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Assessment of Tuberculosis Preventive Therapy Among Household Contacts in Urban Field Practice Area of Raichur Institute of Medical Sciences: A Cross-Sectional Study

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ABSTRACT

Introduction: The global burden of tuberculosis (TB) remains a significant public health challenge, especially in densely populated urban areas where transmission is intensified. Household contacts of pulmonary TB patients are at increased risk of latent infection and progression to active disease. Tuberculosis Preventive Therapy (TPT) is a critical intervention to reduce this risk, yet uptake and adherence remain suboptimal due to various barriers. The present study focuses on assessing TPT awareness, initiation, and completion among household contacts in an urban field practice area of Raichur Institute of Medical Sciences.

Objectives: The study aims to evaluate the awareness, initiation, and treatment completion rates of TPT among household contacts of pulmonary TB patients and to identify reasons for non-initiation and non-completion of therapy in this population.

Methodology: A cross-sectional observational study was conducted over two months in the urban field practice area associated with Raichur Institute of Medical Sciences. A total of 220 household contacts of pulmonary TB patients registered at the DOTS center were selected through simple random sampling. Data were collected via interviewer-administered semi-structured questionnaires based on PMTPT guidelines. Descriptive and inferential statistics were applied to analyze demographic variables, TPT awareness, screening, initiation, adherence, and barriers.

Results: Among the participants, 46.8% were aware of TPT, and only 33.6% underwent screening for active TB. TPT initiation was low at 9.5%, with just 5.5% completing the full course. The predominant barriers to initiation and completion were the perception of no need for preventive treatment (52.3% and 47.3%, respectively) and fear of side effects. Drug availability was a minor concern. Participants recommended enhancing awareness (55.5%), counseling (25.5%), and regular follow-up (11.4%) to improve TPT uptake.

Conclusion: The present study reveals significant gaps in awareness, initiation, and completion of TPT among household contacts in an urban setting. Addressing misconceptions and fears through targeted education, strengthened counseling, and systematic follow-up is essential to improve adherence and reduce TB transmission. Tailored community-based interventions are recommended to enhance preventive therapy outcomes and support TB control efforts in similar urban populations.

Keywords*: Tuberculosis, Household Contacts, Awareness, Urban Public Health, Barriers to Treatment Completion.*

INTRODUCTION

The global burden of tuberculosis (TB) remains a significant public health challenge, with millions affected annually, particularly in densely populated urban settings where transmission risks are heightened. Household contacts of TB patients represent a critical group at increased risk for both latent infection and progression to active disease. Studies have consistently demonstrated that the prevalence of TB among household contacts is substantially higher than in the general population, underscoring the urgency for targeted preventive strategies [1,2]. At a local level, urban areas like the field practice area of Raichur Institute of Medical Sciences experience a concentrated burden of TB cases, where close living quarters facilitate ongoing transmission.

TB preventive therapy (TPT) is an essential intervention aimed at reducing the risk of progression from latent TB infection to active disease among high-risk groups, including household contacts. Its importance is highlighted by evidence showing significant reductions in TB incidence when preventive therapy is effectively implemented, even in contacts exposed to multidrug-resistant TB [3,4]. However, global uptake of TPT remains limited due to barriers such as poor contact evaluation, socioeconomic challenges, and gaps in healthcare delivery, especially in resource-limited settings [5,6]. Innovative community-based programs have shown promise in improving screening, initiation, and completion of preventive therapy among household contacts, demonstrating the feasibility and impact of such interventions [3,6].

Focusing on household contacts in urban areas is crucial due to higher TB transmission intensity and unique challenges posed by urban living conditions. Urban household contacts are often at elevated risk because of close and prolonged exposure to infectious cases and potential difficulties in accessing healthcare services [1,7]. Moreover, urban settings provide strategic opportunities for public health programs to implement active contact investigation and preventive therapy to interrupt transmission chains effectively. Studying household contacts in these areas allows for a better understanding of local epidemiology, barriers to care, and tailored interventions to reduce TB incidence [2,8]. Thus, assessing TB preventive therapy among household contacts in the urban field practice area of Raichur Institute of Medical Sciences addresses a critical gap in TB control and supports evidence-based efforts to mitigate the local and broader TB burden.The aim of the study is to assess the awareness, initiation, and treatment completion of Tuberculosis Preventive Therapy (TPT) among household contacts of pulmonary TB patients, and to identify the reasons for non-initiation and failure to complete TPT in this population.

METHODS

Study Design and Setting: The present study is a cross-sectional observational study conducted in the urban field practice area of Raichur Institute of Medical Sciences, Raichur. The study duration is two months. Ethical clearance has been applied for and will be obtained from the institutional ethical committee prior to data collection. All procedures will adhere to ethical guidelines, ensuring informed written consent is obtained from all participants.

Study Population: The study population consists of household contacts of pulmonary tuberculosis (TB) patients registered at the selected DOTS center under the Urban Health Training Center (UHTC), Raichur Institute of Medical Sciences.

Inclusion criteria: Household contacts of pulmonary TB patients registered at the DOTS center who are able to provide informed written consent.
Exclusion criteria: Household contacts not willing to participate or unable to provide consent.

Sample size calculation is based on a previous study reporting 66.5% adherence to Tuberculosis Preventive Therapy (TPT). Using the formula (n = \frac{Z^2 \times P \times Q}{L^2}), with P = 66.5%, Q = 33.5%, allowable error (L) = 10% of P (6.65%), and Z = 1.96 for 95% confidence, the calculated sample size is 194. Accounting for a 10% non-response rate, the final sample size is 214.

Simple random sampling using computer-generated random numbers will be employed to select 214 household contacts from the sampling frame created by enumerating contacts of index pulmonary TB patients.

Data Collection: Data will be collected through house visits after telephonic communication and scheduling. A predesigned, semi-structured, semi-open-ended, interviewer-administered questionnaire based on the Programmatic Management of Tuberculosis Preventive Treatment (PMTPT) guidelines will be used. Written informed consent will be obtained prior to administration.

Statistical Analysis: Descriptive statistics will summarize demographic characteristics and key study variables, including awareness, initiation, and completion rates of TPT among household contacts. Categorical variables will be

presented as frequencies and percentages, while continuous variables will be summarized using means and standard deviations or medians and interquartile ranges as appropriate.

Inferential statistical analyses will assess associations between various risk factors, socioeconomic determinants, and TPT uptake using appropriate tests (e.g., chi-square test for categorical variables). A p-value of less than 0.05 will be considered statistically significant. Data will be entered into Microsoft Excel and analyzed using IBM SPSS Statistics for Windows, Version 21.0.

Ethical Considerations: The study will be conducted following ethical standards, with approval sought from the institutional ethics committee. Confidentiality of participant information will be maintained throughout the study. Participation will be voluntary, with informed written consent obtained from all subjects. No invasive procedures or interventions will be performed as part of this study.

RESULTS

Socio-demographic profile

A total of 220 household contacts of Index TB patients were included in the study. The median age of the study participants was 28 years with IQR 15.25-44.75. Among them 108 (49.1%) were males and 112 (50.9%) were females. The majority of participants were Muslims 125 (56.8%), while Hindus constituted 95 (43.2%) of the study population. More than half of the participants belonged to joint families 125 (56.8%), whereas 95 (43.2%) belonged to nuclear families. 112 (50.9%) participants were married, 103 (46.8%) were unmarried, 3 (1.4%) were widowed, and 2 (0.9%) were separated. Educational status revealed that illiteracy was common among the participants, with 63 (28.6%) being illiterate.

Primary education was reported among 47 (21.4%) participants, followed by high school education among 40 (18.2%), middle school among 31 (14.1%), intermediate/diploma among 29 (13.2%), and only 10 (4.5%) were graduates or postgraduates. Regarding occupation, students formed the largest group 77 (35.0%), followed by employed individuals 64 (29.1%), unemployed participants 47 (21.4%), and homemakers 32 (14.5%). Socioeconomic status assessment showed that the majority belonged to the lower middle class 90 (40.9%), followed by upper lower class 68 (30.9%) and upper middle class 51 (23.2%). A smaller proportion belonged to the lower class 6 (2.7%) and upper class 5 (2.3%). (Table 1)

Table1: Socio-demographicprofileofstudyparticipants

Variable	Levels	Frequency	Percentage
Gender	Male	108	49.1
	Female	112	50.9
Religion	Hindu	95	43.2
	Muslim	125	56.8
Typeoffamily	Joint	125	56.8
	Nuclear	95	43.2
Marital status	Married	112	50.9
	Unmarried	103	46.8
	Separated	2	0.9
	Widowed	3	1.4
Educational status	Illiterate	63	28.6
	Primary	47	21.4
	Middle	31	14.1
	High school	40	18.2
	Intermediate/ Diploma	29	13.2
	Graduate/Postgraduate	10	4.5
Occupation	Employed	64	29.1
	Unemployed	47	21.4
	Student	77	35
	Homemaker	32	14.5
Socioeconomic status	Upper class	5	2.3
	Upper middle class	51	23.2
	Lower middle class	90	40.9
	Upper lower class	68	30.9
	Lower-class	6	2.7

Household and Health History

Among the 220 household contacts included in the study, 89 (40.5%) participants reported living in the same room as the index tuberculosis patient, while 131 (59.5%) did not share the same room. Overcrowding was present in 83 (37.7%) households, whereas 137 (62.3%) participants reported no overcrowding in their homes. History of tobacco use was observed among 11 (5.0%) participants, while the majority 209 (95.0%) had no history of tobacco consumption. Similarly, alcohol use was reported by only 10 (4.5%) participants, whereas 210 (95.5%) denied alcohol consumption.

Regarding co-morbidities, most participants 195 (88.6%) did not have any associated medical conditions. Among those with co-morbidities, hypertension was the most common condition reported in 16 (7.3%) participants, followed by diabetes mellitus in 8 (3.6%) participants and dialysis dependency in 1 (0.5%) participant. A previous history of tuberculosis was present among 10 (4.5%) participants, while 210 (95.5%) had no prior history of TB. The majority of participants 212 (96.4%) had a visible BCG scar, whereas only 8 (3.6%) participants did not have a visible scar. (Table 2)

Table2:Household and healthhistoryofstudy participants

Variable	Levels	Frequency	Percentage
Livinginthesameroomasthe IndexTB patient	Yes	89	40.5
	No	131	59.5
Overcrowdinginyour house	Yes	83	37.7
	No	137	62.3
Historyoftobackhouse	Yes	11	5
	No	209	95
Historyofalcoholuse	Yes	10	4.5
	No	210	95.5
Anyco-morbidities	Diabetes	8	3.6
	Hypertension	16	7.3
	Dialysis	1	0.5
	None	195	88.6
PrevioushistoryofTB	Yes	10	4.5
	No	210	95.5
VisibleBCGscar	Yes	212	96.4
	No	8	3.6

Awareness and Screening

Among the 220 household contacts included in the study, only 103 (46.8%) participants had heard about Tuberculosis Preventive Treatment (TPT), while 117 (53.2%) were unaware of TPT (Figure 1). Only 74 (33.6%) participants reported that they had undergone screening, whereas the majority 146 (66.4%) had not been screened for active TB (Figure 2). Among the screening methods used, sputum examination was the most commonly employed method, accounting for 64 (29.1%) participants, while chest X-ray screening was performed in 10 (4.5%) participants.

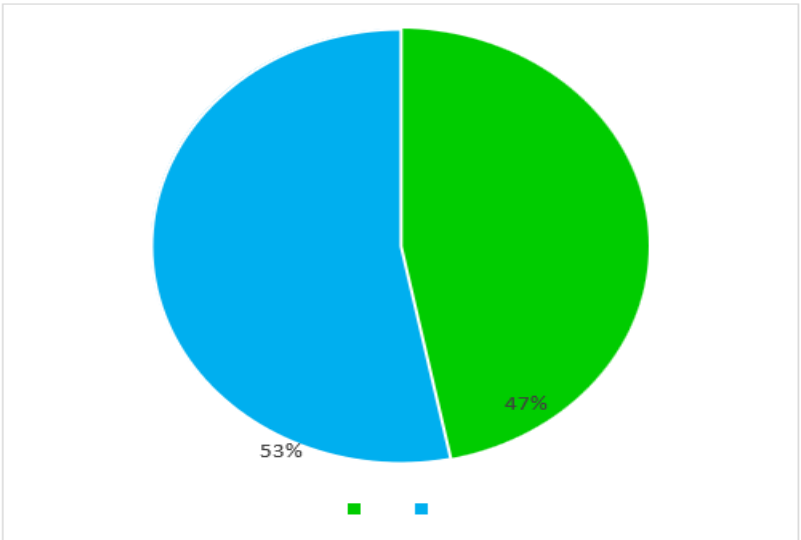

Figure1: AwarenessofstudyparticipantsaboutTuberculosisPreventiveTreatment(TPT),

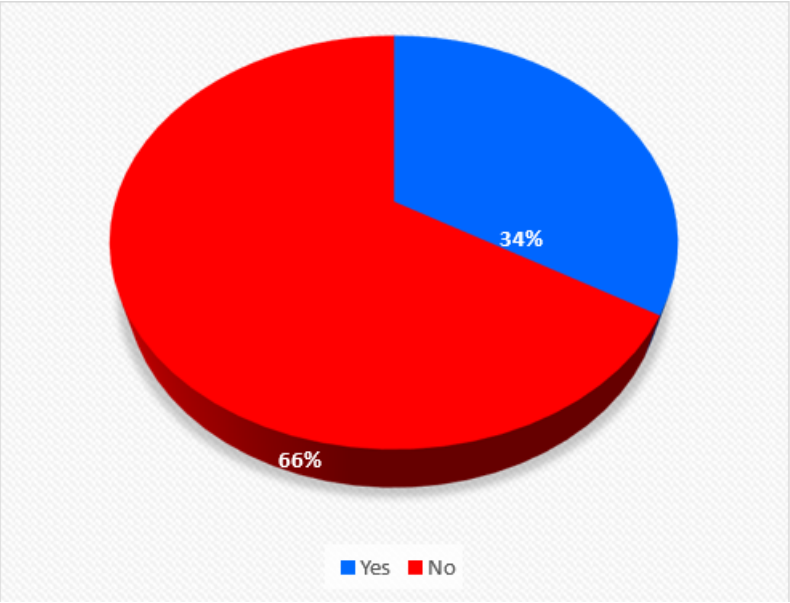

Figure 2: Distribution of Study Participants Who Underwent Screening for Active TB

TPT Initiation and Adherence

Among the 220 household contacts included in the study, only 21 (9.5%) participants had initiated Tuberculosis Preventive Treatment (TPT), while the majority 199 (90.5%) had not started TPT. Among the 21 participants who initiated TPT, 18 (85.7%) received the 3HP regimen (Isoniazid + Rifapentine for 3 months), whereas 3 (14.3%) received the 6H regimen (Isoniazid for 6 months). Of those who initiated TPT, 12 (57.1%) completed the full course of treatment, while 9 (42.9%) did not complete the prescribed regimen (Table 3).

Table3:TPTinitiationandadherenceofstudyparticipants

Variable	Levels	Frequency	Percentage
StartedonTPT	Yes	21	9.5
	No	199	90.5
Regimen among participantsinitiatedon TPT (n = 21)	(3HP)Isoniazid+ Rifapentinefor3 months	18	85.7
	6H(Isoniazidfor6 months)	3	14.3
TPT completion among participants initiated on TPT(n=21)	Yes	12	57.1
	No	9	42.9

Reasons for Non-Initiation of TPT

Among the 220 study participants, 21 (9.5%) had initiated TPT. Among those who did not initiate TPT, the most common reason was the perception that preventive treatment was unnecessary [138 (62.7%)], followed by fear of side effects [40 (18.2%)], other reasons [19 (8.6%)], and non-availability of medicines [2 (0.9%)].

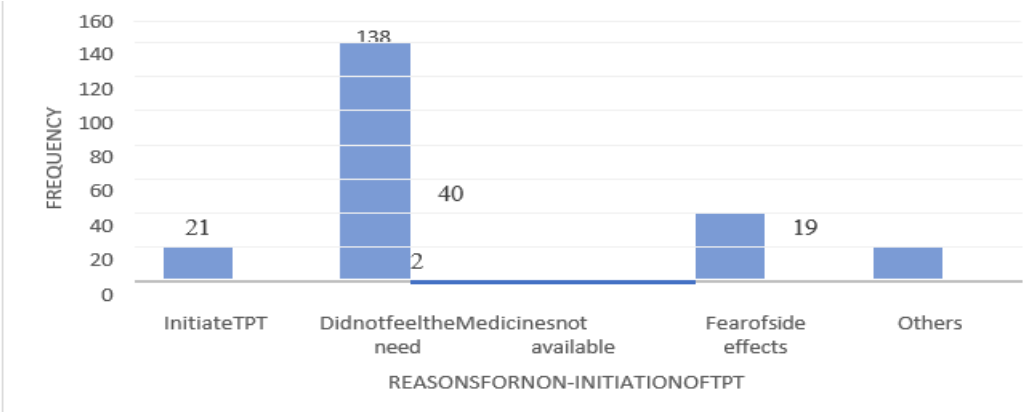

Figure 3: TPT Initiation Status and Reasons for Non-Initiation Among Study Participants

Reasons for Non-Completion of TPT

When participants were asked about possible reasons for non-completion of TPT, the most commonly reported reason was feeling healthy and perceiving that treatment was unnecessary [104 (47.3%)]. Other reported reasons included miscellaneous reasons [75 (34.1%)], development of side effects [29 (13.2%)], non-availability of medicines [8 (3.6%)], and forgetting to take medicines [4 (1.8%)].

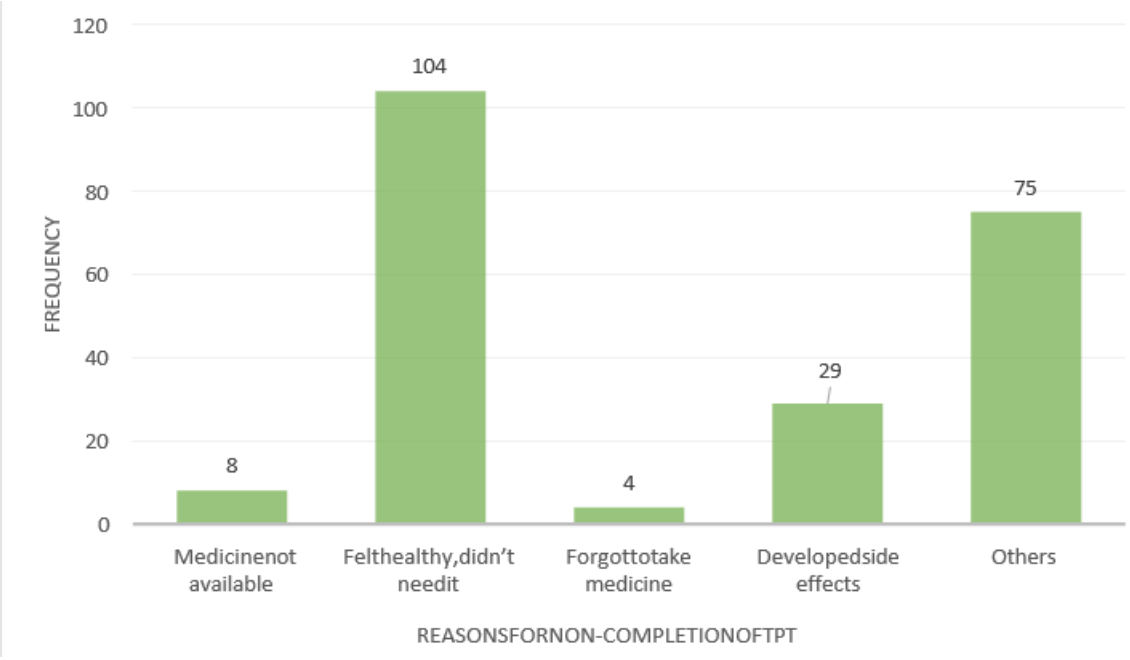

Figure 4: Perceived Reasons for Non-Completion of TPT Among Study Participants

Reasons for Non-Completion of TPT

When participants were asked about possible reasons for non-completion of TPT, the most commonly reported reason was feeling healthy and perceiving that treatment was unnecessary [104 (47.3%)]. Other reported reasons included miscellaneous reasons [75 (34.1%)], development of side effects [29 (13.2%)], non-availability of medicines [8 (3.6%)], and forgetting to take medicines [4 (1.8%)].

Suggestions and Feedback

Regarding measures to improve the initiation and completion of TPT, the majority of participants [122 (55.5%)] suggested enhancing awareness about TPT and its benefits. Counseling by healthcare workers was reported as an important measure by 56 (25.5%) participants. Regular follow-up and easy availability of drugs were suggested by 25 (11.4%) and 12 (5.5%) participants, respectively. Other measures were suggested by 5 (2.3%) participants**.**

DISCUSSION

In the present study assessing tuberculosis preventive therapy among household contacts, the demographic profile revealed a median age of 28 years, with a near-equal gender distribution—49.1% male and 50.9% female. The participants predominantly belonged to the Muslim community (56.8%), lived in joint families (56.8%), and were mostly married (50.9%). Illiteracy was comparatively high at 28.6%, while the majority were students (35%) or employed (29.1%). Socioeconomic status was mainly categorized as lower middle class (40.9%).

These findings align in part with similar demographic patterns reported in other studies, though with both concordances and notable differences. For example, a cross-sectional study conducted in periurban Malawi with 16,079 adults reported a comparable median age of 30 years and a similar male-female distribution. However, that study noted that 60% of participants were married, slightly higher than the 50.9% observed in your study, and educational attainment was relatively higher with 62% having received secondary schooling, contrasting with the 28.6% illiteracy in your cohort. Employment types also differed, where salaried employment was the most common occupation for men (40.7%), and petty trading for women (23.5%) [9]. This suggests that while the age and gender distribution are consistent, socioeconomic and educational profiles may vary depending on geographic and cultural contexts.

In contrast, a large study from Northwest China assessing knowledge, attitude, and practice toward tuberculosis among 2,341 residents reported a higher mean age of 50 years and a predominance of females (58.8% male vs. 41.2% female in

your study). The Chinese study also highlighted a higher education level among participants, with many having at least primary school education and occupations including teachers and doctors, groups associated with better tuberculosis knowledge and practices [10]. These demographic differences reflect potential underlying variations in urbanization, education access, and occupational structures compared to your urban field practice area in Raichur.

Furthermore, the present study's literacy profile with 28.6% illiteracy resonates with findings from a Nigerian study where low educational levels were significantly associated with poorer tuberculosis stigma experience among 205 patients, though that study did not report the exact literacy percentages. The Nigerian cohort also displayed no significant gender or religion-based differences in tuberculosis stigma, which complements your finding of nearly equal gender distribution and predominance of a single religious group (Muslims at 56.8%) without evidence suggesting adverse social determinants tied to religion [11].

Regarding socioeconomic stratification, your study showed a predominance of lower middle class households (40.9%). This partially agrees with evidence from a systematic review in Malaysia, which found varied socioeconomic factors like income, occupation, and education as risk factors for tuberculosis, though results were inconsistent across different studies within that review, reflecting the complexity of socioeconomic impacts on TB risk and prevention [12]. Your finding of a considerable proportion of students (35%) as household contacts also highlights a younger demographic potentially at risk, aligning with other studies emphasizing the vulnerability of younger populations to TB exposure.

In the present study, 40.5% of household contacts lived in the same room as the index TB patient, with 37.7% reporting overcrowding. Tobacco and alcohol use were low at 5% and 4.5%, respectively. Most participants (88.6%) were free of comorbidities, with hypertension (7.3%) and diabetes (3.6%) being the most common. Prior TB history was noted in 4.5%, and 96.4% had a visible BCG scar. These findings align with Lee et al., who found 38% TST positivity among close contacts in South Korea, highlighting household contact and prior TB history as key risk factors [13]. Similarly, Souza et al. reported 62.4% TST positivity in Brazilian contacts, supporting the role of close cohabitation in TB transmission [14]. In contrast, tobacco and alcohol prevalence in your study is notably lower than 18% tobacco use reported in a UK study, indicating regional behavioral differences influencing TB risk [15]. The high BCG scar prevalence reflects effective vaccination coverage consistent with protective effects documented internationally [16].

In the present study, awareness of Tuberculosis Preventive Treatment (TPT) among household contacts was found to be 46.8%, with only 33.6% undergoing any TB screening, predominantly sputum examination (29.1%). These findings resonate with challenges reported in other settings. For instance, in Bhopal, India, only 37% of child contacts were screened for TB, and a mere 22% initiated isoniazid preventive therapy, largely due to poor awareness and inadequate counseling among healthcare providers and caregivers [17]. Similarly, in rural Karnataka, India, a higher screening rate of 91.3% was noted; however, the subsequent testing and initiation of TPT remained suboptimal due to logistical barriers and lack of household contact awareness [18]. Contrastingly, the community-based program in Ethiopia demonstrated remarkable improvements, with screening coverage reaching 99.2% and TPT uptake at 95.3%, emphasizing the effectiveness of enhanced community engagement and health worker training [19]. These comparative studies underscore that while your study reflects moderate awareness and low screening, intensified community-level interventions and provider education are pivotal for improving TPT uptake and TB control.

In the present study, TPT initiation among household contacts was notably low at 9.5%, with the majority (83.2%) initiated on the 3-month Isoniazid plus Rifapentine regimen, and only 16.8% receiving 6 months of Isoniazid. Treatment completion was minimal at 5.5%. These findings are consistent with challenges observed in similar Indian settings. For instance, a mixed-methods study from rural Karnataka reported higher initiation (98%) and completion rates (77%) among 83 eligible contacts, highlighting better outcomes where programmatic support was strengthened, though challenges in contact identification and logistics persisted [18]. Conversely, a Tamil Nadu study revealed 33% initiation and only 22.9% completion among child household contacts, with barriers including lack of education about IPT and treatment duration concerns, mirroring your observed low uptake and completion [20]. Globally, completion rates tend to be higher with shorter regimens; a systematic review found initiation ranging from 26% to 99% and completion between 39% and 96%, generally favoring short-course treatments [21]. Compared to community-based interventions in Ethiopia where TPT initiation reached 95.3% and completion 98.1%, your results emphasize the critical need for enhanced community engagement, counseling, and system-level support to improve TPT uptake and adherence [19].

In the present study, the primary reason for non-initiation of tuberculosis preventive therapy (TPT) was the perception of no need for preventive treatment (52.3%), closely followed by fear of side effects (13.6%). Regarding non-completion, feeling healthy and considering treatment unnecessary accounted for 47.3%, with side effects and drug unavailability comprising 13.2% and 3.6%, respectively. These findings partially align with those reported by Sharma et al., who observed parental perceptions of unimportance (9%) and fear of side effects (3%) as reasons for non-initiation in a multi-centric Indian study; nonetheless, their reported non-initiation due to lack of information by paramedical workers (82%)

highlights a predominant health system barrier absent in your findings [22]. Similarly, Devi et al. documented high IPT completion rates but emphasized drug stock-outs and adverse effects as major causes for non-completion, resonating with your side effects barrier but differing regarding drug availability being a less frequent reason in your study (3.6%) compared to their primary challenge [23]. Contrastingly, in Kyrgyz Republic, Moldogazieva et al. reported a higher TPT initiation rate (49%) with completion at 81%, but did not emphasize patient perception as a leading barrier, focusing instead on gaps in contact identification and timely screening [24]. The perception of wellness diminishing treatment adherence in your study is consistent with findings from the Cambodia data analysis, which identified younger age groups as more likely to not complete TPT, possibly reflecting a lower perceived risk among otherwise healthy individuals [25]. Unlike some studies that underscore health system factors like drug stock-outs or counseling deficiencies as predominant barriers, your results suggest patient-level perceptions chiefly drive non-initiation and non-completion, indicating an urgent need to enhance patient education and address misconceptions regarding TPT necessity and safety within your urban setting.

In the present study, the majority of respondents (55.5%) emphasized increasing awareness about the benefits of tuberculosis preventive therapy (TPT) as a crucial measure to improve TPT uptake. This finding aligns with the qualitative study by Nakafeero et al., where patient and caretaker education on TPT benefits and TB risk was identified as a major facilitator for initiation and completion among children and adolescents living with HIV in Uganda [26]. Similarly, Ngosa et al. highlighted counseling by healthcare workers as a key enabler, consistent with your observation that 25.5% recommended enhanced counseling to boost adherence [27]. Regular follow-ups suggested by 11.4% of participants in your study are also supported by these studies, emphasizing appointment reminders and joint ART and TPT visits to maintain engagement [26,27].

In contrast, your finding that only 5.5% recommended easier drug availability as a solution somewhat diverges from the broader literature, where drug supply and stock-outs are frequently cited as major barriers to TPT scale-up; for example, policies in 35 countries reveal widespread isoniazid stock-outs negatively impacting uptake [28]. Likewise, studies in South Africa stress the critical importance of consistent drug availability and health system strengthening to improve prescribing practices [29,30]. This discrepancy may indicate that in your urban context, patient-centered interventions such as awareness and counseling hold more immediate promise than supply-side factors, which are often more prominent in resource-limited or rural settings. Collectively, these comparisons underscore the necessity of tailoring interventions to local perceptions while ensuring health system reliability for broader TPT uptake enhancement.

The present study has several limitations. Its cross-sectional design captures data at a single time point, restricting the ability to infer causal relationships between factors affecting Tuberculosis Preventive Therapy (TPT) uptake and adherence. Reliance on self-reported information may introduce recall and social desirability biases, potentially impacting data accuracy. The sample, drawn from a single urban field practice area, limits generalizability to other urban or rural settings with different socio-demographic or health system contexts. Additionally, healthcare system factors such as provider knowledge and facility readiness were not explored in depth. The two-month study duration may have missed temporal variations in TPT practices, and excluding contacts unwilling or unable to consent could have introduced selection bias.

The present study highlights the critical need to enhance awareness and education regarding Tuberculosis Preventive Therapy (TPT) among household contacts in urban settings. Strengthening counseling services by healthcare workers and ensuring regular follow-up can significantly improve initiation and completion rates. Addressing misconceptions about the necessity of TPT and alleviating fears related to side effects are essential to increase adherence. While drug availability was less frequently cited as a barrier, maintaining consistent supply remains important. Tailored community-based interventions focusing on patient education and engagement are recommended to effectively reduce TB transmission and improve preventive therapy outcomes in similar urban populations.

CONCLUSION:

The present study assessed awareness, initiation, and completion of Tuberculosis Preventive Therapy (TPT) among household contacts in an urban setting. Key findings reveal that less than half of the participants were aware of TPT, with only a small proportion undergoing screening and an even smaller fraction initiating and completing the therapy. The predominant barriers identified were the perception of no need for preventive treatment and fear of side effects, while drug availability was a less frequent concern. These results underscore significant gaps in knowledge and adherence within this high-risk population. Overall, the study highlights the critical importance of enhancing education, counseling, and follow-up services to improve TPT uptake and completion. Addressing patient misconceptions and fears through tailored community-based interventions is essential to effectively reduce TB transmission and improve preventive outcomes in similar urban populations. This evidence supports targeted strategies to strengthen TB control programs in comparable settings.

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