Original Article

Active Case Finding among Adults using an Individual's Vulnerability Score for Pulmonary Tuberculosis in a Rural Village of Goa: A Cross-sectional Study

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Abstract

Background: "Detect–Treat–Prevent–Build" to achieve tuberculosis (TB)-free India is envisaged in the National Tuberculosis Elimination Program (NTEP). To be able to achieve this, it is important to address the fact that the most vulnerable and hard-to-reach groups need to undertake screening. The present review aimed to examine the vulnerability in connection with TB disparities faced by distinct sub-populations generally viewed as vulnerable and follow these for testing. **Materials and Methods:** The community-based cross-sectional study was conducted in the field practice area of sub-center Carambolim in a rural area of Goa for 3 months. The households were visited, and data collected via personal interviews were recorded on the questionnaire study tool. Based on the data, the participants' vulnerability mapping was done per the parameters identified. **Results:** Among 223 households, 528 persons were screened for vulnerability. The 47 highly vulnerable participants were advised sputum CBNAAT, of which 9 (19%) tested positive for pulmonary TB, while of the 86 moderately vulnerable participants, 4 (5%) tested positive for pulmonary TB. Among the 34 with symptoms suggestive of TB, 3 (9%) tested positive for pulmonary TB. **Conclusions:** The study detected 16 new TB patients from the population and found a higher incidence of pulmonary TB among the vulnerable group with no symptoms of Pulmonary TB. A further state-wide survey is recommended to diagnose such cases.

Keywords: Active case finding, NTEP, tuberculosis, vulnerability mapping

Introduction

India has the highest burden of tuberculosis (TB) in the world. India's TB incidence for the year 2021 is 210 per 100,000 population.[1] Approximately 6 decades after the National Tuberculosis Control Program's launch, TB remains a major public health problem in India. The government should strengthen four strategic pillars, "Detect–Treat–Prevent–Build" (DTPB), to achieve TB-free India, as envisaged in the National Tuberculosis Elimination Program.[2] Segments of the population at risk of poor health and health care disparities are usually considered as vulnerable. It is important to address the most vulnerable and hard-to-reach groups, undertake screening for active TB and latent TB infection (LTBI) in TB contacts, and select high-risk groups. Appropriate treatment should be given to them,[3] and the role played by social determinants in the pathways of TB causation and the cascade of TB care needs to be understood.[2]

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Multi-sectoral convergence is required for TB elimination by promoting local action for active case finding (ACF).[4] Based on the varying prevalence of TB, we need to prioritize the interventions in highly prevalent states and plan for elimination in low prevalent states.[5] The World Health Organization TB statistics for India for 2021 give an estimated incidence figure of 2.59 million cases, a rate of 188 per 100,000 population.[6] Hence, there is a need to undertake vulnerability mapping to move toward elimination as the follow-up to the hospital (public or private) on the development of TB symptoms was only 36.4% in a national TB prevalence survey

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study. Actively searching for TB cases in high-risk groups is an efficient and effective way to improve TB case detection.[7]

The present review aimed to examine the vulnerability in connection with TB disparities faced by distinct sub-populations generally viewed as vulnerable. Furthermore, our main purpose was to follow the vulnerable population for testing.

Objectives

To identify households with high vulnerability to TB

To screen all members of vulnerable households

To provide TB-related health education to highly vulnerable households.

Methodology

The study was conducted in the field practice area of sub-center Carambolim in a rural area of Goa. We identified the above village as it has a mixed population of locals and migrants along with populations working in industries. Data about households were obtained from the Village panchayat, and a line listing of households was prepared. Systematic random sampling was carried out to select the household.

Data were collected via personal interview and recorded on the questionnaire study tool after obtaining consent. Vulnerability mapping of the households was done as per the parameters identified, and the members of vulnerable households were recommended to get the sputum tested at the nearest health center.

Sample size and sampling technique

Carambolim is a village in Tiswadi taluka of Goa with a population of 7066 and around 1413 houses. The area was divided into following four parts:

- Village Panchayat Office Carambolim
- Madkaikar Navchaityan High School Corlim
- G.I D C Corlim Office Industrial Estate Corlim
- Govt. Primary School Carambolim

Every fifth house was visited. Thus, a total number of 271 HH were visited.

Systematic random sampling was used, for which a micro plan was prepared to map the area, and the visits were planned. Each household was coded for identification. As per the zone allotted, houses were visited by a research team member equipped with the questionnaire, Falcon tube, and pamphlets on TB. If the house was found locked on two consecutive visits, the household was dropped from the study. People aged less than 18 years were excluded from the study.

Data were collected using the personal interview method. As far as possible, the information was collected directly from each member. However, if a member of the household was absent during the visit, information was collected about the person from the existing member. A TB vulnerability screening tool was utilized to collect the data, which were later entered into google forms.

Based on the data, the individuals' vulnerability mapping was done per the parameters identified. Vulnerability factors (with their weighted scores in brackets) used are as follows:

Household contact (5), immunosuppressive therapy (4), malnutrition (4), health care worker (3), diabetes mellitus (3), chronic disease (3), tribal (3), worked/lived in high-burden cities (3), street dweller (3), coastal (2), chronic lung disease (2), smoking (2), alcoholism (2), migrant (2), prison inmate (2), age above 60 (1), and slum dweller (1).

A score of 0 was considered as not vulnerable, and a score of 1 to 4 was moderately vulnerable. If the score was 5 or above, the person was classified as highly vulnerable. The latter two groups were advised to do a sputum CBNAAT examination at the nearest health center. The results of sputum reports were collected from the lab, and patients testing positive were started on treatment for pulmonary TB.

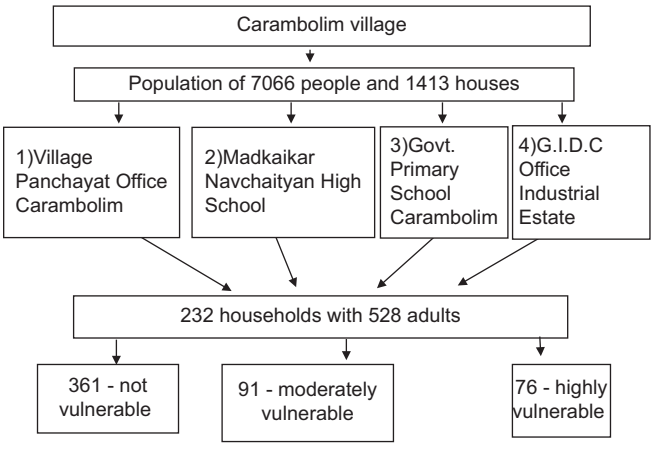
Statistical analysis

Statistical analysis was carried out using IBM SPSS Statistics for Windows (Version 22.0. Armonk, NY: IBM Corp. For categorical variables, T test was the test of significance, and a *P*-value ≤0.05 was considered statistically significant.

Ethics approval and human participant protection

Ethics approval for the study was obtained from the Institutional Ethics Committee of Goa Medical College (Reg No: ECR/83/Inst/GOA/2013/RR-20). Written informed consent was obtained from all the participants recruited in the study. Participation in the study was voluntary, and data were kept strictly confidential.

Flow diagram showing selection of the study population.



Results

Of the 271 households visited, 39 houses were either locked or refused to give consent to participate in the study. Hence, the study was conducted among 232 households, among whom 528 consenting participants were interviewed, with an average number of persons per household of 2.28. Among

them, 76 (15%) had a score ≥5, 91 (17%) had a score less than 5, and 361 (68%) had a score of 0 [Figure 1].

Distribution of study participants as shown in Table 1. There were 34 (6.5%) participants who had symptoms suggestive of TB (cough 25, weight loss 3, fever 6) and were referred for sputum examination. Among them, 29 had vulnerability score ≥5 (score of 5, 14%; 6, 3%; 7, 21%; 8, 0%; 9, 28%; 10, 7%; 11, 14%; 12, 7%; 13, 3%; 14, 0%; and 15, 3%) and 5 participants had a score of 1–4 (score 1, 60%; 2, 0%; 3, 20%; 4, 20%).

Among the remaining 494 (93.5%) asymptomatic participants, 361 were not vulnerable (score 0), 86 were moderately vulnerable (score 1, 24%; 2, 31%; 3, 26%; 4, 19%), and 47 had a vulnerability score ≥5 (5, 13%; 6, 6%; 7, 6%; 8, 13%; 9, 6%; 10, 8%, 11, 11%; 12, 17%; 13, 9%; 14, 2%; and 15, 9%), and the latter two groups were advised to go for screening test for TB, among whom 19 (40%) were males and 28 (60%) were females. The factors are described in Figure 2.

Among the 47 highly vulnerable participants, all were advised to follow up for sputum CBNAAT; 9 (19%) tested positive for pulmonary TB. Among the 86 moderately vulnerable participants, only 4 (5%) tested positive for pulmonary TB. Among the 34 with symptoms suggestive of TB, 3 (9%) tested positive for pulmonary TB, and all had vulnerability score ≥5. Hence, the overall positivity rate was 9.5%; that is, 16 out of 167 tested turned positive. The positivity rate among 91 highly vulnerable was 12 (15%), and that among 76 moderately vulnerable was 4 (4%).

The mean vulnerability score was 9.82 ± 0.91 among 47 highly vulnerable populations and 9.3 ± 0.71 among 34 participants with symptoms of TB. Among the 16 positive cases, five were aged above 60 years, 11 were suffering from DM type 2, and three had a history of TB contacts in family

Discussion

The above study was carried out to identify individuals with a high risk of developing pulmonary TB and advise them to submit sputum for CBNAAT testing. The study was carried out at Carambolim Village of Goa as it includes a diverse population of locals and migrants, industrial regions, and slums.

India started a national, community-based active TB case finding (ACF) program in 2017 as part of the Countrywide Tuberculosis Elimination Program's strategic plan (NTEP). This assessment assessed the components of the ACF

Table 1: Distribution of study participants based on socio-demographic data

Parameters	Total (*n*=528)	Percentage (%)
Age (years)		
≤40	112	21
40–60	278	53
≥60	138	26
Marital status		
Married	344	65
Unmarried	72	14
Widow	112	21
Religion		
Hindu	240	46
Christian	256	48
Muslim	32	6
Type of family		
Nuclear	380	72
Joint	42	8
Three generational	106	20
Sex		
Male	192	36
Female	336	64
Educational status		
Illiterate	184	35
Primary	58	11
Middle school	72	14
High school	158	30
Graduation	56	10

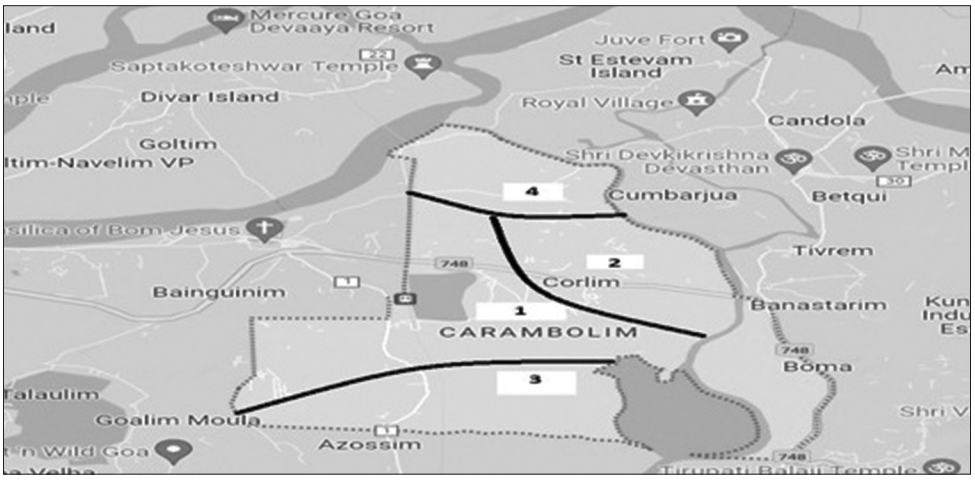


Figure 1: Map of Carambolim village

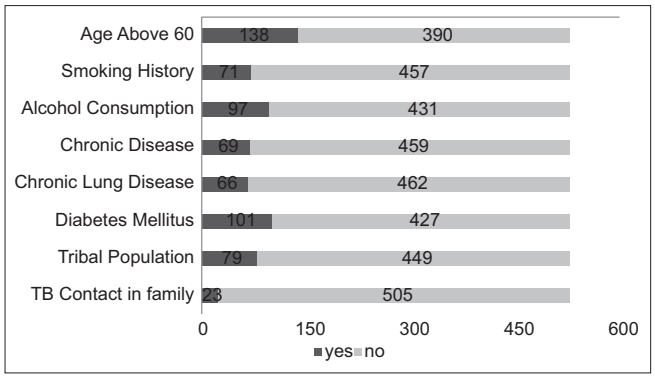


Figure 2: Distribution of study participants based on TB vulnerability factors

campaign's outcomes against minimum indicators and elicited the challenges faced in implementation like manpower, loss manpower, loss to follow-up, and attrition.[5]

Community-based active case-finding programs for TB are some of the most widely implemented and longest-running screening interventions, and there is evidence to suggest that community-based active case-finding for TB might effectively change TB epidemiology if delivered with high coverage and intensity.[8] The evidence for effectiveness in other settings and using alternative TB screening approaches was mixed. Therefore, as part of the well-planned research protocols and in view of contributing evidence to significant knowledge gaps related to TB cases, policymakers should consider carrying out an Intensive Active Case Investigating Intervention for those populations with a high prevalence of unrecognized TB.[9]

Also, the program indicators have not included the number of people required to be screened to diagnose one case of TB (NNS). Such a factor is important as the states have limited capacity to process CBNAAT samples per day, and hence, a large number of samples per day cannot be processed and may be a hindrance to launch a state-wide ACF program on a larger scale. The approximate measure of ACF's effectiveness differed greatly among the states and union territories. The results consistently showed that the states with a better diagnostic yield and a lower NNS were those that tested a larger percentage of people who were screened during ACF and employed chest X-rays or CBNAAT (or both) to identify TB.[10]

Assuming 100% sensitivity of the screening and diagnostic instruments being employed, the NNS to discover one person with confirmed TB in a particular risk category is the inverse of the prevalence of detectable TB in that risk group. In contrast, if a given risk group has a high prevalence of TB that can be detected by the screening and diagnostic tools being used, fewer people will need to be screened for each case detected, resulting in a lower NNS. This is because if a given risk group has a very low prevalence of detectable TB, many people will need to be screened to find one case of TB, which will require a high NNS.[6] In addition, a declining TB incidence in several states using the present methods alone will lead to decreased detection of cases, and many cases will be missed or diagnosed later, hampering the goal of elimination of TB.

Hence, introducing interventions in addition to conventional TB control measures is part of the plan for TB eradication. The incidence of TB declined in India from 247 (456–102)/100,000 in 2010 to 188 per 100,000 population (129–257 per 100,000 population) in 2020.[1]

Interventions should be taken into account by nations with an intermediate and progressively declining TB incidence (i.e. 50 cases per 100,000 population), as well as those with low and moderate incidences of the illness close to the eradication phase.[1]

The TB detection in the year 2022 was 9.9% in Goa (2054 cases and 20758 tests), which is like the overall detection rate of 9.5% (16 out of 167) in our study, which is much lower than the detection rate of 15% (12 out of 76) among the vulnerable population following vulnerability screening.

The study conducted in Kerala by Balakrishnan SK *et al*.[4] found that the percentage of positivity was higher among people with a high vulnerability (16%) score, per our findings (19%). Also, they followed up moderately vulnerable for a period of 6 months and re-tested with sputum examination, which could then be a reason for the higher percentage of TB among moderately vulnerable (11.5%) compared to our study (5%).

Periodic prevalence surveys, nationwide monitoring of TB drug resistance, improved public health informatics, better tracking of TB deaths, and implementation of science to locate and treat missing TB patients are all necessary components of surveillance.[11]

New infections and cases of TB occur as a result of the transmission of TB. However, if the global TB pandemic is to be eradicated, transmission which continues to cause new infections and cases will also need to be addressed in addition to treating existing cases.[12] It would be like attempting to empty a basin of water without first shutting off the tap that filled it if TB elimination efforts were made without halting transmission.[13]

Finding those with the disease and ensuring they receive prompt, effective treatment to make them quickly non-infectious are essential stages in preventing transmission.[14] Regularly screening socio-economic or demographic risk groups that produce a disproportionate number of cases is another generally applicable method for targeted active case finding, the local tuberculosis burden. This strategy is important in both low-burden settings and high-burden settings.[15]

Our method showed promise for better case identification and early detection of asymptomatic cases. Although it is crucial for the eradication of TB, program directors or decision-makers can use the data obtained through vulnerability mapping to promote public health. Before deciding to scale up such therapies, future

research should evaluate their cost-effectiveness to identify the ideal frequency of such interventions. To meet the TB goals for 2025, policymakers must consider implementing vulnerability screening on a broader scale.

Limitations

Our study was conducted in a small area, and only sputum CBNAAT was used for diagnosis. This is one of the study's limitations.

Conclusion

To conclude, the study detected 16 new TB patients from the population and found a higher incidence of pulmonary TB among the vulnerable group with no symptoms of pulmonary TB. A further state-wide survey is recommended to diagnose such cases.

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Nil.

Conflicts of interest

There are no conflicts of interest.

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