ORIGINAL ARTICLE

Community-Based Active Case Finding for Tuberculosis in Rural Uttar Pradesh: Yield and Epidemiological Profile

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ABSTRACT

Background: Active case finding is a critical strategy under the National Tuberculosis Elimination Programme (NTEP) to identify undiagnosed TB cases in the community. By reducing diagnostic delays and interrupting transmission, ACF plays a crucial role in advancing India's goal of TB elimination. **Objectives**: The study aimed to assess the effectiveness of Active Case Finding (ACF) in a rural community by identifying presumptive TB cases and high-risk groups, describing their demographic and clinical characteristics, estimating prevalence and diagnostic yield, calculating number needed to screen, and exploring operational barriers . **Materials and Methods:** A cross-sectional screening activity was conducted in three randomly selected villages . Sample was collected from the eligible cases and the positive cases were linked to treatment under NTEP guidelines. **Results:** Out of 1100 individuals screened, 130 (11.8%) were identified as eligible for sputum collection. Of these, 78 (60%) underwent diagnostic testing. Five individuals (6.4% of those tested) were found to be TB positive. **Conclusion:** Even though barriers like stigma associated with the disease and logistical challenges were observed, the activity highlights the importance of community-level TB screening for early detection and prompt initiation of treatment, contributing to TB control efforts.

KEYWORDS

Tuberculosis, Active case finding , Rural population , Epidemiology

INTRODUCTION

Tuberculosis remains a major public health challenge in India, contributing nearly one-fourth of the global burden. Under National Tuberculosis Elimination Programme (NTEP) , TB incidence rate decreased by 17.7%, from 237 per 100,000 in 2015 to 199 per 100,000 in 2022. (1) Despite this progress , a substantial number of TB cases remain undiagnosed or are diagnosed late, especially in rural and hard-to-reach populations. These "missing" cases contribute to ongoing transmission and hinder the country's progress toward TB elimination goals. Recognizing this, the Government of India has launched the TB Mukt Bharat Abhiyan under NTEP .

Active case finding refers to the systematic screening for active TB in at risk populations, typically implemented outside the health facilities (community or congregate settings). (1) Interventions for ACF may encompass a variety of strategies, ranging from house hold or social contact tracing, door to door screening, facility based case finding, targeted screening of high risk groups or retrospective contact. (3) Unlike passive case finding, which relies on symptomatic individuals seeking care, ACF has the potential to uncover cases early . Several studies, including those under the Axshya Project and USAID-supported initiatives, have highlighted the role of ACF in enhancing TB detection in underserved settings. (4)

In this context, the present community based study was conducted in a rural setting of Uttar Pradesh with the aim of assessing the effectiveness of community-based ACF in detecting pulmonary TB .

The specific objectives of the study were a) to determine the proportion of individuals identified as presumptive TB cases or high-risk groups eligible for sample collection, b) to describe their demographic and clinical characteristics c) to estimate the prevalence of TB in the study population , assess the diagnostic yield and calculate the number needed to screen (NNS), and d) to identify the challenges encountered during the implementation of ACF in a rural setting

MATERIAL & METHODS

Study Type and Design: This was a community-based cross-sectional study.

Study Setting: The study was conducted in the rural field practice area of the Department of Community Medicine, Noida International Institute of Medical Sciences. The Rural Health Training Centre is located at the Primary Health Centre, Jewar, in Gautam Buddha Nagar district, Uttar Pradesh. The PHC caters to a population across 10 villages, of which three villages—Jewar Bangar, Sabota

Mustafabad, and Mewla Gopalgarhi—were selected using simple random sampling.

Study Population: All individuals aged more than 15 years residing in the selected households were included.

Study Duration: The study was conducted from April to July 2025

Inclusion Criteria

- Individuals aged more than 15 years
- Residents of selected households who provided consent

Exclusion Criteria

- Individuals not available after two visits
- Individuals unwilling to participate

Sample Size Calculation: Based on Census 2011, the average household size ranged from 5.78 to 5.81. It was assumed that at least four individuals aged >15 years would be available per household. A total of 20% of households from each village were selected: 62 from Jewar Bangar, 117 from Sabota Mustafabad, and 87 from Mewla Gopalgarhi, totaling 266 households. This yielded an estimated sample size of 1064 individuals; however, 1100 individuals were ultimately enrolled.

Data Collection Technique: The first household in each village was selected randomly followed by consecutive sampling till the desirable sample size was achieved. A trained team consisting of interns , medico social workers and laboratory technician conducted door-to-door screening using a structured questionnaire assessing symptoms (cough ≥2 weeks, fever, weight loss, night sweats) and high-risk conditions (diabetes mellitus, HIV, chronic kidney disease, immunosuppressant use, smoking, alcohol use and past history of tuberculosis). Individuals meeting any criteria were considered eligible for sputum examination.

Eligible individuals provided sputum samples collected under aseptic precautions in sterile falcon tubes. Samples were transported to the Department of Microbiology and tested using Truenat.

Data Analysis: Data were entered into Microsoft Excel and analyzed using SPSS version 28.0. Continuous variables were expressed as mean and standard deviation, while categorical variables were presented as frequencies and proportions.

Ethical Issues and Informed Consent: Ethical approval was obtained from the Institutional Ethics Committee. Written informed consent was obtained from all participants prior to enrolment.

RESULTS

130 individuals (11.8%) out of 1100 screened population met the eligibility criteria for sputum collection. (Table 2) These individuals reported one or more of the following symptoms: persistent cough for ≥2 weeks, fever, night sweats, unexplained weight loss, or reported a past history of TB or belonged to high-risk categories such as smokers , alcoholics , diabetes, HIV, chronic kidney disease and use of immunosuppressive drugs. Among the 130 eligible cases, sample collection was done for 78 individuals (60%) which was evaluated by Trunaat. (Table 2) Of the 78 eligible people whose sample were collected , 21 were presumptive TB cases and 57 belonged to high risk groups . The remaining 52 individuals (40%) did not complete testing due to various reasons (Figure 1).

Table I: Demographic and clinical profile of individuals who underwent sputum testing (N = 78)

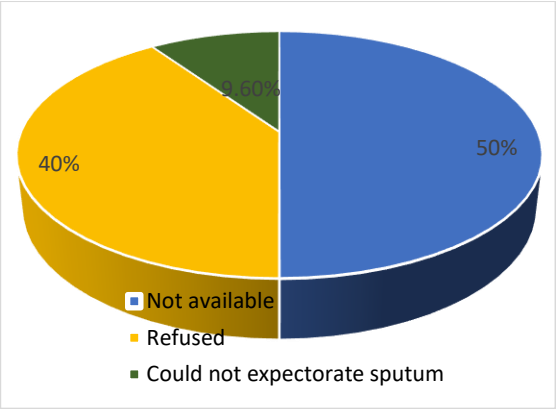
Age Group (years)	*Number*	*Percentage (%)*
21–39	9	11.5
40–59	11	14.1
≥60	58	74.4
Gender	***Number***	***Percentage (%)***
Male	47	60.3
Female	31	39.7
History of Past TB	***Number***	***Percentage (%)***
Yes	21	26.9
No	57	73.1
Diabetes Status	***Number***	***Percentage (%)***
Yes	9	11.5
No	69	88.5
Presumptive TB	***Number***	***Percentage (%)***
Yes	21	26.9
No	57	73.1
H/O Smoking	***Number***	***Percentage(%)***
Yes	19	24.4
No	59	75.6
H/O Alcohol	***Number***	***Percentage (%)***
Yes	12	15.4
No	66	84.6

No HIV positive case , H/O chronic kidney disease and use of immunosuppressant was present

A total of 5 cases were diagnosed as positive for tuberculosis, resulting in a diagnostic yield of 6.4% among those tested. The overall prevalence of tuberculosis in the screened population was 0.45%, equivalent to 450 cases per 100,000 population..

All five diagnosed cases were promptly referred to the DOTS centre and were started on appropriate anti-tubercular therapy (ATT) as per program guidelines. Contact tracing and counselling were also initiated for their household members; The number needed to screen to detect one case of tuberculosis was found to be 220.

Figure 1 : Reason for inability to collect sample



DISCUSSION

The proportion of eligible cases for sample collection (11.8%) was consistent with findings from similar community-based studies. The NTEP expects that around 5% of people in the community with TB symptoms will be identified through house-to-house screening. (4) While

our study has exceeded the expected threshold set by NTEP and the high proportion found in our study can be attributed to inclusion of additional asymptomatic high risk groups . It may be mentioned that out of 78 people tested , 26.9% were presumptive TB and the rest belonged to any of the high risk categories eligible for sample collection . In the Kolkata-based active case finding (ACF) study (5), only 0.3% were identified as presumptive TB patients out of total screened while the study conducted in a tribal setting of Madhya Pradesh reported a proportion of 14.9% eligible for testing (6). These comparisons highlight the contextual variability in the proportion of eligible individuals for testing influenced by the population characteristics and inclusion criteria adopted in different settings.

The mean age of people who underwent testing in our study was 63.6 years (SD ±14.9), notably higher than 43.1 years (SD ±17.1) reported in an ACF based study in Kolkata (5). Chinnakali P et al (7) also reported a lower mean age compared to our study. The higher mean age in our study may be attributed to the timing of the active case finding (ACF) activities, which were conducted during the day when younger, productive-age individuals were likely to be away from home due to work or educational commitments. As a result, older adults, who tend to be at home during daytime hours, were more likely to be available for screening. This demographic shift may also have implications for the observed yield, as older age is often associated with higher risk of TB due to comorbidities.

Males constituted 60.3% of our population who were tested , which is comparable to Dey A et al (5) with 57.2% male participants . History of past TB was reported by 26.9% among the sample collected patients, significantly higher than 7.4% in the study reported by Dey A et al (5), suggesting a greater cumulative exposure or burden in our study population. Known diabetes was present in 11.5% in our study , lower than 21.5% observed by Dey A at al (5).

In the present study, the overall prevalence of microbiologically confirmed tuberculosis in the screened rural population was 0.45% (450 per 100,000 population), based on NAAT testing. It has been observed that continued and intensive ACF activities, when coupled with robust diagnostic support, can play a crucial role in progressively lowering TB prevalence in high-burden communities and sustaining the gains achieved over time.

In a study by Bhat et al. among the Saharia tribe in Madhya Pradesh, implementation of an ACF intervention reduced the prevalence of tuberculosis from 1,357 to 752 per 100,000 population. (8) Similarly, the ACT3 study from Vietnam reported prevalence rate of 126 per 100000 population in the intervention arm—after three years of sustained annual active case finding using NAAT (Xpert MTB/RIF) and chest radiography which was found to be lower than the control arm with a prevalence of 226 per 100,000 population. (9)

Our study identified the eligible population for sample collection to be 130 among screened individuals . However, only 60% of those eligible were actually tested . Reasons for non-testing included non-availability for sample collection during further visits , reluctance due to stigma and inability to produce sputum. These findings underscore the importance of community sensitization, strengthening follow-up mechanisms and training staff for improved sputum collection in future screening drives.

While not ideal, this rate is consistent with findings from other outreach efforts in India reported by Dey A et al (5) and Vyas A et al (10) where logistical challenges and community-level barriers often affect testing coverage. In a study by Nagaraja SB et al , 41.6 % of those eligible were tested in Union Axshya Project , while a higher proportion was seen among the eligible , i.e 74% by Project THALI supported by the Global Fund (4) . Mark GB et al reported a much lower sample collection rate of 33% in their intervention group and 41% in the control group in a community based study done in Vietnam. (9)

One of the notable challenges encountered during the implementation of community-based active case finding (ACF) in this study was the lack of trust and cooperation from community members. A similar barrier was reported in a study conducted in Kolkata, where community mistrust and lack of engagement were noted as significant impediments to successful TB screening. (5)Such barriers highlight the importance of intensive pre-campaign awareness activities, engagement of local influencers and capacity building of field workers in community rapport-building to enhance the acceptability and success of similar public health interventions in the future.

The diagnostic yield in our study was 6.4% among those tested using NAAT . This is comparable to other community-based TB case-finding program reported by the Union Axshya Project which reported a diagnostic yield of 9.7% conducted at the national level from 2018 – 2020 while the USAID-supported community-based screening initiative in India showed a positivity rate of 7.2% among presumptive cases. (3). Prasad BM et al in his article on Axshya Project carried out at the national level reported a diagnostic yield of 8% which is congruent with our findings. (11)

While our yield is slightly lower, it is important to consider that chest X-ray was not included in our screening algorithm due to resource limitations. The absence of radiological support likely contributed to under-detection. On the contrary, our finding was found to be much lower than the diagnostic yield of 24% reported by Dey A et al. (5) Several factors may explain this difference, including regional epidemiological variations and differing diagnostic algorithms .

The number needed to screen (NNS) to detect one case of active TB varies widely both within incidence settings, depending on the risk group screened, and across incidence settings. (12)

The Number Needed to Screen (NNS) in the present study was 220, indicating a relatively efficient yield of Active Case Finding in the rural community. This finding is comparable to the weighted mean NNS of 271 reported by Garg T et al. for community-based screening. (12) The lower NNS observed in our study compared to some settings, such as a study from Kolkata reporting an NNS of 2183 (5) suggests better targeting or higher underlying disease burden in the study population . The relatively favourable NNS in the present study may be due to the

inclusion of high-risk groups and symptom-based screening which likely enhanced case detection. These findings highlight the importance of targeted community-based interventions in improving the efficiency of tuberculosis case detection in resource-limited rural settings.

Conclusion

Community-based TB screening is an effective strategy to identify undiagnosed TB cases. Strengthening such outreach activities, especially in rural and underserved areas, is vital for achieving TB elimination targets. Active case finding (ACF) remains an essential component of TB control, and improving diagnostic completion among presumptive cases is critical to maximizing its impact. However, several barriers need to be addressed to enhance the effectiveness of ACF initiatives. These include stigma associated with TB and logistical challenges in sputum collection and transport . Addressing these challenges through community engagement, better planning of field visits, capacity building and robust follow-up mechanisms is crucial for improving case detection and ensuring timely initiation of treatment.

Recommendation

Community-based ACF should be scaled up in rural and underserved areas to improve early detection of tuberculosis. Health education activities should be strengthened to improve symptom recognition and encourage early health-seeking behavior. Continuous monitoring and evaluation of ACF activities should be undertaken to identify implementation gaps and improve program effectiveness.

Limitation of the Study

The study was conducted in selected villages of a single rural block, which may limit the generalizability of the findings to other settings. Only 60% of eligible individuals provided sputum samples, which may have led to underestimation of the true tuberculosis burden. The study included individuals aged more than 15 years, thereby excluding pediatric tuberculosis cases.

Relevance of the Study

This study is relevant as it evaluates the effectiveness of community-based Active Case Finding in a rural setting, aligning with national priorities under the tuberculosis elimination program. By focusing on underserved populations, it highlights the feasibility of implementing door-to-door screening strategies in resource-limited settings.

Authors Contribution

All authors have contributed equally.

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Nil

Conflict of Interest

There are no conflicts of interest.

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Declaration of Generative AI and AI Assisted Technologies in the Writing Process

The authors haven't used any generative AI/AI assisted technologies in the writing process.

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