



ISONIAZID PREVENTIVE THERAPY (IPT) COVERAGE AMONG HOUSEHOLD CONTACTS OF TUBERCULOSIS DIAGNOSED CASES ATTENDING DESIGNATED MICROSCOPY CENTRE (DMC) OF A TERTIARY HEALTH CARE INSTITUTION IN NORTHERN INDIA.

Dr Heena Nazir¹, Dr Tanzeela Bashir Qazi², Dr Sana Rafiq Khuroo^{*3}, Dr Amar Saeed⁴, Dr Ashfaq Ahmad Bhat⁵, Aabid Manzoor⁶, Mushtaq ul Islam⁷.

¹ Assistant Professor, Dept of Community Medicine, Al-Falah School of Medical Sciences & Research Centre

² Senior Resident, Dept of Community Medicine, SKIMS,

³ Assistant Professor, Department of Community Medicine, Shri Mata Vaishno Devi Institute of Medical Excellence,

⁴ Medical Intern, Department of Community Medicine, SKIMS

⁵ Professor, Dept of Community Medicine, SKIMS,

⁶ Senior Resident, Dept of Physiology, Shri Mata Vaishno Devi Institute of Medical Excellence

⁷ Senior resident, Hamdard Institute of Medical Sciences and Research New Delhi.

***Corresponding author:** Dr Sana Rafiq Khuroo

*E-mail: sanarafiqk@gmail.com.

Abstract

Background: Tuberculosis (TB) continues to be a major public health challenge in India, where household contacts of pulmonary TB patients are at an elevated risk of acquiring latent TB infection (LTBI). Isoniazid Preventive Therapy (IPT) is a key strategy recommended under the National TB Elimination Programme (NTEP) to prevent progression to active TB. However, the uptake and completion of IPT among eligible contacts often remain suboptimal due to programmatic and patient-level barriers. **Aim:** To assess IPT coverage among household contacts of microbiologically confirmed pulmonary TB patients attending the Designated Microscopy Centre (DMC) of a tertiary healthcare institution in Northern India. **Methods:** A retrospective, record-based study was conducted at the DMC, SKIMS Medical College and Hospital, Bemina, from January 2022 to December 2023. Data were extracted from NTEP programmatic records, including TB laboratory registers, treatment cards, contact tracing forms, and IPT monitoring sheets. Demographic and clinical details of index patients, screening status of contacts using TST and IGRA, and IPT initiation and completion rates were analysed using descriptive statistics. **Results:** A total of 272 TB patients and 109 household contacts were reviewed. Among contacts screened, 35 (32.1%) tested positive for LTBI. Of these, 30 (85.7%) initiated IPT, and all completed the full course, achieving a 100% completion rate. IPT recipients included 33.3% aged ≤ 18 years, 26.7% aged 19–30 years, and 40.0% aged >30 years, with equal distribution across genders. **Conclusion:** IPT initiation and completion rates were remarkably high in this setting, reflecting strong adherence support and effective follow-up. Strengthening systematic screening and preventive therapy among household contacts remains essential for reducing TB transmission and progressing toward TB elimination goals.

Keywords: Tuberculosis, Isoniazid Preventive Therapy, Household contacts, Latent TB infection, TST, IGRA, NTEP.

INTRODUCTION

Tuberculosis (TB) is an infectious disease caused by a bacterium called *Mycobacterium tuberculosis*. It most commonly affects the lungs, but can also involve other parts of the body like the spine, kidney, or brain. Tuberculosis is primarily spread through airborne routes from person to person when a person with pulmonary TB coughs, sneezes or spits. TB contacts are people who are in close contact with patients with infectious TB. Contacts of tuberculosis (TB) cases are at high risk of TB infection and disease and in low- and middle-income countries 2.2–4.4% of them will develop TB¹. TB contacts should systematically be investigated for investigation and disease. Systematic screening of contacts and high-risk groups is a priority of the WHO TB elimination strategy – End TB². This intervention aims at early diagnosis and treatment of TB cases and the identification of individuals with latent TB infection (LTBI) who can benefit from TB preventive therapy. However, contacts and persons at risk are lost in each step of the LTBI cascade of care – the process between the identification of eligible individuals to completion of TB preventive therapy³. Tuberculosis preventive therapy is a global priority among children <5 years old exposed to TB because they are at high risk of disease progression after a primary infection and of developing severe forms of TB⁴. Despite high-quality evidence on the benefits of TB preventive therapy among children and it being included in most National TB Programme (NTP) guidelines, the implementation of this intervention at global level is poor. In 2017, only 23% of the estimated 1.3 million eligible <5-year-old contacts of bacteriologically confirmed TB cases-initiated isoniazid preventive therapy (IPT), far below the 90% global target⁵. A mixed-methods systematic review on studies reporting on child TB contact management identified challenges at health system and users' level, related to lack of infrastructure, knowledge gaps, attitudes and perceptions, stigma, access to care, competing priorities and treatment⁶. According to National TB Elimination Programme (NTEP) guidelines in India, target population for TPT after ruling out active TB includes people living with HIV (PLHIV), all household contacts of pulmonary TB patients notified in Nikshay from public and private sector, individuals who are on immunosuppressive therapy, having silicosis, on anti-TNF treatment, on dialysis and preparing for organ or hematologic transplantation. According to a prospective observational study conducted in 2021, 84.68% of eligible contacts of microbiologically confirmed TB underwent screening with Tuberculin skin test (TST) with the major reason for refusal of screening being the lack of perception of risk of TB disease due to asymptomatic status. Refusal of screening further leads to refusal to Isoniazid preventive therapy (IPT), common reasons being absence of symptoms, feeling completely healthy and drug adverse effects. TB preventive treatment can reduce rates of progression from infection to active TB disease by 90% hence it's proper administration should be a priority.

MATERIAL AND METHODS

Study Population

The study population consisted of all household contacts of microbiologically confirmed pulmonary tuberculosis (TB) patients registered at the Designated Microscopy Centre (DMC), SKIMS Medical College and Hospital, Bemina, during the defined study period. A household contact was considered any individual residing in the same dwelling as the index case during the infectious period and therefore at risk of exposure. Index cases were restricted to patients with bacteriologically confirmed pulmonary TB, diagnosed through smear microscopy, CBNAAT, or culture, to ensure uniformity in exposure classification. All such confirmed pulmonary TB patients and their documented household contacts were included in the study.

Study Period

The study was conducted over a two-year period from January 2022 to December 2023, allowing sufficient duration to capture variations in contact management practices and IPT implementation.

Data Collection Procedure

This study utilized a retrospective approach based on secondary data obtained from routinely maintained programmatic records under the National TB Elimination Programme (NTEP). Ethical approval was secured from the Institutional Ethics Committee prior to commencement of data extraction. Information was collected from standardized sources including the TB laboratory register, treatment cards, contact tracing register, and IPT monitoring records. Data pertaining to index cases included demographic and clinical details such as age, sex, sputum smear status, type of TB, drug susceptibility testing (DST) results, and treatment regimen. Corresponding household contact information was reviewed to obtain age, sex, symptom status at the time of screening, results and dates of Tuberculin Skin Test (TST), and clinical assessments performed to exclude active TB. IPT-related variables, including the date of initiation, completion status, and total duration of therapy, were also documented. All extracted data were meticulously cross-checked with original entries to ensure completeness, accuracy, and internal consistency before being finalized for analysis.

Statistical Analysis

The compiled dataset was entered into Microsoft Excel and analysed using standard statistical software. Descriptive statistical methods were applied to summarize the findings. Categorical variables, such as symptom status, gender distribution, and IPT initiation or completion, were expressed as frequencies and percentages. Continuous variables, including age of index cases and contacts, were summarized using means and standard deviations. Descriptive comparisons were conducted to explore patterns and potential determinants of IPT uptake, such as demographic characteristics, TST results, and the presence of symptoms. As the study was descriptive in nature, inferential statistical tests were not undertaken; however, notable trends relevant to programmatic performance were identified to support contextual interpretation.

RESULT

Table 1: Baseline characteristics of diagnosed Tuberculosis patients.

Variables	Frequency (n=272)	Percentage (%)
Age(years)		
Mean $\pm$ S.D	42.1 $\pm$ 21.6	
≤ 18	35	12.9
19-30	78	28.7
>30	159	58.5
Gender		
Male	128	47.1
Female	144	52.9
Residence		
Urban	93	34.2
Rural	179	65.8
Weight (kg)		
Mean $\pm$ S.D	52.1 $\pm$ 12.9	
Type of tuberculosis		
Pulmonary	135	49.6
Extra pulmonary	136	50.0
Both	1	0.4
Transfer out		
Yes	227	83.5
No	45	16.5

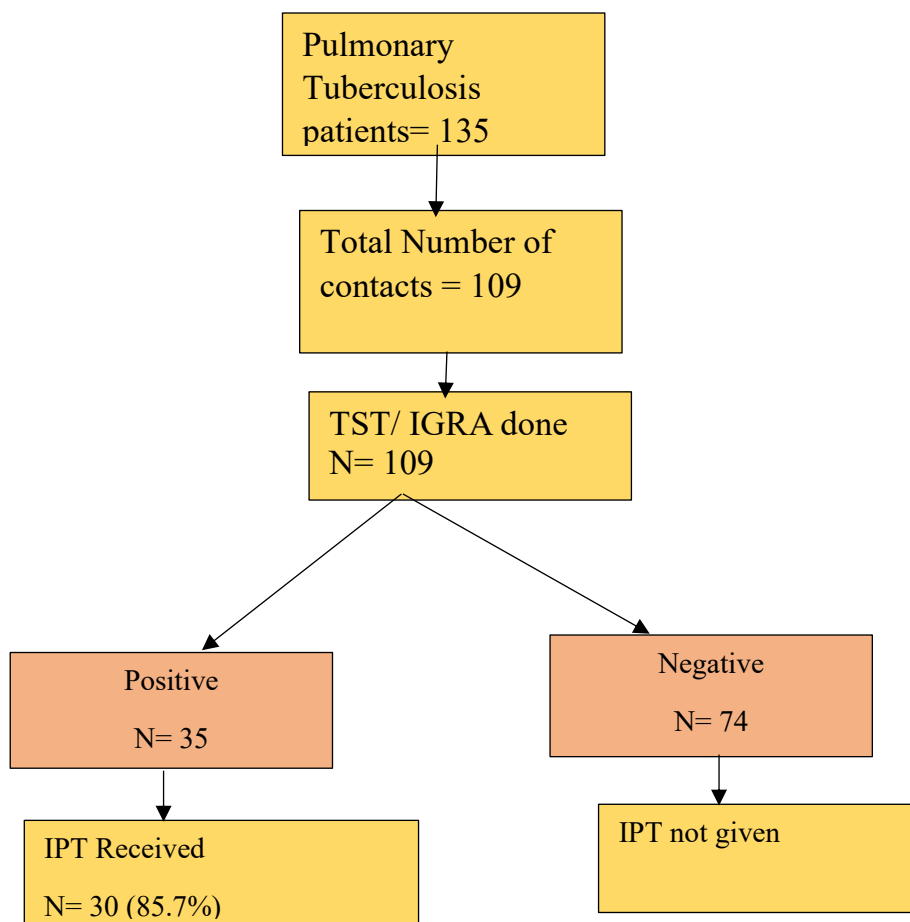


Figure 1: Flowchart showing percentage of household contacts receiving IPT Prophylaxis.

Table 2: Characteristics of household contacts who were given IPT Prophylaxis.

Variables	Frequency (n=30)	Percentage (%)
Age(years)		
Mean $\pm$ S.D		
≤ 18	10	33.3
19-30	8	26.7
> 30	12	40.0
Gender		
Male	15	50.0
Female	15	50.0
Prophylaxis completed		
Yes	30	100.0
No	0	0

DISCUSSION

This study is one of the few studies conducted under the Indian NTEP which has examined the implementation of contact screening and provision of IPT. Like previous studies conducted elsewhere and in India, the study findings show sub-optimal implementation of contact screening and IPT. There appears to be a lack of importance given the implementation of these activities under the NTPs even though it is one of the most cost-effective approaches to prevent childhood TB disease, especially in resource limited settings. ⁽⁶⁻¹³⁾ The baseline characteristics of the 272 diagnosed tuberculosis (TB) patients in this study reveal several important trends and align with findings from other studies.

Age Distribution: The mean age of the diagnosed TB patients was 42.1 years, with a standard deviation of 21.6 years. The majority of patients (58.5%) were over 30 years old, which is consistent with global TB data indicating higher prevalence among older age groups¹⁴. This age distribution suggests that TB remains a significant health issue among adults, particularly those in their productive years.

Gender: The gender distribution was relatively balanced, with 47.1% male and 52.9% female patients. This contrasts with some studies that report a higher prevalence of TB in males¹⁴. The slight female predominance in this cohort could be due to regional variations or differences in healthcare-seeking behaviour between genders.

Residence: A significant proportion of patients (65.8%) were from rural areas, highlighting the higher burden of TB in rural populations. This finding aligns with other studies that have shown higher TB incidence in rural areas due to factors such as limited access to healthcare, lower socioeconomic status, and higher rates of malnutrition¹⁵.

Weight: The mean weight of the patients was 52.1 kg, with a standard deviation of 12.9 kg. Low body weight is a known risk factor for TB, as it can indicate malnutrition, which compromises the immune system¹⁶. This underscores the need for nutritional support as part of TB management.

Type of Tuberculosis: The distribution of TB types was nearly equal, with 49.6% having pulmonary TB and 50.0% having extra pulmonary TB. This is somewhat unusual, as pulmonary TB is generally more common¹⁴. The high rate of extra pulmonary TB in this cohort may reflect specific regional epidemiological patterns or diagnostic practices.

Transfer Out: A high percentage (83.5%) of patients were transferred out, which could indicate issues with continuity of care or the need for specialized treatment facilities¹⁷. This high transfer rate warrants further investigation to ensure that patients receive consistent and comprehensive care. In this study, we evaluated 135 pulmonary tuberculosis (TB) patients and their 109 contacts using Tuberculin Skin Test (TST) and Interferon-Gamma Release Assay (IGRA). Among the contacts, 35 (32.1%) tested positive, while 74 (67.9%) tested negative. Of the positive contacts, 30 (85.7%) received Isoniazid Preventive Therapy (IPT), whereas none of the negative contacts were given IPT. Our findings align with previous studies that emphasize the importance of screening and preventive treatment among close contacts of TB patients. For instance, a study by Ma et al. (2024) found that 47.3% of household contacts of TB patients progressed to TB infection, with IGRA conversion occurring within 24 weeks of exposure¹⁸. This highlights the critical window for intervention and the potential effectiveness of IPT in preventing the progression of latent TB infection (LTBI) to active disease. Comparatively, our study showed a lower percentage of positive contacts (32.1%) than Ma et al.'s study. This discrepancy could be attributed to differences in the study population, the duration of follow-up, and the criteria for defining a positive IGRA result. Additionally, our higher IPT uptake rate (85.7%) among positive contacts suggests effective implementation of preventive measures, which is crucial for TB control. Another study by Lönnroth et al. (2015) compared TST and IGRA in predicting TB disease and found that both tests have their merits, but IGRA may offer better specificity in certain populations. Our use of both TST and IGRA aligns with these findings, providing a comprehensive approach to identifying LTBI among contacts. Furthermore, a systematic review by Assefa et al. (2023) highlighted the efficacy and safety of different IPT regimens, reinforcing the importance of preventive therapy in high-risk groups¹⁹. Our study's high IPT uptake rate among positive contacts underscores the feasibility and acceptance of IPT in our setting.

In the present study, the age distribution of household contacts receiving IPT prophylaxis revealed that 33.3% were ≤ 18 years, 26.7% were between 19–30 years, and 40.0% were >30 years, indicating that a substantial proportion of adults above 30 years benefitted from prophylaxis. In comparison, a study focusing on childhood tuberculosis and IPT among household contacts emphasised that children under five years constituted the primary target group for preventive therapy due to their higher susceptibility to developing active TB²⁰. This contrast highlights the broader and more inclusive age coverage observed in our study. Gender distribution in our cohort demonstrated an equal representation, with 50% males and 50% females. This pattern aligns with observations from similar

investigations, such as a study conducted in Navi Mumbai, which similarly reported a nearly equal gender distribution among household contacts receiving IPT²⁰. These findings suggest that gender does not appear to significantly influence access to or uptake of prophylactic therapy. A notable finding of our study is the 100% completion rate of IPT among participants. This outcome is particularly significant given the well-documented challenges associated with IPT adherence. Previous research, such as a study on household contacts of children with active TB, has reported lower adherence rates attributed to barriers including inadequate awareness, logistical difficulties, and inconsistent follow-up²¹. The excellent completion rate observed in our study may reflect robust patient support mechanisms, active follow-up, and effective counselling strategies implemented within the programme.

CONCLUSION

Our study highlights the need to strengthen TB control in rural areas, ensure gender-responsive care, and provide nutritional support for affected individuals. The similar distribution of pulmonary and extrapulmonary TB cases emphasizes the importance of maintaining vigilant diagnostic practices. The findings also support the use of TST and IGRA for screening household contacts and the implementation of IPT for those who test positive, as essential measures to prevent progression from latent infection to active disease. Future work should focus on improving screening uptake, treatment adherence, and evaluating long-term outcomes of IPT.

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