

Original Research Article

Assessing the reach of tuberculosis contact tracing in Mysore district

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Received: 16 April 2025

Revised: 21 May 2025

Accepted: 22 May 2025

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ABSTRACT

Background: Tuberculosis (TB) is the second-leading infectious killer and the 13th primary cause of global mortality. India alone has one-fifth of the world's TB cases. The world health organization (WHO) recommends contact tracing as an effective tool to identify missing TB cases. It allows for early detection and treatment of active TB, reducing its severity and transmission. The study aims to assess the extent of contact tracing in pulmonary TB patients and identify the factors influencing contact tracing in TB.

Methods: The study included a total of 411 notified TB patients from January 2021 to December 2021. From each quarter, nearly 103 individuals were selected. A telephonic survey was conducted to gather information about their contact tracing and sociodemographic details using a semi-structured questionnaire.

Results: Out of the total participants, 338 had their family members contact traced, and among those who were traced, 17 individuals were found to be positive for TB. Factors like socioeconomic status, disclosure of disease status to family members, motivation and approach by health workers, awareness of TB transmission to close contacts, family members' interest in getting themselves contact traced, and awareness about contact tracing are found to be statistically significant

Conclusions: To combat TB effectively, comprehensive and targeted contact-tracing strategies should be implemented, aiming to identify and support those at risk and reduce the spread of the disease.

Keywords: Active tuberculosis, Contact tracing, Infectious disease, Pulmonary tuberculosis

INTRODUCTION

Tuberculosis (TB) remains a significant global health challenge, affecting people of all ages and socioeconomic backgrounds.¹ *Mycobacterium tuberculosis* causes it and primarily spreads through the air. Despite its long history, TB continues to be a major cause of mortality and morbidity worldwide, particularly in developing countries.^{2,3} In the year 2021 alone, approximately 10.6 million cases were reported, resulting in 1.6 million deaths, making TB the second-leading infectious killer and the 13th primary cause of mortality globally.⁴

An estimation is made that greater than two-thirds of TB cases were recorded in Asia and Africa, and in terms of

actual numbers, China, India, and Indonesia account for 43% of all TB cases worldwide.⁵ Out of which one-fifth of the world's cases of TB are in India. Annually, there are approximately 1.8 million new reported cases of TB. Each year, TB causes close to 400,000 deaths; that's more than 1000 each day and more than two every three minutes. The majority of patients are in a financially productive age group and has a significant influence on the nation's socioeconomic situation. *Mycobacterium tuberculosis* infections affect almost 40% (or around 400 million) of the Indian population.⁶

Efforts to combat TB have seen considerable progress over the past two decades, but more needs to be done to achieve global eradication. The WHO has set ambitious

goals for TB control under the "end-TB plan," aiming to eliminate TB-related illnesses, deaths, and suffering by 2035.⁷

In India, there is a substantial number of "missing" TB cases each year, which are either not reported, remain undiagnosed, or receive inadequate treatment in the private healthcare sector.⁸ In middle income and low-income countries, about 50% of all contacts with TB cases have active TB infection and latent TB infection, respectively. Hence, contact tracing has emerged as a crucial tool recommended by the WHO to identify these missing cases and facilitate early detection and treatment.⁹ Contact investigation is a crucial active case-finding technique for worldwide TB control that involves conducting a systematic assessment of people who have had direct contact with an infectious patient. Behavior modification and early detection and treatment of infectious people and their close connections are essential for containing the TB epidemic.¹⁰ It involves systematically assessing individuals who have had direct contact with TB patients. It allows for earlier detection and treatment of active TB, reducing its severity and spread.¹⁴ It is important to know that TB can be controlled and prevented with simple measures such as detecting and treating active diseases, with proper contact tracing.¹¹ It may also help to improve TB treatment outcomes, health outcomes, and the social and economic implications of the disease.¹²

In light of the significance of contact tracing in TB control, this study aims to assess the extent of contact tracing coverage for TB in the Mysuru district.

Objectives

Objectives were to assess the extent of contact tracing that happened in TB patients who were on TB treatment from January 2021 to December 2021, to assess the factors influencing contact tracing in TB.

METHODS

Study design and setting

A cross-sectional study was conducted in the Mysuru district of Karnataka. The study population includes all diagnosed and notified TB patients for a period of one year (January 2021 to December 2021) after obtaining approvals from the institutional ethics committee (Approval no. JSS/MC/PG/94/2021-2022).

Sample size and sampling technique

A sample size of 411 was selected using convenient sampling technique.

Inclusion criteria encompass all individuals within the specified time frame, while exclusion criteria comprise extra pulmonary TB cases and patients who provided

inadequate responses. The participants were chosen from the Nikshay portal of Mysuru district, and telephonic survey was conducted to gather information on contact tracing and sociodemographic details of the household members for group of nearly 103 patients from each quarterly reported case.

The questionnaire used in this study consisted of three main components. The first component focused on socio-demographic characteristics and included questions about age, sex, religion, marital status, educational status, occupation, family type, total family members, socioeconomic status, and annual income. The second component of the questionnaire pertained to TB-related inquiries. Participants were asked about how their TB was diagnosed, whether they disclosed their disease to family members and at the workplace, reasons for not disclosing the disease if applicable, and their awareness of how the disease spreads. The third component of the questionnaire delved into contact tracing aspects. Participants were asked about their awareness of contact tracing, whether contact tracing was conducted for them, whether they were approached by health workers for contact tracing, their interest in getting contact traced, reasons for not being interested in contact tracing if applicable, and the number of people who tested positive after contact tracing. Like the previous components, these questions were administered through a pretested questionnaire using the interview method. The interview method ensured the collection of accurate and detailed information directly from the study participants, providing valuable insights into the factors influencing contact tracing in TB control.

Data analysis

The collected data were entered into Microsoft Excel and subsequently analyzed using SPSS version 24.0, which is licensed to our institution. The analysis included both descriptive and inferential statistical methods. Descriptive statistics such as means, percentages, and standard deviations were computed to summarize the data. For inferential analysis, a chi-square test was employed to examine the associations between variables. Statistical significance was determined with a threshold of $p < 0.05$. The results were presented visually using graphs and tables where appropriate.

RESULTS

From Table 1 it can be observed that among 411 TB patients included in the study, significant proportion of the study participants 170 (41.3%) were of age group of 21 to 40 years, 166 (40.3%) participants in the age group 41-60 years. The majority of participants were males 277 (67.4%), followed by females 133 (32.4%) and majority of them were married (85.4%). Most of the participants 336 (81.8%) were Hindus, followed by 44 (10.7%) being Muslims. The 136 (33.1%) participants were skilled workers, followed by 121 (29.4%) who were unemployed

and majority of the participants 123 (29.9%) were from the lower middle, followed by the lower with 90 (21.9%).

Table 1: Socio-demographic characteristics of respondents.

Variables	Category	N (%)
Age (in years)	Less than 20	22 (5.3)
	21-40	170 (41.3)
	41-60	166 (40.3)
	Greater than 60	53 (12.8)
Gender	Male	277 (67.4)
	Female	133 (32.4)
	Transgender	1 (0.2)
Marital status	Married	351 (85.4)
	Unmarried	60 (14.6)
Religion	Hindu	336 (81.8)
	Muslim	44 (10.7)
	Christian	31 (7.5)
Educational status	Primary school	12 (2.9)
	Middle school	51 (12.4)
	High school	103 (25.1)
	Intermediate and diploma	50 (12.2)
	Graduation and post-graduation	85 (20.7)
	Professional degree	10 (2.4)
	Illiterate	100 (24.3)
Occupation	Professional	19 (4.6)
	Semi professional	12 (2.9)
	Arithmetic skill job	44 (10.7)
	Skilled worker	136 (33.1)
	Semiskilled worker	31 (7.5)
	Unskilled worker	48 (11.7)
	Unemployed	121 (29.4)
Type of family	Nuclear family	286 (69.6)
	Joint family	125 (30.4)
Socio-economic status	Upper (>7863 Rs)	57 (13.9)
	Upper-middle (3931-7862 Rs)	71 (17.3)
	Middle (2359-3930 Rs)	70 (17.0)
	Lower middle (1179-2359 Rs)	123 (29.9)
	Lower (<1179 Rs)	90 (21.9)

Study participants distribution based on how they got the disease is shown in table no 2.70.8% of the participants has no idea how they got the disease from and 17.3% of the study participants got the disease from family members.

From Figure 1 it is observed that 17 (4.8%) family members of the participants were tested positive for TB.

Among the 411 participants, 78 individuals were not interested in undergoing contact tracing. The Figure illustrates the reasons for their lack of interest in participating in contact tracing.

There is a significant association between socioeconomic status and contact tracing from Table 4 it was observed that most of the subjects 333 (82.0%) out of 406 participants have disclosed their disease status to their family members and they were contact traced. The 274 (89.2%) out of 307 participants were aware of how TB spreads and they were contact traced. The 278 (93.9%) out of 296 participants were aware of TB being transmitted to their close contacts, and 338 (99.4%) out of 340 participants were motivated by health professionals. The 332 (99.6%) out of 333 participants were interested in getting their contact traced and they were contact traced. All these findings were found to be statistically significant.

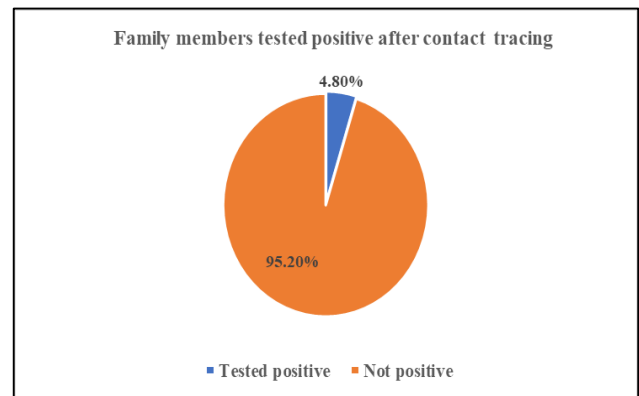


Figure 1: Study participants distribution based on their family members being tested positive after contact tracing, (n=412).

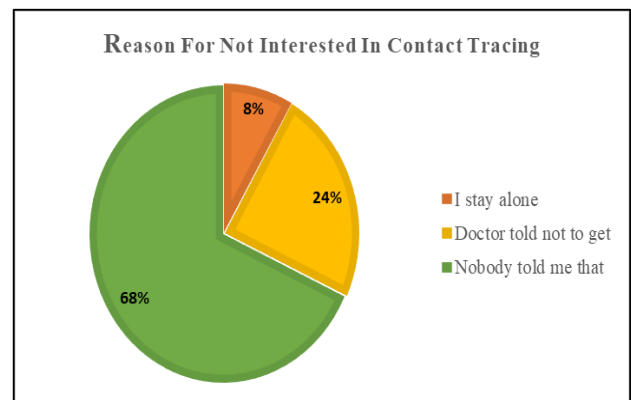


Figure 2: Reasons for not being interested in contact tracing.

Table 2: Study participants distribution based on how they got the disease according to them.

How they got the disease	N	Percentage (%)
Family	71	17.3
Workplace	29	7.1
No idea	291	70.8
Smoking	20	4.9

Table 3: Association between socio economic profile and contact tracing.

Socio economic status	Contact tracing, N (%)		Total	Chi-square	P value
	Done	Not done			
Upper (>7863 Rs)	44 (77.1)	13 (22.9)	57	10.028	0.04*
Upper-middle (3931-7862 Rs)	53 (74.6)	18 (25.4)	71		
Middle (2359- 3930 Rs)	58 (82.8)	12 (17.2)	70		
Lower middle (1179-2359 Rs)	100 (81.3)	23 (18.7)	123		
Lower (<1179 Rs)	83 (92.2)	7 (7.8)	90		

*p<0.05 is considered to be statistically significant.

Table 4: Association between factors influencing contact tracing.

Factors influencing contact tracing	Contact tracing, N (%)		Total	Chi square	P value
	Done	Not done			
Disclosure of the disease status to the family members				397.38	<0.001*
Yes	333 (82.0)	73 (18)	406		
No	5 (100)	0	5		
Awareness of how TB spreads				40.843	<0.001*
Yes	274 (89.2)	33 (10.8)	307		
No	64 (61.5)	40 (38.5)	104		
Awareness of TB being transmitted to their close contacts				98.810	<0.001*
Yes	278 (93.9)	18 (6.1)	296		
No	60 (52.1)	55 (47.9)	115		
Awareness about contact tracing				366.25	<0.001*
Yes	302 (99)	3 (1)	305		
No	36 (33.9)	70 (66.1)	106		
Motivated by health professionals for contact tracing				397.38	<0.001*
Yes	338 (99.4)	2 (0.5)	340		
No	0 (0)	71 (100)	71		
Approached by health professionals for contact tracing				357.60	<0.001*
Yes	335 (98.5)	5 (1.5)	340		
No	3 (4.2)	68 (95.8)	71		
Family member's interest to get contact traced				366.25	<0.001*
Yes	332 (99.6)	1 (0.4)	333		
No	6 (7.6)	72 (92.3)	78		

*p<0.05 is considered to be statistically significant.

DISCUSSION

In the current study, it was found that most of the study participants belonged to the age group of 21-40 years (41.3%), similar findings were seen in Mandal et al study where 43.7% of subjects belonged to the age group of 21-40 years.²⁴ In the current study, there is no significant association between age with contact tracing status, which is similar to the study conducted by Baluku et al which showed no association between age with contact tracing status.¹⁴

In the current study, the majority of the subjects are males (67.4%), similar findings were also found in the study conducted by Baluku et al where most of the study participants are males (66.5%) and there were no significance association between gender and contacting tracing status.¹⁵ Most of the participants were illiterates (39%) in a study done by Rehman et al but in this study only 24.3% of the participants were illiterates.¹⁶

In the current study most of the participants belong to the lower middle class 29.9% followed by the lower class at 21.9% but, according to a study conducted by Rehman et al the majority of the participants were of lower class with 67.1% and then followed by lower middle with 37.5%.¹⁷

In the current study, 72% of the participants were aware of TB being transmitted to their close contacts but, according to a study conducted by Omotowo et al awareness of TB being transmitted from patients to contacts is only 55.2%.¹⁸

According to a study conducted by Babatunde et al revealed that a significant proportion of TB patients were not familiar with contact tracing. Less than 33% of the participants had prior knowledge of contact tracing. This lack of awareness likely played a role in their limited understanding of the concept. Additionally, less than one-third of the respondents were aware that all household

members of individuals with TB who produce sputum should undergo screening. However, the contradictory current study revealed that 74.2% of people were aware of contact tracing. As the awareness about contact tracing is higher in our study participants, understanding the importance of contact tracing is also high.¹⁸

According to a study conducted by Joseph Baruch Baluku et al only 58.5% of people were contact traced but in the current study, the majority of the household contacts of the study participants that is 82.2% were contact traced.²⁵ This finding of the current study is similar to a study conducted by Imsanguan et al that is, (81.1%).¹⁹

According to national TB elimination program guidelines, contact tracing should be conducted by healthcare workers, in my current study it was found that 82.7% of study participants were approached by healthcare workers for contact tracing.¹⁸ In the current study nearly 17 (4.8%) of the contacts of TB patients tested positive for TB which is almost similar to the study done by Imsanguan et al where nearly 11 (6%) of the contacts were tested positive for TB.¹⁹

In the current study among 78 (19%) participants the reasons for not being interested in getting contact traced are as follows, they stayed alone and felt contact tracing was not necessary (8.3%), were told by doctors that it was not necessary to get contact traced (23.6%), most of them are not aware that family members should also get tested (68.1%), in a study conducted by Tesfaye the reasons were as follows not being familiar with the importance of screening household contacts of TB patients, household contacts workload and commitment and motivation of household contacts and index cases.²⁰

In a study conducted by Rathnayake, A strong association was observed between the knowledge level of patients regarding disease transmission, treatment, and prevention, and the successful completion of contact investigations which is almost similar to the present study where knowledge level on disease transmission has a strong association with contact tracing, along with this motivation and approach by health care workers for contact tracing has showed strong association.²

Limitations

This study relied on telephonic surveys, which may have introduced recall bias or incomplete responses due to participants' limited understanding or willingness to disclose accurate information. Additionally, the study was conducted during the COVID-19 lockdown period, which impacted the implementation of program activities

CONCLUSION

This study underscores the critical role of awareness, family involvement, and health worker engagement in the effectiveness of TB contact tracing. Most participants

were middle-aged, male, married, and from nuclear families, with a considerable proportion belonging to the lower middle class and having at least a high school education. Awareness about TB transmission, the risk to close contacts, and the importance of contact tracing was notably high among participants. Health workers significantly influenced the process, with the majority of participants being both motivated and directly approached for contact tracing. Most individuals openly shared their TB status with family members, many of whom expressed a willingness to be screened. As a result, a large number of contacts were traced, leading to the identification of 17 new TB cases. Statistically significant associations were found between successful contact tracing and factors such as socioeconomic status, disease disclosure, health worker support, awareness levels, and family members' interest, highlighting the need for comprehensive, community-centred strategies to enhance TB control efforts.

Funding: No funding sources

Conflict of interest: None declared

Ethical approval: The study was approved by the Institutional Ethics Committee (Approval no. JSS/MC/PG/94/2021-2022).

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Cite this article as: Aasweeja G, Shabadi N, Nath AR. Assessing the reach of tuberculosis contact tracing in Mysore district. *Int J Community Med Public Health* 2025;12:2773-8.