ISSN No. 2321-2705 | DOI: 10.51244/IJRSI |Volume XII Issue V May 2025

Uptake and Completion of Tuberculosis Preventive Treatment among Contacts of Tuberculosis Patients in a Nigerian Tertiary Hospital

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DOI: https://doi.org/10.51244/IJRSI.2025.12050091

Received: 03 May 2025; Accepted: 07 May 2025; Published: 10 June 2025

ABSTRACT

Background: Tuberculosis Preventive Treatment (TPT) is a proactive approach aimed at stopping latent tuberculosis (TB) infection from progressing into active TB disease. It is especially important for individuals who are at higher risk such as contacts of TB patients. This study was aimed at investigating the uptake and completion of TPT among contacts of TB patients.

Methods: This was a prospective study involving the contacts of TB patients at Chukwuemeka Odumegwu Ojukwu University Teaching Hospital Awka. Patients diagnosed with active TB were enrolled, and their contacts were identified through comprehensive interviews. The identified contacts were followed up over a six-month period, with monthly check up visits.

Results: A total of 121 patients with active TB disease were recruited for this study, leading to the identification of 474 contacts. Over 95% of the contacts were eligible for TPT, out of which 53.6% were initiated on TPT with their consent. Approximately 60.7% of under-five contacts were also commenced on TPT. Over 81% of contacts commenced on TPT completed their treatment with treatment completion rate significantly associated with the duration of the treatment regimen prescribed ($p < 0.05$). The under-five completion rate of TPT was 94.6%. The TPT outcomes in contacts was also significantly associated with the treatment outcomes of the index TB patients ($p < 0.05$).

Conclusion: TPT is a cornerstone of the World Health Organisation (WHO) End TB Strategy, aiming to reduce TB incidence globally. When effectively implemented, it can protect both individuals and communities from TB.

Keywords: tuberculosis; contacts; tuberculosis preventive treatment; uptake; completion

INTRODUCTION

Tuberculosis (TB) has been in existence since ancient times, being an infectious disease caused by the bacteria *Mycobacterium tuberculosis* (TB bacilli) ultimately leading to illness and death especially in low and middle income (LMIC) countries of the globe [1] – [19]. TB spreads mostly through airborne droplets from person to person when people with active TB cough, sneeze, spit or speak [1], [7], [8], [17], [18].

About 25% of the world population is estimated to be infected with TB [1]. Of those infected, 5 – 15 % will go on to develop active TB disease in their lifetime (commonly within the initial five years following infection)

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while the rest will either clear the infection or develop latent TB infection [1], [20] – [22]. Latent TB infection is defined as a state of persistent immune response to stimulation by TB bacilli antigens with no observable clinical manifestation of active TB disease [20], [23]. There is no gold standard test for latent TB infection [20], [23]. The burden of latent TB infection is not known with certainty in Nigeria; however, up to 20% of Nigerian population is estimated to be infected with TB bacilli with majority showing no signs or symptoms of TB disease and are not infectious [20]. They are however at risk for active TB disease and for becoming infectious [20]. Identification and treatment (i.e. TB preventive treatment) of latent TB infection can substantially reduce the risk of development of active disease (by as much as 60%), and is an important TB control strategy [20].

Prevention of active TB disease by testing and treating for latent TB infection is a crucial component of the WHO End TB Strategy [20]. The efficacy of currently available latent TB infection treatments ranges from 60% to 90% [20]. Management of latent TB infection involves a comprehensive package of interventions including; identifying those individuals who should be tested to exclude active TB disease, delivering effective, safe treatment in such a way that the majority of those starting a treatment regimen will complete it with no or minimal risk of adverse events, and monitoring and evaluation of the process [20]. The identification and treatment of people with latent TB infection occurring as a result of recent contact with an index case of active TB is very crucial to TB control [24].

TPT or treatment of latent TB infection is treatment offered to individuals who are considered to be at risk of developing TB disease such as contacts of active TB patients, people living with human immunodeficiency virus (HIV), or persons with weakened or compromised immune systems, in order to reduce their risk of developing active TB disease [20], [23], [25]. Identification and treatment of latent TB infection can substantially reduce the risk of development of active disease by as much as 60% [20]. Prior to the commencement of TPT, contacts of index TB cases are investigated to rule out active TB disease. Latent TB infection can be effectively treated to prevent progression to active TB, thus resulting in a substantial benefit for both the individual and the community [20].

The drug regimens commonly used for TPT include [20], [23], [25];

i. Isoniazid (INH) daily for 6 months (6H).

ii. Isoniazid and rifampicin daily for 3 months (3HR).

iii. Isoniazid and rifapentine weekly for 3 months (3HP).

iv. Isoniazid and rifapentine daily for 28 days (1HP).

This study sought to examine the uptake and completion of Tuberculosis Preventive Treatment (TPT) among contacts of active TB patients, along with the possible factors influencing these outcomes.

METHODS

This research was carried out at the Chest/TB clinic of Chukwuemeka Odumegwu Ojukwu University Teaching Hospital (COOUTH) in Awka, Southeastern Nigeria. This was a prospective study involving consenting active TB patients and their contacts. All individuals diagnosed with active TB were enrolled in the study consecutively, along with their identified contacts. Through comprehensive interviews with the index cases, their contacts were identified and subsequently invited to the TB clinic.

Data was collected from the study participants using an interviewer-administered questionnaire. Additionally, the contacts underwent clinical screening, which included history taking and physical examination, to assess the presence of key symptoms and signs indicative of presumptive TB. These symptoms include a cough lasting two weeks or more, or any duration in individuals living with HIV, fever, weight loss, night sweats, and, in children, failure to thrive. Suitable samples (sputum for adults and stool for children unable to produce sputum) were collected from the contacts for analysis using the Xpert MTB/Rif Ultra assay. After investigation, the contacts were initiated on either appropriate TB treatment or TPT depending on the outcome of the investigation. The

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study participants were followed up over a period of six months with monthly visits for check up and medication pick up.

The collected quantitative data were analyzed using SPSS version 20. Frequency distributions of relevant variables were presented in tables and charts for better visualization. Key statistical measures, including percentages, means, and standard deviations, were computed to summarize the data. Additionally, tests for statistically significant differences in proportions and associations were conducted using the chi-square test, with a significance level (α) set at 0.05.

RESULTS

A total of 121 index TB patients took part in the study. Majority of them were males, lived in the rural areas and were within the age group of 36 – 45 years (Table 1).

Table 1: Socio-demographic Profile of Index TB Patients

Variables	**Frequency (N = 121)**	**Percentage**
Age group (years)		
≤ 15	4	3.3
16 – 25	18	14.9
26 – 35	25	20.7
36 – 45	32	26.4
46 – 55	21	17.4
56 – 65	12	9.9
≥ 66	9	7.4
Mean age ± SD (40.49 ± 16.258)		
Sex		
Male	69	57
Female	52	43
Place of residence		
Urban	55	45.5
Rural	66	54.5

A total of 474 contacts of index TB patients took part in the study. Majority of them were females, lived in the rural areas and were within the age group of ≤ 15 years (Table 2).

Table 2: Socio-demographic Profile of Contacts of Index TB Patients

Variables	**Frequency (N = 474)**	**Percentage**
Age group (years)		
≤ 15	198	41.8

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16 – 25	90	19
26 – 35	70	14.8
36 – 45	54	11.4
46 – 55	24	5.1
56 – 65	23	4.9
≥ 66	15	3.2
Mean age ± SD (24.01 ± 18.979)		
Sex		
Male	194	40.9
Female	280	59.1
Place of residence		
Urban	228	48.1
Rural	246	51.9
Type of contacts		
Household contact	451	95.1
Close contact	23	4.9

Over 67% of the index TB patients had treatment success whereas 25.6% were lost to follow up (Table 3).

Table 3: Distribution of treatment outcomes in index TB patients

Treatment outcomes	**Frequency (N = 121)**	**Percentage**
Treatment success	**82**	**67.8**
Died	**8**	**6.6**
Lost to follow up	**31**	**25.6**

Out of the 95.6% of the contacts who were eligible for TPT, 53.6% were commenced on TPT with their consent. Six months of isoniazid and three months of rifampicin and isoniazid were the regimen used for the TPT, and 81.9% of contacts completed their treatment (Table 4).

Table 4: Distribution of TPT characteristics of contacts of index TB patients

Variables	Frequency	Percentage
Eligible for TPT	N = 474	
Yes	453	95.6

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No	21	4.4
Commenced TPT	N = 453	
Yes	243	53.6
No	210	46.4
TPT regimen received	N = 243	
INH	139	57.2
3HR	104	42.8
TPT outcome	N = 243	
Treatment completed	199	81.9
Lost to follow up	44	18.1

INH (6 months of Isoniazid); 3HR (3 months of Rifampicin and Isoniazid)

Both treatment outcome in index TB patients and the type of TPT regimen used were significantly associated with the TPT outcomes in contacts, p-value = 0.000 (Table 5)

Table 5: Relationship of some variables with TPT outcomes in contacts of index TB patients

Variables	Treatment completed n (%)	Lost to follow up n (%)	X^2	p-value
Treatment outcomes in index TB patients				
Treatment success	177 (93.2)	13 (6.8)		
Died	9 (60.0)	6 (40.0)		
Lost to follow up	13 (34.2)	25 (65.8)	66.160 (F)	0.000
TPT regimen used				
INH	95 (68.3)	44 (31.7)		
3HR	104 (100.0)	0 (0.0)	40.200	0.000
Gender				
Male	80 (82.5)	17 (17.5)		
Female	119 (81.5)	27 (18.5)	0.037	0.848

F = Fisher's exact test INH (6 months of Isoniazid); 3HR (3 months of Rifampicin and Isoniazid)

Over 60% of under – fives were commenced on TPT with 94.6% completion rate (Table 6).

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Table 6: Summary of gender and age group distribution of TPT characteristics of contacts of index TB patients

TPT characteristics of contacts of index TB patients	Combined n (%)	Adults (≥15 years) n (%)	Children (≤14 years) n (%)	Children (<5 years) n (%)	Male n (%)	Female n (%)
Eligibility for TPT	453 (95.6)	273 (94.8)	180 (96.8)	61 (95.3)	182 (93.8)	271 (96.8)
Commenced TPT	243 (53.6)	136 (49.8)	107 (59.4)	37 (60.7)	97 (53.3)	146 (53.9)
Completed TPT	199 (81.9)	104 (76.5)	95 (88.8)	35 (94.6)	80 (82.5)	119 (81.5)

DISCUSSION

This research work investigated the uptake and completion of TB preventive treatment (TPT) in contacts of TB patients. A total of 474 contacts and 121 TB patients were investigated. A great majority of the contacts were eligible for TPT, out of which a little more than half (53.6%) were initiated on TPT sequel to their consent. This proportion of contacts initiated on TPT was lower than findings in Portugal (100%) [26], Switzerland (81%) [27], and the middle east (76.3%) [28] but higher than findings in Malawi (49.7%) [29], Kenya (27%) [30], and Australia (12%) [31]. The finding of a high proportion of under – five contacts (60.7%) commenced on TPT compares with findings in rural South Africa (50%) [32]. The variations in the uptake of TPT can largely be attributed to the level of awareness and understanding among contacts regarding active TB disease and latent TB infection. In the index study, many contacts declined TPT, primarily due to misconceptions about its purpose. A significant portion of them believed that TPT was intended for treating active TB and mistakenly assumed that because they were asymptomatic, treatment was unnecessary. This highlights the critical need for targeted health education and awareness campaigns to clarify the distinctions between active TB and latent TB infection, emphasizing the importance of preventive treatment even in the absence of symptoms. Strengthening counselling efforts and improving access to accurate information could play a crucial role in increasing TPT acceptance and adherence.

A very high proportion of contacts (81.9%) commenced on TPT completed their treatment with treatment completion rate statistically significantly associated with the duration of the treatment regimen prescribed as shown by the finding that all contacts initiated on 3HR (daily Isoniazid and Rifampicin for 3 months) completed their treatment as against those commenced on 6 months daily Isoniazid therapy. This completion rate compares with the finding in Portugal (96%) [26] and Australia (100%) [31]. The TPT completion rates were however lower in Switzerland (67%) [27] and Malawi (41.1%) [29]. The under- five completion rate was far above that in Malawi [29].

The rate of completion for Tuberculosis Preventive Treatment (TPT) was significantly influenced by the duration of the treatment regimen initiated. Longer treatment courses often posed challenges related to adherence, as patients faced difficulties such as medication fatigue, accessibility issues, and potential side effects. Conversely, shorter regimens were generally associated with improved compliance and higher completion rates, likely due to reduced pill burden and enhanced motivation to complete therapy. This highlights the importance of optimizing treatment duration and providing adequate patient support to improve overall TPT success rates. Studies with higher completion rates were linked with the prescription of shorter duration treatment regimens [26], [31] whereas those with lower completion rates utilized the 6-month Isoniazid regimen [27], [29]. Shorter duration treatment regimens are convenient to use, well tolerated with minimal adverse drug reactions, and encourages adherence thereby enhancing completion rate of TPT.

The treatment outcomes of index TB patients were closely linked to the TPT outcomes of their contacts. A significant majority of contacts who successfully completed TPT were associated with index TB patients who achieved treatment success. This correlation suggests that the adherence and recovery of index TB patients play a vital role in influencing the treatment trajectory of their contacts. This aligns with the findings of a study in Benin City, Nigeria where a high rate of adherence to TPT (86%) was attributed to the use of simple tools associated with the follow-up of index cases and are part of the National Tuberculosis Control Programme [33].

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This suggests that when index TB patients receive effective counselling and consistent follow-up, they are more likely to adhere to their prescribed medication, ultimately leading to successful treatment outcomes. Their improved adherence not only enhances their own recovery but also strengthens disease control efforts within the community. As a result, their contacts undergoing Tuberculosis Preventive Treatment (TPT) benefit from this supportive environment and are more likely to complete their treatment successfully. This highlights the importance of comprehensive patient-centered approaches, where counselling, monitoring, and continued engagement play a crucial role in ensuring both individual and public health benefits.

CONCLUSIONS

This research highlights the uptake and completion of TB preventive treatment in contacts of active TB patients. TPT is a critical public health strategy to combat TB by preventing latent TB infection from progressing to active TB disease. The findings indicate that shorter duration treatment regimens were more convenient for the recipients, enhancing adherence to medication and improving completion rate. Ensuring regular availability of the shorter duration treatment regimens is essential towards improving the uptake and completion of TPT. Continuous patient education is also required to mitigate poor consent to TPT.

Effective management and counselling of TB patients not only improve individual health outcomes but also create a supportive treatment environment for their close associates. Strengthening patient education, follow-up mechanisms, and healthcare system support for TB treatment can further enhance adherence rates and overall success in TB prevention

Ethics approval

The research protocol was approved by the COOUTH Health Research Ethics Committee (HREC), and all the participants signed an informed consent form.

Availability of data and materials

The generated data that support the findings of this study are included in this article.

Competing interests

The authors declare that there are no competing interests.

FUNDING

This study was conducted without financial support from any public, commercial, or non-profit organizations at any stage.

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