Burden of Pulmonary Tuberculosis among Tribal Population: A Cross-sectional Study in Tribal Areas of Maharashtra, India

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Abstract

Background: It is very important to identify and treat infectious pulmonary tuberculosis (PTB) patients at the earliest to save the life of the patients and to prevent the transmission of infectious agent to others. As per Global Tuberculosis (TB) Report 2017, an estimated 28 lakh new TB cases occur and 4.23 lakh people die due to TB annually. Due to the poor health services and lack of awareness, particularly vulnerable tribal groups are vulnerable or at risk to many diseases including TB. Methodology: A community-based cross-sectional study was conducted to determine the burden of pulmonary TB (PTB) among adult tribal population of Maharashtra. House-to-house visit was conducted to identify the presumptive TB cases and sputum microscopy and chest X-ray were done to confirm the diagnosis. Results: In the survey, 6898 tribal adults were interviewed from 8 tribal clusters, and among them, 144 (2.1%) presumptive TB cases were identified. The most common symptom among the presumptive TB cases was cough for >2 weeks (93.1%). The prevalence of PTB in the study area estimated is 26.1 per lakh tribal population per year. Conclusion: The current study shows that the estimated burden of PTB among tribal population is within the wide variation of prevalence reported from other studies in different tribal communities (133–3294 per lakh population) in India. The current study provides vital information on the burden of TB among the tribal population of Maharashtra which can be used as a baseline data for future epidemiological studies.

Keywords: Presumptive tuberculosis case, prevalence, tribal population, tuberculosis

Introduction

One-third of the global population is infected with Mycobacterium Tuberculosis (TB), of whom 5%–10% develops TB during their lifetime, which might infect others, as an active case of pulmonary TB (PTB) can infect 10–15 persons per year.[1] It is very important to identify and treat infectious PTB cases at the earliest to save the life of patients and also to prevent transmission of infectious agent to others. India accounts for one-fourth of the global TB burden. Annually, an estimated 28 lakh TB cases occur in India.[2] In 2017, India re-estimated the burden of TB by incorporating more information from different sources including the private sector. India has the highest burden of both TB and multidrug-resistant TB (Global TB Report 2017).[3]

The tribal population (scheduled tribes) is estimated as 104.54 million, 8.6% of the India’s total population (2011 Census).[4] There are certain tribal communities in India who have declining or stagnant population, preagricultural level of technology, low level of literacy and are economically backward, such groups have been identified and categorized as particularly vulnerable tribal groups.[5,6] Due to the poor health services and lack of awareness, they are vulnerable or at risk to many diseases including TB. Studies in tribal communities help to gather information on the burden of TB which will play a vital role for planning control and preventive strategies for TB. However, the tribal community studies on TB are limited to few specific tribal communities.[7–17] In view of the paucity of research in this vulnerable group, the current study was conducted to determine the burden of PTB among tribal population of Maharashtra, India.

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**Methodology**

A community-based cross-sectional study was conducted in tribal districts (based on the tribal population) of Maharashtra (Ahmadnagar, Dhule, Nashik, Nandurbar) from March 2015 to July 2017 to determine the burden of PTB among adult (≥15 years) tribal population. Adults (aged ≥15 years) and resident of the selected villages were included in the study and individuals, who were not available even after 3 revisits by the field investigators were excluded.

The sample size estimated was 6293 considering the prevalence of PTB among tribal adults as 3294 per lakh tribal population with a precision of 16% at 95% confidence level, design effect of 1.3 and nonresponse rate of 10%. As the study was conducted at 8 clusters (6293 for 8 cluster = 787 per cluster), the final sample size calculated was 6400 tribal adults (800 × 8 clusters = 6400). In the current study, random cluster sampling method was used to select 8 clusters (villages) in the 4 tribal districts. House-to-house survey was conducted in the selected clusters. The households were numbered and household wise families members list was prepared. The eligible individuals (age ≥15 years) were identified from the list prepared. The time for individual interview was fixed with the head of the family so that the interview could be taken at their convenience time. Efforts were taken to include all the eligible participants of the family; the procedure was continued till the sample size was achieved. The enrolment was continued till a specific geographical portion such as one side of the main road, specific area or hamlet was fully covered even if the target was achieved. If the target was not achieved in one selected cluster then the whole procedure was repeated in an additional village which was socioculturally similar and closed to the selected cluster. Nontribal population in selected clusters were also included in the study for the public interest, but only the data of tribal population was extracted and analyzed.

During the survey, presumptive TB cases were identified based on symptoms, sputum samples were collected after proper counseling and consent and sent by courier to the Intermediate Reference Laboratory and Mumbai for microscopy (Fluorescent Microscopy). All the sputum negative presumptive TB cases patients were counseled and referred for chest X-ray at the nearest health center with X-ray facility to rule out sputum negative PTB. Efforts were made to screen all the contacts of newly diagnosed sputum positive PTB patients. Newly diagnosed TB cases were referred to the nearest health center to initiate the treatment with the help of Local Revised National TB Control Programme (RNTCP) staff.

The data were collected by a structured questionnaire and entered in EpiData version 3.1 (The EpiData Association, Odense, Denmark). Data analysis was done using IBM Statistical Package for the Social Sciences (SPSS) Statistics for Windows, Version 21.0. (developed by IBM Corp, Armonk, New York). The results were presented in proportion and percentages.

**Operational definition of presumptive pulmonary tuberculosis**

An individual with any one or more of the following symptoms was considered as a presumptive TB case: (1) persistent cough for >2 weeks, (2) fever for 1 month or more, (3) chest pain for 1 month or more, and (4) hemoptysis anytime in the past 6 months.

The study was approved by Institute Ethics Committee of a tertiary hospital in Puducherry. Approval was also obtained from the Tribal Welfare Department of Maharashtra. The project was implemented with the help of Maharashtra State and local RNTCP staffs at the concerned study clusters. Permission was taken from each village headman before starting the survey in the clusters. Participant information sheet containing information regarding the survey was given to all participants, and informed consent was obtained before starting the individual interviews. The information collected from the family members was kept confidential. During the survey, if any health-related issues were identified, the same was informed to the family head, and appropriate advice was given and informed to contact the nearest health center for treatment and follow-up.

**Results**

During the survey, 8570 eligible adults (age ≥15 years) from 2048 households were enrolled. Of 8570 eligible participants, 7011 (81.8%) were interviewed among them 6898 (80.5%) were tribal and 113 (1.3%) were nontribal. Among the 6898 tribal individuals interviewed, 47.8% were male and 52.2% were female. Maximum number of participants belong to 15–25 years of age group (30.62%), followed by 26–35 years of age group (20.83%).

In the current study, 144 (2.1%) presumptive TB cases were identified, among them, 55% were female and 45% were male. Maximum presumptive TB cases belonged to more than 60 years (22%) followed by 50–60 years of age group (21%). The most common symptom among the presumptive TB case identified was cough for >2 weeks [Table 1].

Among the 144 presumptive TB cases identified, two sputum samples were collected from 143 (99%) presumptive TB case. All the sputum negative adults (139) were referred for chest X-ray to the nearest health facility, from whom at least one participant was done for 40 (29%) participants and 99 participants did not get their chest X-ray done. During the subsequent follow-up visits, the participants who did not get their chest X-ray done

| Symptoms                                | n (%)                  |
|----------------------------------------|------------------------|
| Persistent cough for >2 weeks          | 134 (93)               |
| Fever for 1 month or more              | 93 (64.6)              |
| Chest pain for 1 month or more         | 102 (70.1)             |
| Haemoptysis anytime in last 6 months   | 2 (1.4)                |

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**Table 1: Distribution of presumptive tuberculosis case based on symptoms (n=144)**
had no active symptoms of PTB. Among the presumptive TB case, 10 (8%) new cases were diagnosed (4 sputum positive TB and 6 X-ray suggestive TB). Among the participants, 8 tribal adults were identified who were either on treatment or completed TB treatment within 1 year of the date of interview [Figure 1]. Among the confirmed TB cases, one-third (33%) were females and most (28%) of the confirmed TB patients were between 30–40 years. The estimated prevalence in the study area is 261 per lakh tribal population per year [Table 2].

**DISCUSSION**

In the present study, the proportion of presumptive TB among the tribal adults was 2.1% and the prevalence of PTB among the tribal adults was estimated as 261 per lakh population per year.

TB is a major public health problem in India. As per the TB annual report 2018, every year 211 new cases per lakh population are contributing to the pool of TB in India. Community-based survey for TB is very difficult to carry out and costly also, but it provides the most accurate and reliable information about the disease burden. Community-based survey among tribal population to determine the burden of TB are limited, and studies were conducted in few specific tribal communities in central India only. These studies have shown a wide variation in the prevalence of PTB among tribal population ranging from 133 per lakh population to 3294 per lakh population. In the present study, the prevalence of it is estimated as 261 per lakh population per year.

In the current study, the proportion of presumptive PTB is 2.1% which is higher than the reported proportion of 1.54% in a study in tribal and nontribal populations of the Ashti and Karanja tahsils of Maharashtra. Contrary to above findings the estimated prevalence of sputum smear-positive PTB (SP-PTB) is 58 per lakh population which is lower than the reported prevalence of 133 per lakh population in Ashti and Karanja tahsils of Maharashtra. The higher prevalence of SP-PTB in above study was may be due to the inclusion of 5–14 years’ age tribal people, which contributes 28% of total participants while the current study was among adults ≥5 years of age.

The most common symptoms reported in the current study was cough for ≥2 weeks (93%) similar to the above study findings (97.8%). In another study among Saharia tribe of Madhya Pradesh, out of 9653 individuals aged ≥15 years, 1100 (11.4%) participants were found to be symptomatic for PTB. Sputum specimens were collected from 1071 (97.4%) symptomatics and prevalence of PTB was 3294 per lakh population. In the current study, sputum samples were collected from 99% of presumptive TB cases and overall prevalence was estimated as 261 per lakh population per year. The higher prevalence of PTB in the above study was due to higher sputum microscopy positivity rate as compared to the current study.

Baigas tribal study in Madhya Pradesh estimated the prevalence of PTB as 146 per lakh population with a coverage of 97.4% (1374 of 1410) and proportion of presumptive TB cases as 8.4%, but in the current study, the estimated prevalence of PTB as 261 per lakh per year with 81% (7011 of 8570) coverage and reported proportion of presumptive TB as 2.1%. The lower proportion of presumptive TB may be due to lower coverage in the current study as compared to the above-mentioned study at Madhya Pradesh. A study conducted by Bhat et al. in Madhya Pradesh had reported a higher prevalence (387 per lakh population) of PTB as compared to the present study (261 per lakh population) with a coverage of 95.1%, higher than the present study (82%). In

![Figure 1: Number of participants interviewed, presumptive cases identified and confirmed tuberculosis cases](image-url)

**Table 2: Burden of tuberculosis among the tribal population (n=6898)**

| Category                                      | n (18 cases) | Rate (per lakh population) |
|-----------------------------------------------|--------------|-----------------------------|
| New sputum smear positive pulmonary tuberculosis cases | 3 (1 female) | 58                          |
| Clinically diagnosed pulmonary tuberculosis cases | 4 (2 female) | 87                          |
| TB patients who were on treatment or completed treatment within one year of date of interview | 5 (3 female) | 116                         |
| Total number of TB patients identified        | 12 (6 female) | 261                         |

TB: Tuberculosis
the present study, maximum number of participants were in the age group of 15–25 years which is similar to the findings in Bhat et al. study.

The burden of PTB in the study area is within the lower range of prevalence reported by other tribal studies in India. At present, the burden of PTB is low in the study area as compared to findings from few other tribal communities across India, but the situation may change if appropriate control and preventive measures are not taken by the health-care providers at the right time. Continuous efforts by local and state RNTCP staff are required to create awareness about the disease amongst the tribal population, to diagnose and treat the disease at the earliest to reduce the burden.

**Conclusion**

The burden of PTB estimated in the current study in the study area is lower than the prevalence reported from most of the studies in different tribal communities in India. The estimated burden of TB in the present study could be considered as baseline data for future epidemiological studies in the survey area.

**Limitation**

The study has limitations which need to be considered during interpretation of results. A limited number of screening criteria were included, which underestimated the actual presumptive TB burden in the study area. All the sputum negative patients were referred for chest X-ray among whom chest X-ray was done for 40 (29%) participants and 99 participants did not get their chest X-ray done due to various reasons such as busy in their personal work, unavailability of mobile X-ray facility and inaccessible fixed X-ray centers. As symptom screening picked up about two-thirds of cases, whereas chest X-ray alone picked up more than three-quarters of cases,[21] the estimated burden in the current study was underestimated the true prevalence of PTB in the study tribal area.

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**Conflicts of interest**

There are no conflicts of interest.

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