

Prevalence of Tuberculosis Infection and Disease Among Homeless Persons Staying in NGO Shelters in Chennai

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Chandrakumar Dolla¹, Bhaskar Dhanaraj²,
Chandrasekaran Padmapriyadarsini², Muniyandi Malaisamy³,
Thiruvengadam Kannan⁴, Pradeep Aravindan Menon¹,
Rajendran Krishnan⁴, Kumaravel P¹, Vijayalakshmi R⁴, Devaki D⁵
and Srikanth Prasad Tripathy⁶

Abstract

Latent tuberculosis infection (LTBI) is a inactive stage after being infected with *Mycobacterium tuberculosis* and it reactivates into pulmonary tuberculosis (PTB). This study was to estimate the prevalence of LTBI in homeless persons staying in 13 shelters run by NGOs in Chennai metro city, India. A cross-sectional survey was conducted from January to April 2018. All inmates aged 15 years and above were screened for PTB infection using tuberculin skin test (TST) and disease smear and culture examinations. Out of a total of 1,068 registered, 1,016 persons were screened for PTB disease and 818 persons for LTBI. Among them, PTB was detected in two persons and TST was positive in 275 persons. Univariate and multivariate analyses were performed to find out the factors associated with LTBI. It was found that LTBI is significantly associated with male gender, aged more than 40 years and with chest X-ray TB lesions. This study finding highlights that low prevalence of TB disease and one third of homeless persons infected with tuberculosis. Our finding suggests that there is a need for prevention interventions to eliminate TB in this key population.

Keywords

Pulmonary tuberculosis, latent tuberculosis infection, cross-sectional survey, NGO homeless shelters

Introduction

Way back in 1994, the National Health Care for the Homeless Council demanded that there is a need for attention on tuberculosis among homeless persons from the health-care providers, shelter providers and policymakers (National Health Care for the Homeless Council, 1994). Diagnosing latent TB infection (LTBI) and disease among homeless populations can be challenging due to the factors such as barriers to accessing health care, lack of health insurance, poor paying ability for care, transportation and unawareness of information to access care (Kushel et al., 2001; Parriott et al., 2018). Finding out the burden of TB disease and infection in this vulnerable population is critical. Further treatment and follow-up of treatment are also difficult. It was recommended that there is a need for targeted TB screening and TB disease elimination efforts.

The Government of India aimed and announced in 2017 to eliminate TB by 2025; elimination was defined as there should be less than one case per 100,000 population as per WHO definition. Further in 2020, the Government of India renamed the National TB Control Programme as a National TB

Elimination Programme (NTEP) (Central TB Division, 2020). Since 1968, ICMR-National Institute of Research in Tuberculosis, Chennai, has been conducting a series of TB infection and disease surveys to find out TB burden in the community. There is a paucity of information on TB infection and disease among homeless. We made an attempt to estimate

¹Department of Epidemiology, ICMR-National Institute for Research in Tuberculosis, Chennai, Tamil Nadu, India

²Department of Clinical Research, ICMR-National Institute for Research in Tuberculosis, Chennai, Tamil Nadu, India

³Department of Health Economics, ICMR-National Institute for Research in Tuberculosis, Chennai, Tamil Nadu, India

⁴Department of Statistics (Epidemiology Unit), ICMR-National Institute for Research in Tuberculosis, Chennai, Tamil Nadu, India

⁵Department of Bacteriology, ICMR-National Institute for Research in Tuberculosis, Chennai, Tamil Nadu, India

⁶Director-in-Charge, ICMR-National Institute for Research in Tuberculosis, Chennai, Tamil Nadu, India

Corresponding author:

Chandrakumar Dolla, Department of Epidemiology, National Institute for Research in Tuberculosis, Indian Council of Medical Research, Mayor Sathyamoorthy Road, Chetput, Chennai, Tamil Nadu 600031, India.
E-mail: ckdolla@gmail.com

TB infection and disease in this population in Chennai metro city in Tamil Nadu, South India. We uniformly followed methodology of previous surveys and used the statistical methods recommended by WHO guidelines (World Health Organisation, 2011).

Methodology

Study Area

This study was conducted among 13 homeless shelters in Chennai metro city. These shelters are maintained by NGOs.

Study Design

This is a cross-sectional observational study conducted during January to April 2018.

Study Population

The study population were male and female adults aged 15 years and above.

Survey Procedures

Informed written consent was taken from all inmates and they were screened for signs and chest symptoms suggestive of pulmonary tuberculosis (PTB) such as cough for more than two weeks, chest pain, fever and haemoptysis. We also collected information on smoking and alcohol habits. Digital chest radiography was taken for all individuals screened. For those with an abnormal chest X-ray and signs and symptoms suggestive of PTB, two sputum samples were collected and examined for smear under florescent microscopy, cultured on L-J (Lowenstein–Jensen) medium and tested with Gene X-pert MTB/RIF. In addition, we also collected information on height, weight, random blood glucose levels measured by a portable gluco-meter. For quality control, 10% of screened inmates were selected randomly and verified. Individuals with positive smear or culture were asked to revisit with reports and then started on treatment under NTEP.

After getting consent from the study participants, tuberculin skin test (TST) was done using the Mantoux method. Each participant was given PPD 0.1 ml (2 Tuberculin Unit) intradermal on the volar aspect of left forearm and read after 48–72 hours. Induration was measured in millimetre transversely to arm. Induration of >10 mm is recorded as TST positive.

Data Management

After data collection in PDA, it was sent to Electronic Data Processing Unit at ICMR-NIRT. Data were checked for completeness and errors by the statistical team. Data were

analysed using SPSS 14.0 software (SPSS Inc., Chicago, IL, USA). The prevalence of TB in the community was estimated and stratified based on age and gender. Also the estimated prevalence of TB was stratified by smear positive, culture positive and bacteriologically positive. Univariate and multivariate analyses were done to find out the risk factors such as age, gender, alcohol use, tobacco smoking, body mass index, diabetes, history of TB treatment and chest X-ray TB lesion associated with LTBI. The results of the odds ratio (OR) and the adjusted odds ratio (aOR) with 95% confidence intervals were presented. *P* value <.05 was considered as significant.

Ethical Considerations

This study protocol was approved by Institutional Ethics Committee of the National Institute for Research in Tuberculosis (ICMR) Chennai. All diagnosed TB patients were referred to the nearest NTEP for further management as per the guidelines.

Results

Population Coverage

Total of 1,068 (males 324; females 744) homeless persons were registered for the survey. Of 1,068 registered, 95% (1,016) were screened for PTB disease and 77% (818) for LTBI and TST reading available in 75% (805/1,068).

Prevalence of PTB

Among screened (1,016), 10% (103) of persons were found eligible for sputum specimens collection. Among them, two persons were found smear and culture positive for PTB and sensitive to rifampicin drug. The estimated prevalence of PTB was (2) 197/100,000 population.

Prevalence of LTBI

Out of the total of 818 tested for TST, readings were available for 805 persons. Among them, 34% (275/805) were found TST positive. The demographic, behavioural and clinical characteristics of TST tested inmates are provided in Table 1. Univariate analysis found that TST positivity is significantly associated with male, higher age, alcoholics, low BMI, diabetic and chest X-ray TB lesion. The multivariate analysis found that TST positivity is significantly higher among males (aOR 1.96, 95% CI = 1.38–2.77; *p* = .001), higher age (aOR 1.87, 95% CI = 1.2–2.92; *p* = .006) and those having chest X-ray TB lesion (aOR 1.99, 95% CI = 1.04–3.79; *p* = .037).

Table 1. Demographic, Behaviour and Clinical Characteristics of Study Participants According to the Tuberculin Skin Test (TST) Result.

Variables	TST tested	TST > 10 mm	%	OR (95% CI)	p value	aOR (95% CI)	p value
Gender	No	No	%				
Female	568	166	29	1		1	
Male	237	108	46	2.03 (1.48–2.77)	<.001	1.96 (1.38–2.77)	<.001
Age							
<40	211	55	26	1		1	
40–60	204	86	42	2.07 (1.37–3.13)	.001	1.87 (1.2–2.92)	.006
>60	390	133	34	1.47 (1.01–2.13)	.043	1.14 (0.75–1.72)	.536
Alcohol							
No	787	264	34	2.23	.102	1	
Yes	18	10	56	2.48 (0.97–6.36)	.059	1.5 (0.54–4.16)	.438
Smoking							
No	772	259	34	1			
Yes	33	15	45	1.65 (0.82–3.33)	.16	*	
BMI							
< 18	144	38	26	1		1	
18–25	399	141	35	1.47 (0.96–2.25)	.078	1.34 (0.85–2.11)	.206
>25	262	95	36	1.59 (1.01–2.48)	.043	1.53 (0.93–2.5)	.094
Diabetic							
No	679	221	33	1		1	
Yes	126	53	42	1.51 (1.02–2.23)	.037	1.38 (0.89–2.12)	.146
H/o past TB							
No	797	269	34	1		1	
Yes	8	5	63	3.27 (0.77–13.77)	.107	2.18 (0.48–9.96)	.314
Chest X-ray TB lesion							
No	761	251	33	1		1	
Yes	44	23	52	2.32 (1.26–4.27)	.007	1.99 (1.04–3.79)	.037

Note: *Smoking was excluded from adjusted model due to collinearity.

Discussion

The significant finding of this study was that the number of bacteriologically positive PTB among the sheltered homeless population in Chennai was 2/1,016 and it is estimated prevalence of 197/ 100,000 population. It was less as compared to prevalence of PTB in general population (349/100,000) (Dhanaraj et al., 2015). The current study population are staying in the well-maintained NGOs managed shelters, and in homeless people living on the pavements/road side dwellers, the prevalence of TB was significantly and alarmingly high (1,700/100,000) in Chennai city (Dolla et al., 2018). These NGOs have taken care by providing better living conditions with good ventilation, provision of health-care facilities and good nutrition. This was corroborated with the study on TB in

sheltered homeless population of Rome (Patrizia et al., 2012).

Other salient finding was that 34% had LTBI. In India, the survey to estimate LTBI is very limited and a study undertaken for LTBI diagnosis among 342 participants reported that 42% were positive for LTBI (Kashyap et al., 2014). A cross-sectional study among 726 health-care workers aged 18 to 61 years reported that 360 (50%) were positive by either TST or IFN-gamma assay (Pai et al., 2005). When we compared the current prevalence of LTBI with the other population in this country, it was less.

In this study among women LTBI positivity was 29%. Whereas in a cross-sectional study among 401 HIV negative women, it was reported that 150 (37%) had a positive QFT, compared to 59 (14%) for the TST (Mathad et al., 2014). This indicates that LTBI high among women staying in the shelters.

We also found that in male gender of this population, increasing age and chest X-ray lesion were factors significantly associated with LTBI. These are known risk factors for developing TB disease. LTBI is a dormant stage after being infected with *Mycobacterium tuberculosis* and it reactivates into PTB. We are re-emphasising that there is a need to take appropriate action to modify among these modifiable risk factors, so that PTB can be prevented and the low prevalence of TB can also be maintained.

Conclusion

In the present study, we estimated the prevalence of TB infection and disease among homeless persons staying in the NGO-managed shelters. In this communication, we document that the prevalence of TB disease and LTBI was significantly less as compared to other population. Currently, the Government of India is aiming for TB-free nation by the year 2025. This finding will help government to take appropriate action to prevent TB disease. Our finding suggests that there is a need for prevention interventions to eliminate TB in this key population.

Declaration of Conflicting Interests

The authors declared no potential conflicts of interest with respect to the research, authorship and/or publication of this article.

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