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Risk Factors of Tuberculosis (TB) Among Homeless Population in Chennai City

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***Abstract*---**Background: Tuberculosis (TB) is a major concern among high-risk populations such as the homeless. Tuberculosis (TB) is a major public health problem. The Chennai City has a large population of homeless persons and caregivers and is estimated to be the largest TB-endemic area in the intermediate-prevalence country, India. However, there have been few studies of homeless persons and caregivers. The objective of this study to assess the prevalence and risk factors for pulmonary TB among homeless population around Chennai. Methods: We conducted a cross-sectional study for screening TB symptoms using questionnaire. The study participants were recruited from 15 zones, which included 47-night shelters around Chennai under the control of the Chennai City in Tamil Nadu. Data was collected from homeless people who were living in night

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shelters in the northern, central, and southern regions of Chennai City. Results: Complete responses were available from 484 individuals (263 homeless persons and 173 caregivers). Four active TB cases (1.5%) among homeless persons were found, while there were no cases among caregivers.

***Keywords*---**associated factors, epidemiology, homeless, rick factors, tuberculosis (TB).

Introduction

Homelessness is mainly determined by socio economic and cultural factors of some populations around the world. The estimated homeless population among the different countries ranges between 2 to 7% and 0.15% be homeless persons in India including 0.07% are from Tamil Nadu. The estimated homeless population among the different countries ranges between 2 to 7% and 0.18% are homeless people in India, including 2.87% from Tamil Nadu. The distribution of homeless people is remarkably high in the major cities of India, such as New Delhi, Mumbai, Kolkata, and Chennai. According to India's 2011 Census, the prevalence of homeless people was found at 11000 in the Chennai Corporation.

Tuberculosis (TB) is an example of a long-standing epidemic: it has evolved over more than 2000 years and is the ninth leading cause of death worldwide and the leading cause of infectious disease. 1 Homelessness is widely acknowledged as a TB risk factor: in fact, the need to address the most vulnerable and hard-to-reach groups among which the homeless are listed has been recently highlighted in an action framework aiming at the elimination of TB in low-incidence countries. 2 In Portugal, data from 2011 shows that TB incidence among homeless was five times higher than within the general population. 3 This study intended to identify socio-demographic and health-related variables in the general population and among TB patients that are associated with TB incidence in the homeless population.

The lifestyle of the homeless population might determine the risk factors for health conditions, including poverty, way of living and breathing, night stays on the streets without a home, lack of nutritious food and lack of knowledge and facilities to maintain personal hygiene. [13] Homelessness leads to the spread of infectious diseases through overcrowding in shelters that accommodate more people in the same place, negligence towards disease and enforced lifestyle. Tuberculosis (TB) is not exceptional in this population since the association between TB and poverty is mediated by overcrowding, malnutrition, smoking, stress, social deprivation, and poor social capital. It was reported that, in many industrialized countries, TB spreads faster in the homeless population than in the general population. primary diagnosis of TB will be considered for those who have had a cough for more than two weeks.

Method

Ethics

The study protocol and consent forms were approved by the Institutional Ethical Committee of the SRM Medical College Hospital and Research Centre. Informed written consent was obtained from all the study participants. If participants between 14–17 years, assent was obtained from the individuals and informed written consent was obtained from concerned parents or guardians.

Study area

The study participants were recruited from 15 zones which included 47 night shelters around Chennai under the control of Chennai City Corporation in Tamil Nadu. Data was collected from May to December 2018, from homeless persons who were living in night shelters in northern, central and southern regions of Chennai city (Fig 1).

Study population

Sample size formula N = Z2 P(1-P)/d2 population prevalence of tuberculosis 1% (conservative estimate) Precision = 0.86% samples n= 515. Total 515 participants were approached and 484 (275 male, 209 female) study participants were recruited and age ranged from 14 years and above (Fig 1). Questionnaire was prepared based on the demographic, social, life style, causes for homeless and health information especially related to TB. Data collection performed by Random sampling method. Data was collected from each individual who were interested to participate in this study by personal interview. The inclusion criteria of the study: (1) south Indian origin, (2) night shelter or roaming house and (3) platform/street dwellers within Chennai city. Participants were excluded if they had permanent address or refused consent.

Screening for TB

Study participants were screened for TB using questionnaire-based personal interview and questioned mainly about chest abnormalities, cough for more than 2 weeks, chest pain, fever, and hemoptysis. Based on the personal interview, 2 sputum samples were collected from the 36 suspected TB patients. The first sputum sample was collected at the time of interview and other sample was collected by next day morning. The samples were immediately transported with ice packs to the NIRT laboratory on the same day and examined for TB. As per the Revised National Tuberculosis Control Programme (RNTCP) guidelines, the results were interpreted with appropriate grades.

Statistical analysis

The mean, confidence interval, percentage analysis and descriptive analysis for age, sex, occupation, smoking and alcohol consumption stratification was calculated using SPSS 20.0 software (SPSS Inc.,) and Microsoft spread sheet analysis. The final estimated prevalence was calculated per 1000 populations.

Results

Demographics

The TB prevalence study in homeless population around Chennai city was done with the initial study population of 515 participants. Among them 31 participants were excluded due to exclusion criteria in the present study. Four hundred eighty-four (484) homeless participants were included in the study around Chennai city. Of these 484, 275 (56.8%) were men and 209 (43.2%) were women participants from the homeless shelter.

Age and gender for the study participants (Table 1)

The age interval of the homeless individuals 135 (78 male, 57 female) were between the age of 14 to 17 years, 149 (85 male, 64 female) were between 18 to 45 years, 132 (78 male, 54 female) were 45 to 60 years of age and 68 (34 male, 34 female) were above 60 years. In our society we have widespread information that most of the homeless individuals were the old age people. Our finding revealed that homeless individuals were from all ages from 14 years and above in both the genders. Maximum homeless people were between age 18 to 45 years. In all age groups male individuals were high compared to female in homeless shelters.

Table 1
Age and Gender

Age interval	Gender		Total
	Male	Female	
14-17	78 (57.8%)	57 (42.2%)	135 (100%)
18-45	85 (57.1%)	64 (42.9%)	149 (100%)
45-60	78 (59.1%)	54 (50.9%)	132 (100%)
>60	34 (50%)	34 (50%)	68 (100%)
Total	275 (56.8%)	209 (43.2%)	484 (100%)
Age	Mean	SD	
	45.632	22.78	

Habits of the respondents (Table 2)

A vast majority of the respondents (81%) were non-smokers. It is very encouraging and positive. People are becoming more aware of the ill-effects of smoking. Similar to smoking, a little higher percentage of the respondents (84.9%) did not consume tobacco. It again shows that people are aware of the bad effects of such a thing like smoking and tobacco consumption. Unlike smoking and tobacco consumption, the number of respondents (26.9%) consuming alcohol is high. More than one fourth of the respondents (26.9%) consumed alcohol and probably smoking and chewing of tobacco go along with drinking, all these are perhaps related to one another. People have accepted drinking as an accepted social custom or pain or sadness/sorrow reliever.

Table 2
Habits

Habits	Variable	n	Percent %
Smoking Habits	Yes	92	19%
	No	392	81%
Tobacco Habits	Yes	73	15%
	No	411	85%
Alcohol Habits	Yes	130	27%
	No	354	73%

Before coming shelter where you are living of the respondents (Table 3)

Table No. 23 shows that about one fifth of the respondents (20.2%) lived on platforms before coming into shelter homes. Given their low income or unemployment conditions, it is not surprising that one out of five lived on footpaths and platforms. About two fifth of them (40.3%) lived in bus stand/railway station, homes or rented homes before moving to shelter homes. Others, a little over one third of them (39.5%) lived in temple premises, hospitals, friends and family acquittances, etc. All these people have had a different background or settlement, which could be a cause to contract a disease like TB.

Table 3
Homeless in before shelter

Before coming shelter / living	Frequency	Percent
Bus stand / railway station	65	13.4
Home	71	14.7
Hospital	22	4.5
Place not meant for habitation	34	7.0
Platform	98	20.2
Refugee homes	33	6.8
Rent House	60	12.4
Stayed with Family or friends	35	7.2
Substance abuse treatment facility	21	4.3
Temple	45	9.3
Total	484	100.0

Cause of homeless of the respondents (Figure 1)

From the below table, it is clear that nearly half of the respondents (48.2%) became homeless due to family disputes and poverty. These two factors are interconnected, either they have some properties to share which are disputed or nothing to share or take. Hence they became homeless. Other causes such as unemployment or low wages and substance abuse or bad influence of peers contributed nearly one third (31%).

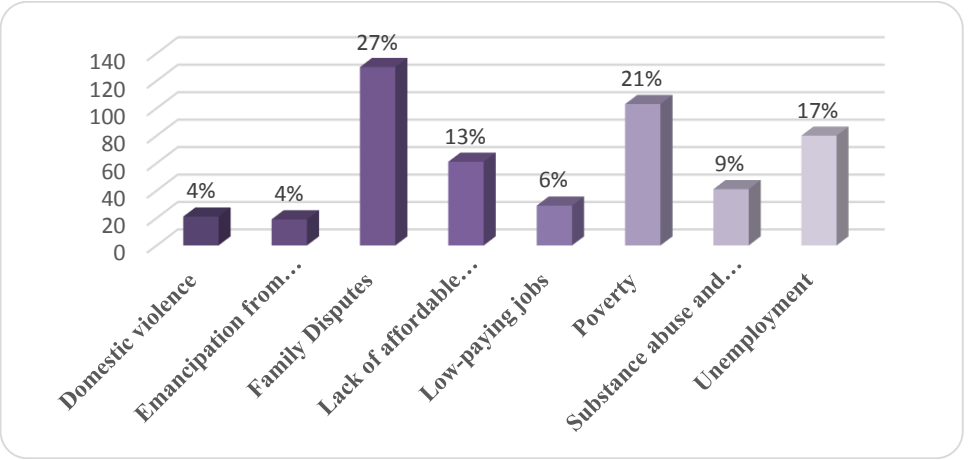

Figure 1. Cause of homeless

Association of TB with demographic and socioeconomic factors (Table 4)

In the below table it is clear, males are more prone to get or contract tuberculosis than females due to socializing nature, going out to work or earn a livelihood and move from place to place for various reasons. Men are also more prone to be affected by tuberculosis due to smoking, drinking and consumption of tobacco or other drug induced substances. As far as marital status is concerned, widowed or married persons are likely to get due to fact the partner might have had and living in the same room, the other is prone to contract. It can affect any age group, except children and adolescents, who may have certain resistance. Illiterate homeless persons are more likely to get affected due to lack of knowledge, awareness and ill-informed about health and hygiene.

Occupation and socio-economic status go hand in hand. In fact, literacy has a direct connection with occupation, although nowadays, many well literate people do not find a job according to their qualifications. Occupation and income are co-related and these two have a direct connection to socio-economic status. Naturally illiterate or less qualified people do menial jobs or unskilled job or rag-picking, collecting scrubs and garbage, etc. and their income is not much and therefore their socio-economic status is low. As far as the place of birth is concerned, it is very obvious that those born in urban areas are more prone to be affected by the sickness than those from the rural villages. The clean and hygienic environment and the mechanism to cope up with the sickness, along with immune system of the village lifestyle may add to this factor. Since the majority of the population is composed of Hindu religious followers, it is certain that those affected most hail from that community. But going by the percentage of affected people, the Muslims and Christians far outnumber the Hindus.

Table 4
Association of TB with demographic and socioeconomic factors

Group	Variable	n	TB status		P value
			Symptom	Non-symptom	
Gender of the Respondents	Female	209	9	200	0.022
	Male	275	27	248	
Marital status	Married / Widow	316	26	290	0.364
	Unmarried	168	10	158	
Age group (Years)	14-17	135	6	129	0.708
	18-45	149	12	137	
	45-60	132	8	124	
	>60	68	10	78	
Education	Illiterate	206	23	183	0.002
	Primary	171	9	162	
	Middle	83	3	80	
	Graduate	24	1	23	
Occupation	Unskilled Worker	144	10	134	0.312
	Unemployed	243	16	227	
	Skilled Worker	24	2	22	
	Semi-Skilled Worker	67	6	61	
	Clerical, shop & owner	6	2	4	
Socio Economic Status	Upper & Upper Middle class	37	3	34	0.024
	Middle class	143	9	134	
	Lower & Upper Lower class	304	24	280	
Place of Birth	Semi Urban	18	3	15	0.310
	Urban	454	32	422	
	Village	12	1	11	
Religion	Hindu	408	22	386	0.001
	Christian	35	5	30	
	Muslim	41	9	32	

Association of TB with risk factors (Table 5)

It is very clear from the above table that there could be other risk factors for the increase in the sickness. Even those who consume alcohol or otherwise are very easily vulnerable and can contract the sickness. The passive smokers are more affected than the smoking ones. Similarly, those who consume tobacco or otherwise are also equally affected. In other words, habits such drinking, smoking or tobacco consuming does not add significantly to the increase in TB. As far as unhygienic and unsanitary living conditions and lack of proper food and poverty are concerned, they are also in some way directly contributing to the increase in the sickness. People living in slum areas, footpath and platforms are under sheltered and malnourished. As a result, they are not able to find a good job or work better, which in turn becomes unaffordable for a decent housing, sanitation and quality food.

Table 5
Association of TB with risk factors

Group	Variable	n	TB status		P value
			Symptom	Non-symptom	
Consumption Alcohol	Yes	130	13	117	0.193
	No	354	23	331	
Consumption Smoking	Yes	92	12	80	0.023
	No	392	24	368	
Consumption Tobacco	Yes	73	6	67	0.783
	No	411	30	381	
Unsanitary living conditions	Bus stand / railway station / Platform	197	18	179	0.012
	Refuge homeless	33	4	29	0.001
Lack of Food / Poverty	Poverty	103	7	96	0.024
	Unemployment	80	8	72	

Discussion and Summary

There were 515 individuals approached, of whom 484 were willing to participate and were enrolled and screened for TB. The coverage of the total subjects, who were screened, was 90%. Despite our three visits, 10% of the individuals could not be included in this study due to their non-availability or not willing to participate. Of the 484, 36 patients were TB suspects aged over 42 years. Finally, 6 tested positives for TB. It is suggested that the homeless TB patients should be identified and accommodated separately. It is found that smoking and drinking, lack of awareness and proper education/information are the major causes of the spread of the disease. Added to that, socio-economic condition, lack of family support, societal rejection, lack of sanitation and personal hygiene, non-affordability of nutritious diet and drinks are the other reasons for the spread of TB. Lack of emotional support or unable to cope with work pressure, stress and tensions could also lead to chest related illnesses. We suggest that the Government makes adequate efforts to prevent and control the spread of TB by taking corrective measures in the light of the points mentioned above. It is possible, though not easy to eradicate TB in our midst.

The estimated potential TB in the homeless population is higher than general population and the disease prevalence is 1.2% which is disproportionately high. Substantially, the lifestyles of these populations were remarkably changed from other general population. They easily spread communicable diseases especially TB in the homeless individuals. The burden of active pulmonary tuberculosis and other TB cases in this population had a considerably high prevalence. The other studies too show same findings which reported in high prevalence for TB from other countries such as South Korea, [11] London in UK, [16] Atlanta, Jacksonville, Los Angeles and Seattle in USA [8,2]. In this current study we focused on small number of homeless shelter groups and the significant difference were noted in the patients with potential TB with demographic and lifestyle factors. In the current study, TB suspected cases were referred to the Govt. TB hospital which belongs to the Tamil Nadu government and diagnosed as per RNTCP guidelines and undergo further treatment. Due to the lower socio-

economic lifestyle, lack of awareness and proper education, they were strongly interplayed to develop high risk of communicable diseases such as TB.

There is a need to increase health awareness for TB among this homeless population. Garden B et al was studied in Russia, complete treatment was possible where the food incentives increased in the homeless TB patients. [7] One homeless individual was completed all the diagnosis which suggested for TB and underwent treatment when given the incentives for food and travel. In San Francisco, the incidence of TB in the homeless population have been increased 270/100 000 per year. [12] Moreover, TB prevalence is higher in situations and conditions such as airborne diseases, malnutrition, chronic diseases, mental illness, street life, lack of nutritious food, and lack of facilities.

In this pilot study around Chennai city homeless population has a few limitations such as already TB suspected or treated were omitted and stay at permanent residence. The current evidence on prevalence of TB among homeless is from only Chennai city, Tamil Nadu, south India. This may vary in other areas, and the findings may not, therefore, be generalized. The other limitation is that the present study was based on a very small sample; therefore, there is a need for a large sample-based survey to estimate the national average to draw implications for the programme. There is a need for a large-scale survey to estimate the prevalence of TB among this population in India. Addressing TB control among this key population are our greatest challenges and opportunities for achieving a Global End TB Strategy. Further information on relevant secondary outcomes such as co-morbidities also is included for the better understanding of risk factors for TB among this population.

Conclusion

We conclude that prevalence of potential TB approximately 1.2% were found among the homeless individuals. Identification, diagnosis, and treatment of the disease in this population is a big challenge. Moreover, this homeless population's priority is searching for food and shelters for night stay, rather than TB or other communicable disease treatment. TB incidence among homeless persons was five times that among the non-homeless, and higher in regions with greater TB incidence among non-homeless persons. The successful treatment outcome rate was lower. Predictors of unsuccessful treatment were age, IDU and HIV co-infection. Integrated TB programmes targeting homeless and non-homeless patients, with measures targeting specific characteristics, may contribute to TB elimination in Portugal.

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Conflict of interest

None of the authors has a conflict to report

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Availability of data and materials

The data set analyzed during the current study is available from the corresponding author on reasonable request.

Ethics approval and consent to participate

The study design and consent forms were approved by the institutional ethics committee of the SRM Medical College, Hospital and Research Centre. Ethics clearance number: 806/IEC/2015. Informed written consent was obtained from each participant in this study.

Authors contributions

CM contributed to concept, design, literature search, data acquisition, data analysis, statistical analysis and manuscript preparation. BSR contributed to data acquisition and statistical analysis. ML contributed to concept and design. KRJ contributed to concept, design, funding, statistical analysis, manuscript editing and finalization. All authors have read and approved the manuscript. ML is the guarantor of the article.

Consent for publication

Not applicable

Competing interests

All authors declare that they have no competing interests.

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