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A Framework for Field Implementation for Tuberculosis Screening in India: Lessons from the 100 Days TB Campaign in Jharkhand, India

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ABSTRACT

India's 100 Days TB Campaign proposes to scale up active case finding by integrating screening activities into the general health system, expanding symptom profiles, and applying a structured vulnerability mapping exercise to reach individuals at higher risk. However, the implementation across districts greatly differs, with consequences of variable quality in screenings, fragmentary diagnostic pathways, and delays in monitoring systems. These then reduce sensitivity at each step of the screening cascade, with implications for campaign cost-effectiveness. Experiences from the 2024-25 implementation in tribal districts of Jharkhand highlight operational challenges; yet, simultaneously offer a number of practical lessons on how TB screening could be strengthened without overwhelming frontline workers or the health system. This paper outlines an implementation framework that standardises vulnerability and symptom assessment, strengthens the use of X-ray and NAAT as first-line diagnostic tools, and transitions to real-time, individual-level monitoring systems. It is expected that the screening yield will increase, diagnostic efficiency will improve, and intensive campaigns will eventually translate into meaningful case detection in vulnerable populations.

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INTRODUCTION

Early detection remains the backbone of India's plans for the elimination of tuberculosis (TB) disease [1,2]. Even after improving the existing infrastructure for detection to a great extent, early detection of TB cases and in risk groups remains dependent on community and health care systems [3]. Active Case Finding (ACF) has thus become an important part of the National Tuberculosis Elimination Program (NTEP), with various programs targeting people not easily reachable through existing health care systems [4].

The 100 Days TB Campaign was planned and formulated as a focused and a specific measure in terms of a concerted effort by Accredited Social Health Activists, community health officers, and primary health centres, along with district levels, in trying to collectively strengthen the ACF. The focus on vulnerability mapping, extended symptoms, and enhanced links in diagnose also marked a major programmatic improvement [5]. The campaign perchance a major improvement in terms of coverage and yields through focusing on the risks of being diagnosed.

However, on actually implementing the measures in the field, some systemic problems came to fore. First among these was the lack of standardization in the screening instruments as well as criteria. Vulnerability criteria were assessed in varying manners, sometimes on the basis of personal opinion, and hence there were inconsistencies in identification of risk groups [6]. Without a common screening method, the same people could be identified as vulnerable in one place and not in another, thus undermining the efficacy of target screening.

Moreover, the monitoring systems contributed to the problem. The continued usage of aggregate reporting formats prevented the immediate confirmation of the attrition along the screening cascade. It was not possible to know if the screened individuals were subjected to the diagnosis test or the treatment process at the district and state levels [7].

A third regard concerning efficiency and cost-effectiveness. There was a lack of consistent screening practices, which, together with inadequate diagnostic algorithms, created a high number of probable cases without a corresponding diagnostic yield, increasing the cost per case [8]. Additionally, a number of non-specific symptoms that could be considered in a screening list decreased efficiency because they did not contribute significantly to the probability of a positive bacteriological TB case [9]. The issues that have been witnessed in the tribal districts of the state of Jharkhand during the 100 Days TB Campaign have pointed out the difficulties, as well as the solutions that can be easily implemented without burdening the health workers. This manuscript gives a synthesis of the efforts, thereby forming an implementation plan that can help in enhancing the efficiency of the process.

Methodology

This paper is grounded on an implementation analysis of the 100 Days TB Campaign, which was performed in 2024-2025 in selected tribal areas of Jharkhand. This implementation analysis relies on three different sources of information, namely (i) experience gained from planning and implementing the campaign, (ii) the reviewing of the micro plans, screening, and reporting forms that were conducted in the campaign, and (iii) unstructured interviews with its main stakeholders, namely ASHAs, CHOs, lab, clinicians, as well as TB programs of the districts.

Operational bottlenecks were enumerated at different stages of the screening process, namely vulnerability identification, symptom screening, referral for chest X-ray, NAAT testing, and entry of data at Nikshay. These findings were validated by programmatic indicators such as the number of presumptive cases, use of X-ray services, NAAT testing, and the time taken for initiating treatment. The lessons thus learned were used for devising an implementation plan that adhered to national guidelines and World Health Organization guidelines on TB screening [2,10]. Patient-level data was not analysed.

Results

Pre-Implementation Phase

But to screen effectively, the reality of district-level capacity must be understood first. The districts need to identify the availability and functionality of X-ray machines, NAAT machines, power backup, availability of qualified technicians, methods of transporting samples, and availability of manpower at the implementation level. In tribal or difficult areas, mobile X-ray vans might be needed or different models of service delivery.

Workforce orientation should be specific and action-oriented and not general in nature. Frontline workers need orientation on vulnerability identification, effective symptom surveillance, testing criteria for X-ray and NAAT tests, and sustenance of simple line listings. They also need refreshers on interpretation of chest X-ray readings with a focus on avoiding empirical treatment in situations where bacteriological proof could be made. Community orientation through community leaders and self-help groups continues to play important roles in health-seeking behaviour in tribal communities.

Vulnerability Mapping

In the Jharkhand campaign, the marking of smokers and alcohol users was restricted by the presence of stigma, and the evaluation of malnutrition was sometimes abandoned due to the lack of equipment and training. the evaluation of adult men was also often done dearly due to home visits conducted by the program during the daytime. The implementation of the yes/no vulnerability calculator, conducted on a regular routine through community interactions such as a village meeting, ration, and self-help group, turned out more accurate in reaching the targeted population. The usage of mid-upper arm circumference tape measure facilitated the accurate evaluation of under-nutrition.

Symptom Screening

Although the expanded symptom list employed in the campaign adjusted for the fact that the symptom profile of TB is not consistent, it was observed that several signs and symptoms, including nonspecific signs (such as feeling tired, loss of appetite), yielded a high number of presumptive without a proportional increase in sensitivity [8,9]. There was also greater efficiency in screening when high-yielding signs/symptoms, vulnerability status, and X-ray results were primarily employed to determine the need for NAAT testing. Blending screening with services offered for non-communicable diseases, Village Health Nutrition Days, or immunizations helped keep coverage without overloading health workers.

Chest X-ray is identified as the most sensitive method in the screening process. In combination with confirmatory testing through NAAT, this is currently considered to be most reliable diagnostic pathway in resource-limited settings [9,10]. It is important to provide support to the functionality of the existing X-ray facilities on a daily basis. Use of public-private partnerships may help infilling these deficiencies in resource-limited districts.

NAAT testing should become a mandatory process for persons who have abnormal chest X-rays or a clinical suspicion of tuberculosis. Prior planning for the transportation of the samples, the supply of the cartridge, and the lab activities is equally important. Focused training and feedback were effective in enhancing the confidence of the health professionals in interpreting the chest X-rays.

Data Systems and Monitoring

There is aggregate reporting formats used during this campaign made verification and attrition in the cascade difficult. The individual real-time entry into Nikshay was much more accurate than contact. The line list with Validation ensured that there were minimal overlap and easy follow-up. The dashboards developed for recording inputs such as cartridge stock, technician time, X-ray function, and transport, and outputs gave a more realistic estimate of their performance in terms of districts' capacity [7].

Post-Implementation Stage

After the screening, the next major goal is to ensure that bacteriologically confirmed cases are treated. Those with abnormal chest X-rays and NAAT negativity require follow-up. Review meetings

involving CHOs, senior treatment supervisors, and medical officers in charge assisted in the identification of bottlenecks in the process of vulnerability assessment, symptoms recorded, referral for diagnosis, and Nikshay entry. The cost per case detected and the yield in both vulnerability and population-level screenings served as the criteria for the adaptation of subsequent rounds.

Structured Flow of Screening

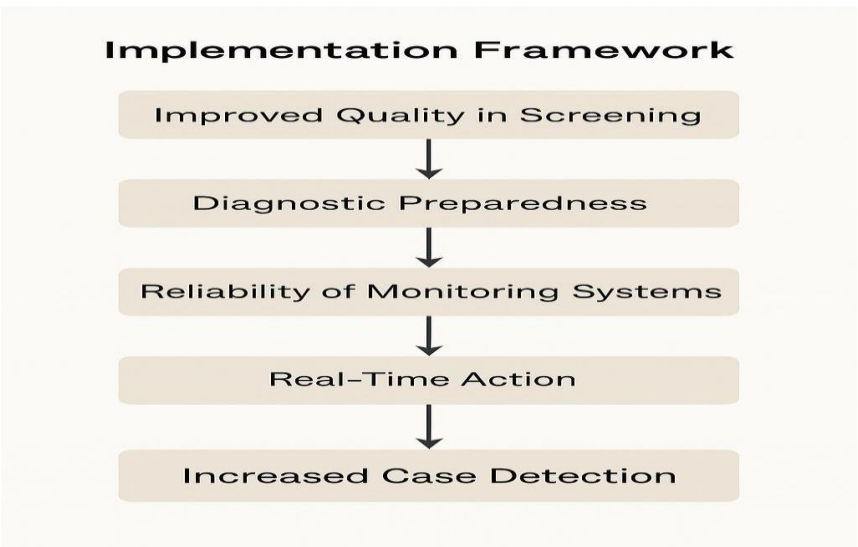
The proposed screening process thus has a sequential logical flow that includes vulnerability assessment, targeted symptom screening, chest X-ray for all vulnerable or symptomatic persons, NAAT testing for persons with abnormal X-rays or clinically suspected ones, rapid Nikshay enrolment, validation of the registered persons, and connecting them with treatment services. Continuous monitoring of input and process variables allows for adaptive planning, and occasional assessments allow for learning during each campaign round (Figure 1).

DISCUSSION

This particular implementation framework directly deals with the gap that was perceived in the 100 Days TB Campaign because it deals with the three major interwoven factors in successful screening of patients – objectivity in risk assessment, preparedness in diagnosis, and the reliability of data. The lack of a standardized vulnerability tool affected the role of field agents to make a priority list of vulnerable patients because the dilution of effort was a result of such a lack. Second, the framework confirms the insufficiency of symptom screening alone in high-burden areas. Chest X-ray and NAAT have been prioritized, which corresponds to the current evidence base regarding the sensitivity of diagnosis and increases the screening test yield [9, 10]. In addition, the current screening demand will be considered to meet the cost-effectiveness issue that has long been associated with the implementation of ACF programs [8]. Third, individual-level, real-time data systems stand out as key program implementation facilitators for accountability. Aggregate reporting tends to hide losses throughout the cascade and ultimately hinders timely interventions. Screening made possible by the integration of the Nikshay service with the effort at the front lines can immensely enhance campaign effectiveness as a whole by facilitating quick validation and start of treatment for those identified as positive for infection, as suggested in reference number 7 Taken together, these features mean that the emphasis of TB screeners is now shifted away from quantity and toward quality. As is evident from this framework, improvements in finding more cases for TB are possible without increasing complexity, but through standardization, enhancing diagnosis, and data use—especially for at-risk groups.

Figure 1:

Figure 1. Organized implementation model of TB screening in intensive campaigns, representing the flow from Vulnerability Mapping to diagnosis, treatment, and monitoring.



RECOMMENDATIONS

For national-scale implementation, it is important to acknowledge the great variability that exists between states in the context of epidemiology, health system capacity, diagnostic facilities, geographic distribution, and the pool of healthcare workers. A "one-size-fits-all" strategy of implementation will, thus, prove neither practicable nor preferable. Rather, this framework should be accepted as a common operating platform that can allow variability in accordance with state, as well as district, modifications.

Some aspects of the framework are more universally applicable and need to be standardized. These include the use of a simple and standardized vulnerability assessment form with clearly articulated criteria; high-sensitivity diagnostics, starting with chest X-ray followed by NAAT, forming the backbone of the screening cascade; individual-level real-time data entry directly linked to Nikshay; and process and output tracking. All of these need standardization to ensure that there is no ambiguity and that there are comparability and quality of the screening process.

Some other parts will require adaptation based on context. In settings with established diagnostic capabilities, there might be greater focus on in-facility X-ray and NAAT strategies, whereas in settings with limited or difficult access, there might be greater reliance on mobile X-ray, dynamic ways of transporting samples, or staggered screening schedules. The vulnerabilities could also look different based on context—slums, tribes, migrants, or factories—requiring very small changes to their distribution networks with the same vulnerability indicators.

The use of technology and dashboards should be pilot tested in the states before scaling up. Additionally, the building of capacity, especially in clinician training for interpreting chest X-ray images, should be adapted for the existing skill and workload base. Most significantly, results of performance should be considered in the context of existing capacity and should not be compared directly between districts or states with differing capacities.

Finally, there should be cost-effectiveness analyses done from a formal perspective with a view to informing long-term planning based on different epidemiological or health system contexts. Insights from such findings will inform the different combinations of elements within the frameworks that bring about the most additional benefit, hence the efficiency within the national scale-up.

CONCLUSION

The experience from Jharkhand shows that outreach itself is not sufficient. TB screening becomes meaningful only when the vulnerability mapping is objective, diagnostics are planned and functional, and monitoring systems capture real-time information at an individual level. A structured implementation framework-simple enough for frontline teams and yet robust enough for district level planning-can substantially enhance the quality and efficiency of TB screening in India. Integrating these best practices into future 100 Days campaigns and other NTEP activities presents a realistic pathway toward better case detection with resource conservation and enhancement of programmatic impact.

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