

Tuberculosis Preventive Therapy Adherence and factors associated with it among Household Contacts of Tuberculosis Patients in Western Uttar Pradesh: A Prospective study

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Abstract:

Introduction: Tuberculosis (TB) remains a significant global health challenge, with India bearing the highest burden. Tuberculosis Preventive Therapy (TPT) is a critical strategy to prevent latent TB infection (LTBI) from progressing to active disease, particularly among household contacts (HHCs) of pulmonary TB patients.

Objective: This study evaluates the completion rate and factors influencing TPT adherence in Agra district, India.

Methods: A community based prospective follow up study was conducted from January 2024 to December 2024 in two randomly selected Tuberculosis Units (TU) (Lohamandi and Bichpuri) in Agra district. A total of 360 Household contacts (HHC) were enrolled in the study. Data was collected via a pilot-tested, semi-structured questionnaire based on the Programmatic Management of Tuberculosis Preventive Treatment (PMTPT) guidelines. Participants were followed for six months to assess TPT completion, adverse effects and factors influencing compliance of TPT.

Results: The TPT completion rate was 55.3%, with 40.9% lost to follow-up and 3.8% discontinuing due to adverse effects. Factors significantly associated with completion included higher education, occupation, socio-economic status, regular follow-up, and awareness of TPT importance (all $p < 0.001$). Common barriers to adherence were lack of perceived need (41.9%) and forgetfulness (38.7%). Reported side effects were minimal, including lethargy (2.8%) and skin rashes (1.1%).

Conclusion: Study highlights that TPT adherence in Agra district is slightly over half hindered by low awareness and poor follow-up. Strengthening education, routine monitoring, and addressing socio-economic barriers are essential to enhancing TPT outcomes and achieving India's TB elimination target by 2025.

Keywords: Adherence, Household contact, Latent TB infection, NTEP, Tuberculosis Preventive Therapy.

Introduction:

A significant part of the world population estimated to be around one-third is affected by latent tuberculosis infection (LTBI), with the majority of cases concentrated in 22 high-TB-burden countries. LTBI is a state where individuals exhibit a persistent immune response to

Mycobacterium tuberculosis without any clinical symptoms of active tuberculosis (TB). In nations with limited healthcare resources and a high incidence of TB, the timely detection and management of active TB cases is a primary concern. However, since LTBI plays a vital role in contributing to future TB cases, identifying and

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treating it among high-risk populations is equally important. Effective LTBI control should involve a focused screening strategy and individualized treatment regimens, alongside enhanced airborne infection control in high-burden regions.^[1]

Due to the lack of a universally accepted diagnostic method for tuberculosis infection (TBI), its true global burden is uncertain, though about 25% of the population is estimated to be infected with *M. tuberculosis*. Most individuals are asymptomatic but remain at risk of developing active diseases, influenced largely by immune status. Preventing new infections and progression to active TB is essential.^[2] WHO recommends Tuberculosis Preventive Treatment (TPT) for high-risk groups like people living with HIV, household contacts of confirmed pulmonary TB patients, and other clinically vulnerable groups.^[3] TPT shows 60–90% efficacy, with isoniazid reducing disease risk and community programs lowering incidence by up to 17%.^[4]

The United Nations aimed to provide TPT to 30 million people between 2018 & 2022, but only 12.5 million (52%) received it by 2021. According to the World TB Report 2023, coverage among household contacts above 5 years of age was just 2 million (10% of the 20 million target). The 2023 United Nations High-Level Meeting (UNHLM) now targets 90% TPT coverage (45 million) by 2027.^[5]

In India, the National Strategic Plan (2017–2025) for TB elimination has emphasized “Prevent” as a major pillar, targeting reductions in TB incidence among vulnerable and high-risk groups.^[6] Despite this, India faces several challenges in TPT implementation. These include a general underestimation of LTBI risk among household contacts, confusion between latent infection and active disease, stigma and fear of discrimination, and concerns about TPT-related side effects. Many of these issues stem from limited public knowledge about TB prevention. As a result, healthcare workers bear a considerable burden in repeatedly educating and counseling household contacts regarding the benefits

and safety of TPT.^[7] The objective of this study was to evaluate the treatment completion of Tuberculosis Preventive Therapy (TPT) among household contacts of pulmonary TB patients and identify the key factors influencing adherence to TPT within the community setting.

Methods:

Study design and setting: A community based prospective follow up study was conducted from January 2024 to December 2024 in Agra district, Uttar Pradesh, India. There are 26 Tuberculosis units (TU) in Agra district. Out of which 6 TB units are urban, and 20 TB units are rural. For the purpose of this study, Simple random sampling was used and two Tuberculosis units (TU) – Lohamandi (urban) and Bichpuri (rural) were selected using the lottery method. This selection gave us the opportunity to ensure representation of both urban and rural populations, while keeping the study feasible in terms of time, manpower, and resources. Since the functioning of TUs is standardized under the National Tuberculosis Elimination Programme (NTEP), data from these two representative units were considered adequate to reflect district-level patterns.

Sample size: The sample size was calculated based on a TPT completion rate of 66.5% from a previous study by Samudyatha UC et al.^[7] (2023) using the formula: $N=4pq/d^2$ where (p=66.5%) (q=33.5%), and (d=5% which is error). This yielded a sample size of approximately 360 Household contacts equally divided between the two Tuberculosis units. (180 per TU).

Study population: Household contacts (HHC) who met the inclusion criteria were selected consecutively in the selected TB units from January 2024 to June 2024. A total sample size of 360 was calculated and was equally allocated to both TU with 180 HHC selected from urban TU and 180 from the rural TU. One or multiple HHC per index case were selected, based on eligibility as per the inclusion criteria. HHC was screened and active TB was ruled out in all the study participants by chest X-ray. Inclusion criteria were people residing in study area from

last 6 months and people who were above 18 years of age. People who were HIV positive and HHC with patients of MDR-TB or were excluded from the study. Chest X-ray was done to rule out active TB in Household contacts before starting TPT.

The participants were contacted on the day of initiation of TPT through telephone and a verbal informed consent was taken explaining all the details about the study. The baseline data was collected. Each participant was followed up twice a month and were monitored for their TPT compliance till 6 months as the TPT regimen includes 6 month of Isoniazid. Household contacts (HHC) are defined as individuals who lived in the same enclosed living space as the index tuberculosis (TB) case, either for at least one or more overnight stay or for repeated or prolonged daytime interactions, during the three months preceding the initiation of the TB patient’s treatment. As per the guidelines outlined in the Programmatic Management of Tuberculosis Preventive Treatment (PMTPT),^[16] treatment completion is defined as the intake of at least 80% of the prescribed doses—equivalent to 144 out of 180 doses—within 133% of the intended treatment duration, which equates to a maximum of 239 days for the 6-month isoniazid (6H) regimen. The effectiveness of TPT is considered optimal when a minimum of 80% of the doses are administered within this allowable timeframe.

Study procedure/data collection: Data was collected by using the semi structured questionnaire based on Programmatic Management of Tuberculosis Preventive Treatment in India (PMTPT) guidelines. Household contacts (HHCs) were interviewed for collection of socio demographic and treatment details as well as its side effects if any by semi structured questionnaire. Study participant’s voluntary consent was taken and participants were informed adequately. Participant identification details were taken, and a serial number was given to each participant questionnaire form. Data analysis was done using MS Excel and free Jamovi software.

Table 1: Socio demographic and Environmental Characteristics of Household Contacts (N=360)

Variable	n (%)
Age Group (years)	
18–39	220 (61.1)
40–59	129 (35.8)
≥60	11 (3.1)
Gender	
Male	212 (58.9)
Female	148 (41.1)
Educational Status	
Illiterate / Primary	20 (5.6)
Middle / High School	130 (36.1)
Intermediate / Graduate	210 (58.3)
Occupation	
Unemployed	183(50.5)
Unskilled/ Semi-skilled	34(9.7)
Skilled/Clerical/Shop/Farmer	92(25.5)
Semi-professional/ Professional	51(14.3)
Socio-Economic Status	
Lower / Lower Middle	170 (47.2)
Middle	74 (20.5)
Upper Middle / Upper	116 (32.2)
Overcrowding	
Present	232 (64.4)
Absent	128 (35.6)
Awareness of Risks of Skipping TPT	
Yes	219 (61.0)
No	141 (39.0)

Ethical considerations: Approval of study was taken from institutional ethical committee (SNMC/ IEC/2024/202).

Table 1 shows Socio demographic and Environmental characteristics of Household Contacts. A total of 360 participants were analysed. The majority were young adults aged 18–39 years. (61.1%). Males constituted a larger share (58.9%) compared to females (41.1%). Educational status revealed that most participants were relatively educated, with 58.3% having completed intermediate or graduate-level

Table 2: Treatment Related Factors and Outcomes among Household Contracts (N=360)

Variable	n (%)
Knowledge about TPT	
Yes	190 (52.7)
No	170 (47.3)
Reasons for Skipping TPT	
No need felt / No symptoms	151 (41.9)
Forgetfulness	139 (38.7)
Adverse Effects	14 (3.8)
Did Not Skip	56 (15.6)
Adverse Effects	
Present	14 (3.9)
None	346 (96.1)
Tablet Consumption	
≥144 tablets	199 (55.3)
<144 tablets	161 (44.7)
Follow-Up Frequency	
Monthly / Bimonthly	240 (66.7)
None	120 (33.3)
Treatment Outcomes	
Completed	199 (55.3)
Lost to Follow-Up	147 (40.9)
Discontinued (Adverse Effects)	14 (3.8)

education. Socio-economically, the study population was predominantly from the lower or lower middle class (47.2%).

Environmental factors indicated that overcrowding was present in 64.4% of households, potentially contributing to higher TB transmission risk. Awareness about the health risks associated with skipping TPT was reported by 61.0% of the respondents, suggesting a moderately informed population.

Table 2 shows that 53% of participants have knowledge about TPT while 47% were unaware about TPT. total 41.9% of participants skipped TPT due to a perceived lack of need or absence of symptoms, and 38.7% cited forgetfulness as the reason. Adverse drug effects were rarely reported as a reason for discontinuation (3.8%), and only 15.6% of participants reported not skipping TPT at all. Regarding adverse effects, a vast majority (96.1%) experienced no side

effects, which indicates good overall tolerability of the therapy. Tablet consumption data showed that 55.3% of participants consumed ≥144 tablets, aligning with the recommended regimen, while 44.7% took fewer than the required number. In terms of treatment outcomes, just over half (55.3%) successfully completed the TPT course, while a significant proportion (66.7%) had follow-up, and 3.8% discontinued treatment due to adverse effects.

Table 3a demonstrates the association between socio-demographic variables and TPT completion among household contacts in Agra District. Age and gender were not significantly associated with completion, though younger participants (30–39 years) showed relatively higher adherence. Head of family status was significant, with non-head members completing TPT more often than heads of households ($\chi^2=4.27$, $p = 0.039$). Occupation showed a strong association. ($\chi^2 - 51.4$, $p < 0.001$); completion was lowest among unskilled workers, while semi-professionals and professionals achieved the highest completion rates. Education was also significantly associated ($\chi^2 - 42.1$, $p < 0.001$); completion increased steadily with higher education, reaching almost 90% among graduates. Similarly, socio-economic status strongly influenced adherence ($\chi^2 - 67.2$, $p < 0.001$), with upper and upper-middle groups showing the highest completion, and lower/low-middle groups the lowest. Marital status was also a significant factor ($\chi^2 - 8.66$, $p = 0.013$); unmarried individuals had higher completion compared to married or widowed/divorced participants.

Table 3b shows that follow-up frequency and awareness were strongly associated with TPT completion. Participants with monthly (81.6%) or bimonthly follow-up (83.0%) had significantly higher completion rates compared to those without follow-up (0.8%) ($\chi^2 - 215$, $p < 0.001$). Similarly, those aware of the risks of skipping TPT showed markedly better adherence (88.1%) than those not aware (4.2%) ($\chi^2 - 244$, $p < 0.001$).

Table 3a: Association of Socio demographic Variables with TPT Completion in Agra District (N=360)

Variable	Completed n (%)	Not Completed n (%)	p value
Age (years)			
18–29	91 (58.8)	64 (41.2)	0.128
30–39	46 (70.7)	19 (29.3)	
40–49	37 (45.6)	44 (54.4)	
50–59	22 (45.8)	26 (54.2)	
≥60	3 (27.2)	8 (72.8)	
Gender			
Male	119 (56.1)	93 (43.9)	0.696
Female	80 (54.0)	68 (46.0)	
Residence			
Urban	107 (59.4)	73 (40.6)	0.112
Rural	92 (51.1)	88 (48.9)	
Head of Family			
Head	32 (44.4)	40 (55.6)	0.039
Not Head	167 (57.9)	121 (42.1)	
Occupation			
Unemployed	104 (56.8)	79 (43.2)	<0.001
Unskilled/ Semi-skilled	9(26.5)	25 (73.5)	
Skilled/ Clerical/Shop/Farmer	51 (55.4)	41 (44.6)	
Semi-professional/ Professional	35 (68.6)	16 (31.4)	
Education			
Illiterate	4 (26.6)	11 (73.4)	<0.001
Primary	1 (20.0)	4 (80.0)	
Middle School	27 (39.7)	41 (60.3)	
High School	33 (53.2)	29 (46.8)	
Intermediate	82 (53.9)	70 (46.1)	
Graduation	52 (89.6)	6 (10.4)	
Socio-Economic Status			
Upper/Upper Middle	99 (85.3)	17 (14.6)	<0.001
Middle	48 (64.8)	26 (35.2)	
Lower/Lower Middle	52 (30.5)	118 (69.4)	
Marital Status			
Married	120 (50.2)	119 (49.8)	0.013
Unmarried	78 (66.1)	40 (33.9)	
Widowed/Divorced	1 (33.3)	2 (66.7)	

*Chi-square test (χ^2) was used to assess the association between treatment completion and socio-demographic variables. A p-value <0.05 was considered statistically significant.

Table 3b: Association of Follow-Up and Awareness with TPT Completion in Agra District (N = 360)

Variables	Completed n (%)	Not Completed, n (%)	p value*
Follow-Up			
Monthly	80 (81.6)	18 (18.4)	<0.001
Bimonthly	118 (83.0)	24 (16.9)	
None	1 (0.8)	119 (99.2)	
Awareness of Risks of Skipping TPT			
Aware	193 (88.1)	26 (11.9)	<0.001
Not Aware	6 (4.2)	135 (95.8)	

*Chi-square test (U^2) was used to assess the association between treatment completion and socio-demographic variables.

Discussion:

Tuberculosis (TB) continues to pose a major public health threat worldwide, especially in high-burden nations such as India. In 2023, India contributed to approximately 27% of the global TB burden, with an estimated 2.8 million newly diagnosed cases.^[5] The present study conducted in Agra district, Uttar Pradesh, aimed to assess the efficacy of Tuberculosis Preventive Therapy (TPT) among household contacts (HHCs) of drug-sensitive pulmonary TB patients. The study found a TPT completion rate of 55.3%, with 40.9% lost to follow-up and 3.8% discontinuing due to adverse effects. These findings align with existing literature but also highlight critical gaps in TPT implementation that need to be addressed to achieve India's National Tuberculosis Elimination Programme (NTEP) goal of TB elimination by 2025.^[8]

The completion rate of 55.3% in this study is comparable to findings from other Indian studies, such as Mukherjee et al., who reported a 51.8% completion rate in West Bengal^[9] but lower than Kumar et al. (2025),^[10] who observed a 66.5% completion rate in rural Delhi. The variation in completion rates may be attributed to differences in population awareness, healthcare infrastructure, and follow-up mechanisms. For instance, the present study identified a significant association between regular follow-up (monthly or bimonthly) and treatment completion ($\chi^2 = 216, p < 0.001$), underscoring the importance of structured monitoring, as also noted by Shah et al. (2024).^[11] However, 34% of participants in this study received no follow-up, which likely contributed to the high loss to follow-up rate (40.9%). This gap in the care cascade is consistent with global challenges reported by Alsudrf et al.^[2] who highlighted substantial dropout rates in latent TB management.

Socioeconomic and educational factors significantly influenced TPT adherence in this study. Participants from higher socioeconomic classes (upper and upper-middle) and those with graduate-level education exhibited completion rates of 85.3% and 89.6%, respectively ($\chi^2 = 67.2, p < 0.001$; $\chi^2 = 42.1, p <$

0.001). These findings corroborate Kumar et al.^[10] who noted that higher education correlates with better TPT compliance due to increased awareness and health literacy. Conversely, lower socioeconomic status and illiteracy were associated with poorer adherence, potentially due to financial constraints and limited access to healthcare facilities, as also reported by Sharma et al.^[12] Additionally, occupational status influenced adherence, with professionals showing 68.6% completion rates, likely due to better access to resources and awareness ($\chi^2 = 51.4, p < 0.001$). Awareness of TPT's importance was a critical determinant of adherence. Participants aware of the risks of skipping TPT had an 88.1% completion rate compared to only 4.2% among those unaware ($\chi^2 = 244, p < 0.001$). This aligns with Borse et al. (2024), who found that knowledge about TPT significantly enhances adherence. However, 53% of participants in this study had knowledge about TPT indicating a need for improved patient education and counseling.^[13] Stigma and misconceptions, as noted by Samudyatha et al.^[7] further complicate TPT uptake, particularly among females, who comprised only 41.1% of participants, possibly due to social barriers.

The study also highlighted environmental risk factors, with 64.4% of participants living in overcrowded conditions and 43.3% in high TB transmission settings. These conditions, as supported by Banu et al. increase TB transmission risk and underscore the need for targeted interventions in vulnerable communities.^[14] Adverse effects, though minimal (3.9% reported lethargy or skin rashes), led to discontinuation in 3.8% of cases, a lower rate than reported by Sharma et al. (2022) (27.5%) but consistent with Yuen et al. (2021) (7%)^[11,15] This suggests that while TPT is generally well-tolerated, even minor side effects can impact adherence if not addressed promptly.

The absence of treatment failure (i.e., no participants developed active TB during TPT) is encouraging and aligns with the high efficacy of TPT when adhered to, as per PMTPT guidelines.^[16] However, the high loss to follow-up rate indicates systemic

challenges, including inadequate follow-up, drug supply issues, and patient-related factors like forgetfulness (38.7%) and perceived lack of necessity (41.9%). These barriers are consistent with findings by Alvi et al.^[17] (2024), who identified drug availability and workforce burden as key implementation challenges.

This study represents, to our knowledge, one of the first community-based assessment involving household contacts of pulmonary TB patients since the nationwide rollout of the TPT program to all HHCs in India. However, as it was a cross-sectional study conducted at only two TB units, the findings may not be widely generalizable beyond the study population.

This study provides valuable insights into TPT efficacy in Agra district, highlighting the critical role of follow-up, awareness, and socioeconomic factors in achieving high completion rates. To enhance TPT effectiveness, interventions should focus on strengthening follow-up mechanisms, improving patient education, and addressing social determinants like poverty and overcrowding. Community-based approaches, and digital adherence tools, could bridge gaps in the care cascade. These findings contribute to the evidence base for scaling up TPT under NTEP, supporting India's goal of TB elimination by 2025.

Conclusion:

The community based prospective study conducted among 360 household contacts (HHC) of drug-sensitive pulmonary tuberculosis (TB) patients in Agra district highlights significant challenges in the implementation of Tuberculosis Preventive Therapy (TPT). Treatment adherence was suboptimal, with 42% intentionally skipping TPT due to the absence of symptoms, 4% discontinuing due to side effects, and approximately 41% lost to follow-up. Notably, only 55.3% of participants completed the treatment regimen.

Key factors associated with treatment completion included occupation, educational status, and socioeconomic status. Regular follow-up and awareness about the consequences of skipping TPT emerged as critical determinants of adherence. These findings

underscore the need for multifaceted interventions at individual, family, community, healthcare facility, and administrative levels. Strategies such as leveraging digital adherence technologies like 99DOTS and MERM, enhancing community awareness, reducing stigma, and strengthening healthcare infrastructure are essential to improve TPT uptake and adherence. Implementing these recommendations can significantly contribute to the National Tuberculosis Elimination Programme's goal of ending TB in India.

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References:

1. Sharma SK, Mohanan S, Sharma A. Relevance of latent TB infection in areas of high TB prevalence. *Chest*. 2012 Sep 1;142(3):761-73. <https://doi.org/10.1378/chest.12-0142>
2. Alsdurf H, Hill PC, Matteelli A, Getahun H, Menzies D. The cascade of care in diagnosis and treatment of latent tuberculosis infection: a systematic review and meta-analysis. *The Lancet Infectious Diseases*. 2016 Nov 1;16(11):1269-78. DOI: 10.1016/S1473-3099(16)30216-X
3. World Health Organization. Guidelines on the management of latent tuberculosis infection. World Health Organization; 2015 Jan 15.
4. Comstock GW, Baum C, Snider Jr DE. Isoniazid prophylaxis among Alaskan Eskimos: a final report of the betel isoniazid studies. *American Review of Respiratory Disease*. 1979 May;119(5):827-30.
5. World Health Organization. Global tuberculosis report 2024. Geneva: World Health Organization; 2024.
6. Khanna A, Saha R, Ahmad N. National TB elimination programme- What has changed. *Indian Journal of Medical Microbiology*. 2023 Mar 1;42:103-7. <https://doi.org/10.1016/j.ijmmb.2022.10.008>
7. Samudryatha UC, Soundappan K, Ramaswamy G, Mehta K, Kumar C, Jagadeesh M, Prasanna Kamath BT, Singla N, Thekkur P. Outcomes and challenges in the programmatic implementation of tuberculosis preventive therapy among household contacts of pulmonary TB patients: a mixed-methods study from a rural district of Karnataka, India. *Tropical Medicine and Infectious Disease*. 2023 Nov 30;8(12):512. <https://doi.org/10.3390/tropicalmed8120512>
8. Rajoria C, Maula MT, Vyas S, Ray A, Nischal N. Paving a Way for "TB Mukta Bharat": A Snapshot of India's TB Elimination Program. *Indographics*. 2024 Dec;3(02):027-32. DOI: 10.1055/s-0044-1787985

9. Mukherjee O, Das DK, Adhikary M, Ghosh R. Tuberculosis preventive treatment among the household contacts of tuberculosis patients—Coverage and correlates in a block of Murshidabad district, West Bengal: A cross-sectional study. *Indian Journal of Tuberculosis*. 2024 Jun 6. <https://doi.org/10.1016/j.ijtb.2024.06.002>
10. Kumar S, Yadav G, Lukhmana S. Community-based assessment of Tuberculosis Preventive Therapy among household contacts living with index pulmonary TB patient in rural Delhi. *Indian Journal of Tuberculosis*. 2025 Feb 3. <https://doi.org/10.1016/j.ijtb.2025.02.004>
11. Shah H, Patel J, Rai S, Sen A. Advancing Tuberculosis Elimination in India: A Qualitative Review of Current Strategies and Areas for Improvement in TB Preventive Treatment. *IJID regions*. 2024 Dec 21:100556. <https://doi.org/10.1016/j.ijregi.2024.100556>
12. Sharma N, Basu S, Khanna A, Sharma P, Chandra S. The intention to receive tuberculosis preventive therapy in adult household contacts of pulmonary TB patients in Delhi, India. *The Journal of Infection in Developing Countries*. 2022 Feb 28;16(02):298-304.
13. Borse R, Randive B, Mattoo S, Malik P, Solanki H, Gupta A, Chaisson RE, Mave V, Suryavanshi N. Three months of weekly rifapentine plus isoniazid for TB prevention among people with HIV. *IJTLD open*. 2024 Sep 1;1(9):404-9. <https://doi.org/10.5588/ijtldopen.23.0609>
14. Banu S, Rahman MT, Uddin MK, Khatun R, Ahmed T, Rahman MM, Husain MA, van Leth F. Epidemiology of tuberculosis in an urban slum of Dhaka City, Bangladesh. *PloS one*. 2013 Oct 21;8(10):e77721. <https://doi.org/10.1371/journal.pone.0077721>
15. Yuen CM, Millones AK, Galea JT, Puma D, Jimenez J, Lecca L, Becerra MC, Keshavjee S. Toward patient-centered tuberculosis preventive treatment: preferences for regimens and formulations in Lima, Peru. *BMC Public Health*. 2021 Jan 11;21(1):121. <https://doi.org/10.1186/s12889-020-10098-5>
16. Central TB Division, Ministry of Health and Family Welfare, Government of India. Guidelines for programmatic management of tuberculosis preventive treatment in India [Internet]. New Delhi: Ministry of Health and Family Welfare; 2023 [cited 2025 Mar 21]. Available from: <https://tbcindia.mohfw.gov.in/wp-content/uploads/2023/05/Guidelines-for-Programmatic-Management-of-Tuberculosis-Preventive-Treatment-in-India.pdf>
17. Alvi Y, Philip S, Anand T, Chinnakali P, Islam F, Singla N, Thekkur P, Khanna A, Vashishat BK. Situation analysis of early implementation of programmatic management of tuberculosis preventive treatment among household contacts of pulmonary TB patients in Delhi, India. *Tropical Medicine and Infectious Disease*. 2024 Jan 17;9(1):24. <https://doi.org/10.3390/tropicalmed9010024>