply-chain management. Recent international reviews underscore roles for pharmacists that range from symptom screening and referral, correct dispensing and directly observed therapy support, to pharmacovigilance and data contribution for surveillance systems (Bhattacharjee *et al.*, 2020; Klein *et al.*, 2019). In India, where substantial care-seeking occurs in community pharmacies and private clinics, formalising pharmacists' contributions could strengthen early detection, improve adherence support, mitigate inappropriate antibiotic use, and enhance adverse-event monitoring - all of which are material to NTEP's objectives (Bhattacharjee *et al.*, 2020).

Despite these theoretical synergies, the literature lacks a consolidated, India-specific synthesis that critiques NTEP's programmatic performance through the lens of pharmacist integration. Existing reviews tend to treat NTEP achievements and challenges or pharmacist roles as separate domains, with limited cross-walk analyses that evaluate how pharmacy interventions could address identified operational gaps. Moreover, empirical evaluations of pharmacist-led interventions within Indian TB programmes remain sparse and heterogeneous, limiting generalisability and policy translation (Prasad *et al.*, 2018; Bhattacharjee *et al.*, 2020). This gap constrains evidence-informed recommendations for workforce deployment and policy reform at a time when rapid course correction is needed.

Accordingly, this review critically examines the achievements and ongoing challenges of the National TB Elimination Program and synthesises current evidence on the expanding clinical and public-health roles of pharmacists in India's TB response. The objective is to identify where pharmacists can most effectively be integrated into NTEP strategies to strengthen case-finding, treatment adherence, pharmacovigilance, and private-sector engagement - thereby informing targeted policy and operational recommendations to accelerate progress toward sustained TB control in India beyond the missed 2025 elimination goal, aligning with global targets for 2030 and beyond.

METHODOLOGY

This study was conducted as a narrative review to provide a comprehensive synthesis of literature related to the National TB Elimination Program (NTEP) in India, its achievements and ongoing challenges, and the expanding role of pharmacists in Tuberculosis (TB) control. Unlike a systematic review, this approach did not follow a predefined protocol involving structured quality appraisal, meta-analysis, or statistical pooling of results. Instead, it aimed to integrate diverse sources of evidence to generate a contextual and policy-relevant understanding of

programmatic and professional dimensions of TB elimination in India.

Literature Search Strategy

A structured but flexible search strategy was employed to identify relevant literature. Electronic databases including PubMed, Scopus, and Google Scholar were searched for peer-reviewed articles. In addition, grey literature and policy documents were retrieved from official government and international sources, including the Ministry of Health and Family Welfare (MoHFW), Government of India, the Central TB Division, annual NTEP reports, and publications from the World Health Organization (WHO) (World Health Organization, 2023; Central TB Division, 2017; Central TB Division, 2023). Reports from international agencies such as the Global Fund and United Nations bodies were also consulted where relevant.

The search covered literature published between January 2010 and February 2026 to capture developments from the later phase of the Revised National Tuberculosis Control Programme (RNTCP) through the transition to NTEP, subsequent programmatic expansion, and post-2025 evaluations. This timeframe allowed for examination of long-term program evolution as well as recent innovations in diagnostics, digital surveillance, patient support mechanisms, and reflections on the missed 2025 elimination target.

Search terms were used individually and in combination with Boolean operators (AND, OR). Synonyms and related Medical Subject Headings (MeSH) were applied where appropriate to enhance sensitivity of the search. Key terms included:

- “Tuberculosis control India.”
- “National TB Elimination Program.”
- “NTEP India.”
- “RNTCP to NTEP transition.”
- “TB elimination 2025.”
- “Post-2025 TB India.”
- “NTEP outcomes 2025.”
- “TB Control India beyond 2025.”
- “Multidrug-Resistant Tuberculosis India.”
- “Private Sector TB notification.”
- “TB Adherence India.”
- “Pharmacist role in Tuberculosis.”
- “Clinical Pharmacist TB Management.”
- “Public Health Pharmacy India.”

Retrieved sources were screened based on the following inclusion and exclusion criteria to ensure relevance and quality.

Inclusion Criteria

Literature was included if it met the following criteria:

- Published in English.
- Focused on tuberculosis epidemiology, policy, program implementation, or drug resistance within the Indian context.
- Examined the structure, performance, or evaluation of RNTCP or NTEP.
- Addressed health system challenges, private sector engagement, digital health interventions, or treatment adherence in TB control.
- Explored the role of pharmacists or pharmaceutical care in TB management, antimicrobial stewardship, medication safety, or public health interventions relevant to TB.
- Included post-2025 programmatic evaluations or updates where available.
- Both original research articles and high-quality review articles were considered.
- Government reports, national strategic plans, annual performance reports, and World Health Organization Global TB Reports were included due to their policy relevance and authoritative data (World Health Organization, 2024). Emphasis was placed on sources providing recent epidemiological data, program outcomes, or critical analyses of implementation challenges.

Exclusion Criteria

Studies were excluded if they:

- Focused exclusively on non-Indian populations without clear relevance to the Indian TB context.
- Addressed basic laboratory or molecular research without linkage to programmatic or policy implications.
- Were opinion pieces lacking empirical or policy grounding.
- Were duplicates or substantially outdated sources superseded by more recent data (except where historical context was essential, e.g., early RNTCP evaluations).
- Were non-English publications (excluded due to resource constraints).
- Data Synthesis and Analytical Approach.

Given the narrative nature of the review, no formal systematic screening process, risk-of-bias assessment, or quantitative meta-analysis was undertaken. Instead, selected literature was critically appraised for relevance, credibility, and contribution to understanding NTEP's achievements, ongoing challenges, and professional practice implications (World Health Organization, 2023; World Health Organization, 2024).

Data extraction focused on key thematic domains: (i) Epidemiological trends and disease burden; (ii) Structural and operational components of NTEP; (iii) Documented achievements in diagnostics, treatment, surveillance, and patient support; (iv) Persistent challenges including multidrug resistance, adherence, private sector reporting, and socioeconomic barriers; and (v) Emerging roles of pharmacists in clinical management, pharmacovigilance, antimicrobial stewardship, and community-based engagement (Bhattacharjee *et al.*, 2020; Klein *et al.*, 2019).

Particular emphasis was placed on policy relevance and practical implications for health systems strengthening. Literature was synthesized qualitatively to identify converging themes, areas of progress, and gaps requiring further attention. The objective was not to quantify effect sizes but to provide a critical and contextually grounded appraisal of India's TB elimination trajectory and to situate pharmacists within this evolving framework (Wells *et al.*, 2019).

Through this narrative synthesis, the review aims to bridge epidemiological evidence, programmatic evaluation, and professional practice perspectives to inform future research, policy development, and interdisciplinary collaboration in TB elimination efforts.

The following sections present the synthesized findings, beginning with an overview of TB epidemiology in India.

EPIDEMIOLOGY OF TUBERCULOSIS IN INDIA

India continues to bear the highest global TB burden, with the disease remaining a significant cause of morbidity and mortality despite decades of control efforts, accounting for approximately 25% of total global TB cases (World Health Organization, 2023). Recent national estimates indicate a TB incidence of approximately 187 per 100,000 population in 2024, reflecting both improved case detection and a 21% decline since 2015, though still far from elimination levels (World Health Organization, 2023).

Globally, TB remains among the leading infectious causes of death, with an estimated 1.23 million deaths annually (World Health Organization, 2023). India contributes substantially to this mortality burden. Although improvements in treatment success rates have been documented over the past decade, the rate of decline in incidence was insufficient to have met the ambitious elimination target set for 2025 under the National TB Elimination Program (NTEP) (World Health Organization,

2023). Epidemiological progress has been uneven across states, with high-burden regions experiencing continued transmission driven by socioeconomic disparities, undernutrition, and limited healthcare access (Central TB Division, 2023).

Case notification has improved significantly following implementation of mandatory TB notification and the digital Nikshay surveillance platform under NTEP (National Health Systems Resource Centre, 2021). However, underreporting—particularly from private healthcare providers—continues to present a challenge (Udwadia *et al.*, 2010). The COVID-19 pandemic further disrupted routine TB services, contributing to temporary declines in case detection and delays in treatment initiation, though post-pandemic recovery has improved coverage to 92% (World Health Organization, 2023).

Multidrug-Resistant Tuberculosis (MDR-TB) represents one of the most pressing epidemiological challenges in India. MDR-TB, defined as resistance of *Mycobacterium tuberculosis* to at least isoniazid and rifampicin, threatens both individual treatment outcomes and broader programmatic success. A recent India-specific systematic review and meta-analysis (2016-2022) reported pooled MDR-TB prevalence of approximately 3.9% among newly diagnosed cases and 13.4% among previously treated cases, highlighting the persistent burden of drug resistance within the NTEP context, with recent reports indicating no significant increase in MDR-TB cases (Prajapati *et al.*, 2023). These findings are comparable to estimates from national drug resistance surveys and underscore the substantial burden of acquired and primary resistance (Prasad *et al.*, 2018).

The higher prevalence among previously treated patients highlights ongoing challenges related to treatment adherence, incomplete therapy, and health system gaps (World Health Organization, 2024). Drug resistance not only complicates therapeutic management but also increases treatment duration, cost, and risk of adverse drug reactions. Consequently, Universal Drug Susceptibility Testing (UDST) and expansion of rapid molecular diagnostics have become central epidemiological interventions under NTEP (World Health Organization, 2022).

Socioeconomic determinants further shape TB epidemiology in India. High population density, poverty, malnutrition, diabetes mellitus, tobacco use, and migration patterns contribute to sustained transmission (World Health Organization, 2023). Urban informal settlements and mobile populations remain particularly vulnerable, often experiencing barriers to early diagnosis and continuity of care (Tanimura *et al.*, 2014).

Collectively, the epidemiological profile of TB in India reflects measurable progress in detection and surveillance alongside persistent structural and biological challenges. The coexistence of high disease burden, substantial MDR-TB prevalence, and social vulnerability underscores the complexity of having achieved TB elimination by 2025. Despite missing the target, progress

continues toward global 2030 goals. These epidemiological realities necessitate strengthened programmatic interventions and multidisciplinary engagement to accelerate incidence reduction and improve treatment outcomes (Wells *et al.*, 2019).

Structure and Strategic Framework of the National TB Elimination Program (NTEP)

Evolution from RNTCP to NTEP

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India's organized response to Tuberculosis (TB) was institutionalized through the Revised National Tuberculosis Control Programme (RNTCP), launched in the 1990s, which operationalized the Directly Observed Treatment, Short-course (DOTS) strategy recommended by the World Health Organization (WHO) (WHO, 2015; Revised National Tuberculosis Control Programme, 2016). The DOTS framework emphasized political commitment, case detection through sputum microscopy, standardized treatment regimens under direct observation, uninterrupted drug supply, and systematic monitoring (Revised National Tuberculosis Control Programme, 2016). RNTCP achieved notable improvements in treatment success rates and expanded diagnostic and treatment coverage across states. Over time, it contributed to stabilization and gradual decline in TB mortality and strengthened the public health infrastructure for TB control (Central TB Division, 2023).

However, as India's TB response matured, limitations of the control-oriented paradigm became apparent. Persistent transmission, rising Multidrug-Resistant TB (MDR-TB), and gaps in private sector reporting-which NTEP addresses through mandatory notifications and public-private partnerships-underscored the need for a more comprehensive and elimination-focused strategy (Thomas *et al.*, 2021; Udwadia *et al.*, 2010). The shift from RNTCP to the National TB Elimination Program (NTEP) represented a strategic reorientation from managing TB as a high-burden endemic disease to actively pursuing its elimination. The renaming of the program was not merely symbolic; it reflected an expanded scope encompassing universal drug susceptibility testing, digital surveillance, social

protection measures, and multisectoral engagement (Central TB Division, 2017).

The transition also signified integration of newer diagnostic technologies and a stronger emphasis on patient-centered care. Unlike the earlier DOTS model that primarily focused on treatment supervision, NTEP incorporates digital adherence monitoring, direct financial support, and active case finding (National Health Systems Resource Centre, 2021). The elimination framework recognizes that biomedical interventions alone are insufficient; structural determinants and health system strengthening are integral components of sustained disease reduction (Odone *et al.*, 2018). Thus, NTEP embodies a systems-based approach aligned with contemporary public health principles (WHO, 2015).

NATIONAL STRATEGIC PLAN (2017-2025)

The National Strategic Plan (NSP) for Tuberculosis Elimination 2017-2025 provided the operational blueprint for NTEP. It articulated India's ambitious goal of eliminating TB by 2025-five years ahead of the global target set under the Sustainable Development Goals. This accelerated timeline underscored the political commitment to transforming TB control into a public health priority of national significance (Central TB Division, 2017). Although the 2025 target was not achieved due to disruptions like COVID-19 and persistent challenges, the NSP laid the foundation for continued progress toward global 2030 targets, with a new National Strategic Plan under development and initiatives like the TB Mukta Abhiyaan (launched in December 2024) to sustain momentum (Sharma, 2017).

The NSP was structured around four strategic pillars: Detect, Treat, Prevent, and Build (DTPB).

Detect

The first pillar emphasizes early and universal access to quality diagnosis, including systematic screening of high-risk populations and universal drug susceptibility testing (UDST). By prioritizing rapid and accurate detection of both drug-susceptible and drug-resistant TB, the program aims to interrupt transmission and reduce diagnostic delays (WHO, 2022).

Treat

The second pillar focuses on ensuring free, high-quality, patient-centered treatment for all diagnosed individuals. This includes standardized regimens for drug-susceptible TB, individualized regimens for MDR-TB, digital adherence technologies, and nutritional support through direct benefit transfers. The shift toward comprehensive treatment monitoring reflects recognition that adherence is critical to preventing relapse and resistance (National Health Systems Resource Centre, 2021).

Prevent

Prevention strategies include active case finding, contact tracing, infection control measures, and expansion of TB Preventive Therapy (TPT) among eligible populations. This pillar marks a departure from reactive case management toward proactive interruption of transmission chains (Odone *et al.*, 2018).

Build

The final pillar addresses health system strengthening, including workforce capacity building, digital infrastructure development, surveillance systems, research promotion, and multisectoral partnerships. It acknowledges that elimination requires resilient health systems capable of sustained implementation (Wells *et al.*, 2019).

The NSP aligns closely with the WHO End TB Strategy, particularly in its emphasis on integrated patient-centered care, bold policies addressing social determinants, and research and innovation (WHO, 2015). However, India's 2025 elimination target was more ambitious than global timelines, reflecting both urgency and the epidemiological centrality of India in global TB control. This accelerated target necessitated intensified programmatic performance and intersectoral coordination (Sharma, 2017).

Key Programmatic Components

The strategic pillars of NTEP are operationalized through several key programmatic components designed to enhance detection, improve treatment outcomes, and strengthen surveillance (Central TB Division, 2017).

Universal Drug Susceptibility Testing (UDST)

UDST is a cornerstone of NTEP's elimination framework. By ensuring that all diagnosed TB patients undergo testing for drug resistance at baseline, the program aims to identify MDR-TB early and initiate appropriate regimens promptly. This strategy addresses historical delays in resistance detection that contributed to amplification of drug resistance. UDST enhances rational drug use and supports antimicrobial stewardship, thereby strengthening long-term program sustainability (WHO, 2022).

Expansion of Molecular Diagnostics

The scale-up of rapid molecular diagnostic tools-including Cartridge-Based Nucleic Acid Amplification Tests (CBNAAT), True Nat platforms, and Line Probe Assays (LPA)-has transformed TB diagnosis in India. These technologies enable rapid detection of *Mycobacterium tuberculosis* and resistance to rifampicin and isoniazid. Their decentralization to district and sub-district levels has reduced turnaround time and facilitated earlier treatment initiation. Strategically, this expansion represents a shift from reliance on smear microscopy to more sensitive and specific diagnostics, aligning with global best practices (WHO, 2024).

Nikshay Digital Surveillance System

Nikshay, the national TB patient management system, functions as a centralized digital platform for case notification, treatment monitoring, and outcome tracking. Mandatory TB notification through Nikshay has improved transparency and data integration across public and private sectors. Digitalization enhances accountability, enables real-time monitoring, and supports programmatic decision-making. By 2024, Nikshay had registered over 25 million patients, facilitating real-time data-driven interventions (National Health Systems Resource Centre, 2021). From a structural perspective, Nikshay exemplifies the integration of digital health within public health governance.

Direct Benefit Transfer (DBT) Schemes

Recognizing the socioeconomic burden of TB, NTEP incorporates direct financial assistance to patients through DBT schemes, such as the Ni-kshay Poshan Yojana providing ₹500 monthly nutritional support (Tanimura *et al.*, 2014). These schemes aim to mitigate catastrophic health expenditure and improve treatment adherence. By addressing financial barriers, DBT represents an intersection of social protection and disease control, reflecting a broader understanding of TB as a disease of poverty.

Private Sector Engagement

A substantial proportion of TB patients in India initially seek care in the private sector. Historically, underreporting from private providers contributed to notification gaps. NTEP has introduced incentives (e.g., ₹500 for notification and ₹750 for treatment outcomes), public-private mix models, and digital notification mandates to enhance private sector engagement (Thomas *et al.*, 2021). This structural reform acknowledges the pluralistic nature of India's healthcare system and attempts to harmonize standards of care across sectors.

TB Preventive Therapy (TPT)

Preventive therapy for high-risk groups, including household contacts and individuals with latent TB infection, represents a strategic shift toward primary prevention. TPT reduces progression from infection to active disease and supports long-term incidence reduction. Its inclusion within NTEP demonstrates alignment with global evidence advocating preventive approaches as essential to elimination (Odone *et al.*, 2018).

Collectively, these programmatic components reflect a multidimensional strategy that integrates technological innovation, patient-centered support, surveillance strengthening, and health system reform. While implementation challenges persist, the structural and strategic architecture of NTEP provides a comprehensive framework capable of accelerating progress toward TB elimination. The extent to which these

mechanisms translate into sustained epidemiological impact ultimately determined the feasibility of having achieved India's 2025 elimination target. Although the target was missed due to factors like COVID-19 disruptions and persistent gaps, these components continue to support ongoing TB control efforts toward global 2030 goals (WHO, 2023).

LIMITATIONS

This article is a narrative review and, by design, does not follow a formal systematic review methodology. A structured PRISMA-based screening process, standardized risk-of-bias assessment, and quantitative meta-analysis were not conducted. Consequently, although relevant literature and policy documents were carefully selected to ensure thematic comprehensiveness, the review may introduce selection bias.

The review primarily relies on secondary sources, including peer-reviewed publications, national policy documents, and reports from governmental and international agencies. While these sources provide authoritative and policy-relevant insights, they may emphasize programmatic achievements and strategic intentions, with comparatively limited independent evaluation data.

Furthermore, tuberculosis epidemiology and program performance indicators in India are dynamic and subject to periodic revision. Rapid policy adaptations, evolving drug-resistance patterns, and post-COVID-19 recovery trends (including post-2025 policy revisions) may influence future interpretations of program effectiveness. Therefore, some observations presented in this review should be interpreted within the context of continuously emerging evidence.

CONCLUSION

The National TB Elimination Program (NTEP) represents a substantial evolution in India's response to tuberculosis, transitioning from a control-oriented framework to an ambitious elimination agenda. Strengthened surveillance systems, expansion of rapid molecular diagnostics, universal drug susceptibility testing, digital patient management platforms, nutritional support initiatives, and structured private sector engagement collectively demonstrate significant programmatic progress. These achievements reflect improved detection capacity, enhanced treatment standardization, and greater patient-centered support-critical pillars for interrupting transmission and improving outcomes.

Despite these advances, persistent challenges continue to have impeded accelerated progress toward elimination. Underreporting, diagnostic delays, multidrug-resistant TB, treatment adherence barriers, socioeconomic vulnerabilities, and disruptions such as those experienced during the COVID-19 pandemic highlight structural and systemic constraints. Without

sustained and adaptive responses, these factors risked slowing momentum toward India's missed 2025 target.

In this context, the strategic integration of pharmacists into NTEP offers an important opportunity to strengthen program performance. From community-level early referral and antimicrobial stewardship to hospital-based pharmacovigilance, drug-drug interaction monitoring, and support in complex MDR-TB management, pharmacists can enhance therapeutic safety, adherence, and overall treatment success. Formal inclusion of pharmacists within national TB guidelines, accompanied by targeted capacity building, would further institutionalize their contributions.

Achieving TB elimination demands multidisciplinary collaboration, data-driven governance, and sustained political commitment. By consolidating existing gains while systematically addressing structural gaps-and by leveraging the expertise of underutilized health professionals-India can accelerate progress toward sustained TB control and a TB-free future aligned with global 2030 goals.

ABBREVIATIONS

TB: Tuberculosis; **NTEP:** National Tuberculosis Elimination Programme; **RNTCP:** Revised National Tuberculosis Control Programme; **MDR-TB:** Multidrug-Resistant Tuberculosis; **WHO:** World Health Organization; **DOTS:** Directly Observed Treatment, Short-Course; **UDST:** Universal Drug Susceptibility Testing; **HIV:** Human Immunodeficiency Virus; **MoHFW:** Ministry of Health and Family Welfare; **MeSH:** Medical Subject Headings; **NSP:** National Strategic Plan; **DTPB:** Detect, Treat, Prevent, and Build; **CBNAAT:** Cartridge-Based Nucleic Acid Amplification Test; **LPA:** Line Probe Assay; **DBT:** Direct Benefit Transfer; **TPT:** Tuberculosis Preventive Therapy; **COPD:** Chronic Obstructive Pulmonary Disease; **UN:** United Nations.

CONFLICT OF INTEREST

The authors declare that there is no conflict of interest.

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Cite this article: Hussain A. National Tuberculosis Elimination Programme (NTEP) in India: Achievements, Ongoing Challenges, and the Expanding Role of Pharmacists. *J Pharm Pract Comm Med.* 2027;13(1):10-7.