Is it feasible to carry out active case finding for tuberculosis in community-based settings?

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ABSTRACT

Introduction and Objective: To achieve elimination of tuberculosis by 2025, identifying the remaining 25% of missed cases would play a major role. But there is paucity of evidence on this statement. This study aimed to assess feasibility of active case finding for tuberculosis in selected region of Puducherry. Methods: Community based survey was conducted by groups of trained undergraduate medical students. During January 2018, all residents of study area were assessed for presence of presumptive symptoms related to tuberculosis. Presumptive cases of tuberculosis were identified as per the programme definition and the same were facilitated to undergo follow up necessary investigations to rule out tuberculosis through frequent domiciliary visits. The data collection was done using mobile based Epicollect open access app. Feasibility was assessed using indicators namely household coverage, proportions of presumptive cases identified and undergone follow up investigations, number needed to screen for presumptive and confirmed cases of tuberculosis and average time spent per person. Results: Of the 2252 houses, 1746 were covered resulting in a response rate of 77.5% and included 6606 residents. Of the 55 presumptive cases identified (55/6606) 51 underwent investigations (51/55). Two new cases of tuberculosis were diagnosed in this survey. To identify one presumptive and confirmed case 120, 3303 people need to be screened respectively. Conclusion: Active case finding for tuberculosis is feasible provided the health system is able to invest adequate human resources and referral linkages to support peripheral centres.

KEY WORDS: Active case finding, community, feasibility, tuberculosis

Introduction

One of the most dreaded diseases of yore and now, the destructive splotches of Tuberculosis are distinctive in the pages of history. It is caused by *Mycobacterium tuberculosis*, the genus hypothesised to have originate more than 500,000 years ago, and has since remained a permanent challenge for humanity. TB has existed for millennia and remains a major global health problem. It is the 9th leading cause of death worldwide and the leading infectious cause, ranking above HIV/AIDS. Both End TB Strategy and Sustainable Development Goals envisage achieving 90% reduction in TB deaths and an 80% decrease in TB incidence by 2030 compared to 2015. In the year 2016, an estimated 10.4 million individuals across the globe were diagnosed with TB. Overall, 56% of all incident TB cases were from five countries – India, Indonesia, China, Philippines, and Pakistan. India contributes to more than one-fourth of overall TB cases and missing cases in the
globe.

In a group of countries with a large proportion of the world’s TB burden, the National TB Prevalence Surveys are the best method to measure the burden of the disease.

The Revised National Tuberculosis Control Program (RNTCP) aims to eliminate TB by 2025. To achieve this, early initiation of treatment which, in turn, depends on diagnosis would play a major role. For complete diagnosis of estimated cases of TB, there is a strong need to identify nearly 33% of missed cases. Active case finding was proposed under RNTCP to enhance the case finding. In Puducherry, 74% of the total expected cases of TB are notified. Active case finding program has been initiated wherein doctors and/or health-care professionals seek out potential/presumptive cases of TB in several rural areas. The following three TB-risk groups are prioritized to get systematically screened for household contacts of active TB cases, people living with HIV, and current and former workers in workplaces with silica exposure.

Despite of the recent recognition on the role of active case finding, there is dearth of literature on the evidence related to yield and feasibility of conducting this activity in community based activity. In this context, this study was aimed to identify the cases of Tuberculosis through active case finding and to assess feasibility among people living in selected areas of union territory of Puducherry.

**METHODS**

**Study design and setting**

A community-based, cross-sectional, descriptive survey was conducted in Muthialpet and Solai Nagar, Puducherry region. This area caters to the population of 8000. The area is well connected to primary health center (2 km away) and the tertiary care government and private facilities (10 km away) where adequate diagnostic and laboratory services made available related to TB at free of cost. Once the patient is diagnosed to have pulmonary TB, after initial investigation, they would be started on anti-TB regimen under RNTCP through Directly Observed Treatment, Short-Course providers such as multiple purpose workers and Anganwadi workers.

**Study population**

This survey included all individuals living in the study area and who are willing to participate. Houses which were locked even after two visits during the duration of survey were excluded. The study was carried out during the month of January 2018. Since this study objective is to assess the feasibility and yield for active case finding of TB, the whole population under the field practice area of the institute was included without any further sampling.

**Data collection**

Administrative approval was obtained from the state TB officer, RNTCP, Puducherry. After obtaining verbal consent, trained medical undergraduates had assessed the demographic characteristics and presence of presumptive symptoms and signs related to TB. This study was conducted as a part of Re-Orientation of Medical Education program for the medical undergraduates. Details of this program are published elsewhere. A total of 10 teams had performed house-to-house survey using the structured proforma. Before conducting the survey, detailed area map was prepared by individual team. Presumptive TB was operationally defined as the presence of one or more of the following symptoms: cough for more than 2 weeks, fever, recent weight loss, hemoptysis, chest pain, and loss of appetite as per the RNTCP criteria. If an individual was found to have anyone of the presumptive symptoms, they were motivated to undergo sputum examination. After educating the presumptive cases to bring out mucopurulent sputum rather than saliva, spot samples were collected by the survey team in the household. The second container was given to presumptive cases to collect early morning sputum, and the same was collected by the survey team on the next day. If the smear is positive, the individual was followed up regularly for early initiation of treatment against TB. Household members of sputum-positive TB patients were facilitated to undergo contact screening for TB. If the smear was negative or if the patient cannot expectorate, then chest X-ray was taken and reviewed with chest physician. If both smear and chest X-ray results are negative but still the treating physician strongly suspects TB, then they were advised to undergo cartridge-based nucleic acid amplification test (CBNAAT).

**Data management**

The data collection was done using mobile-based EpiCollect open-access app. The data were synchronized on daily basis by the individual teams. Data were analyzed using EpiData Analysis software (version 2.2.2.183 EpiData Association, Odense, Denmark) and developed by JM Lauritsen with windows as the operating system. Participants’ characteristics such as age were summarized as mean (standard deviation). Participants’ gender, literacy, occupation, and associated chronic morbidities were summarized as frequencies and percentages. Indicators related to proportion of presumptive cases and confirmed cases are presented as percentages. Feasibility of the active case finding was assessed using the following indicators: (i) household coverage, (ii) proportions of presumptive cases identified against expected, (iii) proportions of presumptive cases undergone two sputum examinations, (iv) proportions of presumptive cases undergone chest X-ray, (v) proportions of sputum-negative and X-ray-positive cases referred for CBNAAT, (vi) number needed to screen for each of presumptive and confirmed cases of TB, and (vii) average time spent for each participant. Time taken for each activity was estimated based on the logbook of resource utilization.

**RESULTS**

A total of 2252 houses were approached and 1746 were covered resulting in response rate of 77.5%. The 6606
people surveyed from 1746 households contributed to around 4 individuals per family. Around two-thirds of the participants were adults aged 25–64 years, with a mean age of 34.5 years. Males and females were almost equally represented with slight preponderance of females. About half of the participants had literacy of high school and more (47%). Around 12% of the surveyed population had diabetes mellitus [Table 1].

Of the 6606 population surveyed, 55 cases were found to have at least one symptom suggestive of TB (0.83%). Mean age of presumptive cases was significantly more compared to the general population. Similarly, proportions of illiterates are more among presumptive cases compared to others (31.3% vs. 12%). Of the 55 cases, 51 underwent at least one investigation, with 37 subjected to sputum acid-fast bacillus (AFB), and 25 underwent X-ray investigations. Of the 73 sputum smears examined, one found to be positive, and similarly of 25 X-rays, 11 exhibited the findings related to old lesions of TB. However, of the 11 X-rays which had lesions suggestive of TB, only one was reported to have active TB. One pediatric patient was subjected to CBNAAT and the result was found to be negative [Figure 1].

Number of Presumptive cases identified 55
Number of presumptive cases did not undergo any investigation 4
Sputum for AFB 37
Sputum Positive 1
Chest X ray 25
Chest X ray findings 11 Suggestive of Tuberculosis 1
Gene X Pert 1
Negative
Total number of Active TB Cases = 2
Number of prevalent Tuberculosis cases (5+2) = 7
Figure 1: Flow of follow-up investigations performed among presumptive cases

Household coverage in this survey was 77.5% (1746/2252). Of the 55 presumptive cases, 51 (92.7%) cases had undergone follow-up investigations. Of the 36

DISCUSSION

This community-based activity of active case finding carried out from urban area of Puducherry identified two new cases of TB. With the current five TB cases, the prevalence of TB estimated was 0.106% which is equivalent to 106/100,000 population. Compared to the national figure, estimated prevalence in the current study is less.\(^5\) This could be attributed to high socioeconomic status, better living conditions, and easy access to health-care facilities.

The estimated prevalence of TB is lesser even compared to other studies conducted from other parts of India including the study conducted in Puducherry region.\(^9\) Compared to other studies, the current study is different in terms of population studied and type of laboratory investigations performed among presumptive cases. The current study used the definition of cough for more than 2 weeks to identify presumptive cases where majority of the previous studies had used the cutoff of 3-week duration cough. Similarly, in this study, the primary diagnosis was based on sputum smear for AFB. In case, if the smear was negative or unable to expectorate, presumptive cases are referred for X-ray. In other studies

| Factor                      | n (%) |
|-----------------------------|-------|
| Age groups                  |       |
| 0-14                        | 1062 (16.1) |
| 15-24                       | 982 (14.9)   |
| 25-34                       | 1098 (16.7)  |
| 35-44                       | 1069 (16.2)  |
| 45-54                       | 930 (14.1)   |
| 55-64                       | 774 (11.7)   |
| 65-96                       | 677 (10.3)   |
| Sex                         |       |
| Male                        | 3226 (48.8) |
| Female                      | 3380 (51.2) |
| Literacy                    |       |
| Illiterate                  | 784 (12)     |
| Primary                     | 904 (13.8)   |
| Middle school               | 1766 (27)    |
| High school                 | 1226 (18.8)  |
| Graduate                    | 1851 (28.3)  |
| Occupation                  |       |
| Unemployed                  | 488 (7.4)    |
| Housewife                   | 1684 (25.5)  |
| Students                    | 1475 (22.3)  |
| Employed                    | 2445 (37)    |
| Retired                     | 308 (4.7)    |
| Chronic morbidity           |       |
| Diabetes mellitus           | 794 (12)     |
| Hypertension                | 852 (12.9)   |
| Angina/stroke               | 84 (1.3)     |
| Asthma                      | 114 (1.7)    |

Table 1: Sociodemographic characteristics of population participated in the active case finding survey 2018, Puducherry

smear-negative presumptive cases, only seven (19.4%) reached for follow-up X-ray investigation. To identify one presumptive case, 120 people need to be screened. Similarly, to diagnose one case of TB, the system needs to screen 3303 individuals. Average time consumed per person interview was 9.5 min. Without traveling time, this activity consumed 5.5 min. Follow-up activities to achieve final diagnosis among presumptive cases needed an average of 129 min (2 hours).
of active case finding projects, the diagnosis was entirely based on sputum AFB.

Furthermore, the study differs by its target population involved. The current study involved all community members regardless of their age, living status, and their comorbidities. Other reported studies from the past literature had mainly focused vulnerable groups such as orphanages, slums, prisoners, and construction workers.

In this study, more than 90% of the presumptive cases had undergone follow-up investigation. Since this study was carried out as an exclusive activity with the team of 40 members for the whole month, the similar results cannot be expected in programmatic settings. On an average, each presumptive case required three visits to counsel and make them understand the need for follow-up investigations.

Despite the high response rate for follow-up investigations, proportions of smear negative patients who underwent follow-up X-ray was only 20%. Even after the persuaded efforts, presumptive cases are not willing to make extra visits. When the perceived susceptibility is considerably low, performing follow-up investigation is challenging even more it is difficult to carry out sequential tests. This raises the need to explore the shift for performing X-ray and sputum simultaneously rather than sequential manner of sputum followed by X-ray.

In the current study, of the total 37 smears tested, one found to be positive. The positive smear was observed the early morning second sputum sample. This emphasizes the need to stringently follow the second sputum and the yield of early morning sputum.

This study has the following strengths. The current study was conducted based on the recent guidelines suggested by RNTCP for active case finding. The response rates for follow-up investigation among presumptive cases were 93%. Repeated visits were made to avoid the noncompliance for diagnosis of TB among presumptive cases. Furthermore, this is one of the very few studies which demonstrated the feasibility of active case finding in community-based settings.

Yet, the study findings should be interpreted with caution considering the following limitations. The total household coverage was 77%. Despite the repeated visits for locked houses, the remaining 23% were unable to be covered. The nonresponded households included 15.2% (77/506) of households which did not give consent. Due to social stigma and fear of disease, certain proportions of households did not give consent.

This study has following implications. Active case finding can fill the gap of large number of missed cases of TB, providing that the health system is willing to invest a cadre of human workforce for house visits. Missing second sample, especially missing early morning sample, can unduly miss the diagnosis of TB. When the presumptive cases are referred for follow-up investigation, health system has to ensure strong two-way feedback and referral linkage to ensure the compliance for follow-up investigations.

CONCLUSION

Active case finding is feasible in community-based settings. Yet, considering the time involved, the health system needs to additionally invest on human resources and strengthening of peripheral health institutes for follow-up diagnosis. There has to be a strong two-way feedback mechanism with the secondary and tertiary care hospitals for appropriate clinical management.

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Conflicts of interest

There are no conflicts of interest.

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