Original Research Article

An observational study to evaluate Loss To Follow-Up (LTFU) rate and treatment outcomes of pulmonary tuberculosis patients in the Dehradun district

Shiv Kumar Yadav[1,2]*, Richa Sinha[2], A R Piyush[3], Dheeraj Gupta[2]

[1]Ph.D. Research Scholar, Hemwati Nandan Bahuguna Uttarakhand Medical Education University (HNBUMU), Dehradun, Uttarakhand, India
[2]Dept. of Community Medicine, Government Doon Medical College, Dehradun, Uttarakhand, India
[3]Dept. of Pathology, Government Doon Medical College, Dehradun, Uttarakhand, India

Abstract

Introduction: Tuberculosis case detection, treatment adherence, and treatment outcomes have significantly improved over the past decade. However, it is essential to identify the ongoing barriers at both grassroots and programmatic levels to enhance these areas, enabling India to move closer to its goal of TB elimination by 2025.

Aim and Objective: This study evaluated the loss to follow-up (LTFU) rate and treatment outcomes among pulmonary tuberculosis patients in the Dehradun district.

Materials and Methods: an observational study carried out using secondary data gathered from tuberculosis patients reported in the Dehradun District during three years (2018-2020). The data collected was analyzed to evaluate treatment results and treatment adherence of the pulmonary tuberculosis patients.

Result: - Among study participants, LTFU rate increased in Chakrata, Dehradun, and Rishikesh in 2020, likely attributed to challenges posed by the COVID-19 pandemic. In contrast, Kalsi exhibited consistently lower loss rates and relatively high positive outcomes, suggesting it could serve as a model for other treatment units. The decline in positive outcomes during the year 2020 at various Tuberculosis Units is in alignment with decreased TB case notification and increased LTFU rates, likely a result of disruptions in the healthcare system and restricted access to tuberculosis services during the pandemic.

Conclusion: The improvement in NTEP indicators, such as tuberculosis treatment adherence and treatment outcomes, indicates that the program is progressing in the right direction. Nevertheless, it remains crucial to address programmatic gaps and expedite efforts in alignment with the national goal of TB elimination by 2025.

Keywords: LTFU, Outcome, Treatment, Tuberculosis

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1. Introduction

India has the world's greatest TB burden, accounting for around 25% of all TB cases globally.[1] Although the National Tuberculosis Elimination Programme (NTEP), formerly known as the Revised National Tuberculosis Control Programme (RNTCP), was successfully implemented, in India, tuberculosis remains a significant problem, particularly in rural and remote regions. India's TB elimination effort is based on a Directly Observed Treatment Short Course (DOTS) with treatment compliance being an effective strategy.[2] NTEP has been employing this treatment approach for about thirty years. It uses several anti-tubercular medications in programmatic settings for both drug-susceptible and drug-resistant TB patients. A significant barrier to the TB elimination effort is poor adherence to treatment, which can extend infectiousness, raise the likelihood of drug resistance, and lead to unfavorable outcomes such as treatment failure, death, and relapse, all of which pose a concern to public health.[3,4] Tuberculosis treatment Loss To Follow-Up (LTFU) occurs when treatment is interrupted continuously for one month or more.[5] Several variables contribute to loss to follow-up, including socioeconomic status, education level, harmful drug reactions, substance use, social stigma, a lack of family support, myths and misbeliefs, and Healthcare system

*Corresponding author: Shiv Kumar Yadav
Email: docshivkumaryadav@gmail.com

challenges.[6-8] Numerous additional studies carried out earlier in various contexts have also found several characteristics that contribute to LTFU, including illiteracy, poverty, lengthy treatment, a variety of medications, access to health facilities, work-related problems, beliefs and habits connected to smoking and drunkenness, etc.[3,9,10]

Tuberculosis case detection, treatment adherence, and treatment outcome have improved compared to the previous decade. However, Loss to follow-up (LTFU) among patients with Pulmonary Tuberculosis PTB) presents a considerable obstacle to effective TB control, resulting in continued transmission, heightened drug resistance, and increased mortality rates. It is essential to comprehend the factors that contribute to LTFU and treatment outcomes to formulate effective interventions.

LTFU negatively impacts treatment outcomes, resulting in ongoing transmission and the emergence of drug-resistant TB strains. A study in Gujarat found that 20% of patients undergoing treatment for multi-drug-resistant TB were lost to follow-up, highlighting the urgent need for effective patient retention strategies.[11] It is essential to recognize the ongoing obstacles at both the grassroots and programmatic levels to facilitate improvements in these areas, thereby enabling India to advance towards its objective of tuberculosis elimination by the year 2025. In light of this context, this study was planned and conducted to assess the loss to follow-up rate and treatment outcomes of pulmonary tuberculosis patients in the Dehradun district.

2. Objectives

1. To document the Loss to Follow-Up (LTFU) rate of Pulmonary Tuberculosis patients in the Dehradun District (2018–2020).
2. To evaluate the Treatment outcome of Pulmonary Tuberculosis patients in Dehradun District (2018–2020).

3. Materials and Methods

As per NTEP, The Tuberculosis Unit (TU) is the nodal point for all TB control activities in the sub-district. Each TU provides services related to TB diagnosis, management, and data record maintenance of 150,000-250,000 population and comprises peripheral health institutes (PHIs). There are six TUs (Dehradun, Raipur, Rishikesh, Shashpur, Kalsi, Chakrata) under the district TB center in Dehradun. Data related to newly diagnosed pulmonary TB patients notified between 2018 and 2020 was evaluated to compare treatment adherence and treatment outcomes. The data was cleaned and checked for duplicate records before subjecting them to analysis. The study was approved by the Ethics Committee of HNBUMEU. Data entry and analysis were done in MS Excel database. Loss to follow rate and positive outcome among different TUs was calculated across 3 years, tabulated, and extrapolated on graphs to make a comparison. The

proportion testing of loss to follow-up and Positive outcome was compared across various TUs by using the Z test considering a P value less than 0.05 as significant.

3.1. Inclusion criteria

Data of Pulmonary TB (Drug Sensitive) Patients of the last 3 years (2018-20)

3.2. Exclusion criteria

1. Data of Extra pulmonary TB patients.
2. Data of Drug-resistant TB patients

4. Result

This study analyzed the loss-to-follow-up rate among Pulmonary Tuberculosis Patients in various TUs of the Dehradun district (2018-2020). The findings are mentioned below and shown in **Table 1** and **Figure 1**.

Chakrata TU: Chakrata had a smaller number of TB patients notified each year. The LTFU rates were low, ranging from 2.8% to 6.1% over the three years. A significant rise in 2020, indicating challenges in patient retention

Dehradun TU: This TU reported the highest number of TB patients notified each year. Despite the large patient load, the LTFU rates decreased notably from 6.7% in 2018 to 4.3% in 2020. Persistent high LTFU rates suggest systemic challenges in patient follow-up.

Kalsi TU: - Kalsi had a very small number of TB patients notified each year. The LTFU rates were low, ranging from 0.3% to 0.4 % over the three years. Exceptional performance in minimizing loss to follow-up rates.

Raipur TU: -LTFU declined from 6% (2018) to 2.5 (2020). Steady improvement, showcasing better patient management over time.

Rishikesh TU: Rishikesh also has a substantial number of TB patients notified annually. The LTFU rates remained relatively stable, with a slight decrease from 4.5% in 2018 and rising to 7.3% in 2020. A sharp rise in 2020 suggests significant disruptions in follow-up.

Sahaspur TU: This TU had fewer TB patients notified annually, with LTFU rates ranging from 6.2% (2018) and decreased to 2.9% (2020). Sahaspur TU had Consistent improvement after 2018.

A comparison of Loss to follow-up among Pulmonary Tuberculosis Patients in various TUs of Dehradun was done and it was found that Kalsi TU (LTFU rate increased from 0.3% to 1.2%), Rishikesh TU, (decreased from 4.5% to 4.3%) and Sahaspur TU (LTFU rate decreased from 6.2% to 2.9 %), TUs have a significant change in Loss to follow-up rates from 2018 to 2019 compared to the rest of TUs as shown in **Table 2**.

Table 1: Loss to follow up among pulmonary tuberculosis patients in various TUs of Dehradun (2018-2020)

Tuberculosis units	Total TB Patients Notified	Loss to Follow-up	Total TB Patients Notified	Loss to Follow-up	Total TB Patients Notified	Loss to Follow-up
	2018		**2019**		**2020**	
Chakrata	289	8	285	11	147	9
Dehradun	2271	152	2606	178	1571	67
Kalsi	301	1	401	5	269	1
Raipur	100	6	113	3	121	3
Rishikesh	881	40	1146	49	660	48
Sahaspur	209	13	239	7	172	5

Table 2: Comparison of Loss to follow up among Pulmonary Tuberculosis Patients in various TUs of Dehradun (2018-2020)

Tuberculosis units	2018 vs 2019	2019 vs 2020	2018 vs 2020
Chakrata	0.124	0.321	0.647
Dehradun	0.189	0.147	0.771
Kalsi	**0.004**	0.214	0.158
Raipur	0.167	0.097	0.167
Rishikesh	**0.021**	0.124	0.647
Sahaspur	**0.016**	0.698	0.698

Table 3: Positive outcome (Cure and Treatment Completed) among pulmonary tuberculosis patients in various TUs of Dehradun (2018-2020)

Tuberculosis units	Total TB Patients Notified	Positive Outcome	Total TB Patients Notified	Positive Outcome	Total TB Patients Notified	Positive Outcome
	Year 2018		Year 2019		Year 2020	
Chakrata	289	267	285	267	147	131
Dehradun	2271	1937	2606	2190	1571	1342
Kalsi	301	288	401	369	269	245
Raipur	100	87	113	106	121	112
Rishikesh	881	727	1146	967	660	542
Sahaspur	209	183	239	210	172	154

Table 4: Comparison of Positive Outcomes (Cure and Treatment Completed) among Pulmonary Tuberculosis Patients in various TUs of Dehradun (2018-2020)

Tuberculosis units	2018 vs 2019	2019 vs 2020	2018 vs 2020
Chakrata	**0.001**	0.214	0.321
Dehradun	**0.048**	0.158	0.145
Kalsi	0.148	0.698	**0.012**
Raipur	0.289	**0.012**	**0.001**
Rishikesh	**0.014**	0.987	**0.039**
Sahaspur	0.369	0.787	0.128

This study analyzed the data of Positive Outcomes (Cure and Treatment Completed) among Pulmonary Tuberculosis Patients in various TUs of Dehradun (2018-2020) and the findings are mentioned below and shown in **Table 3** and **Figure 2**.

Chakrata TU: Patient numbers steadily decreased from 289 in 2018 to 147 in 2020 and Positive Outcomes (Cure and Treatment Completed) declined from 92.4% (2018) to 89.1% (2020). The decline in positive outcomes in during the year 2020 is in alignment with decreased TB case notification and increased LTFU rates likely a result of disruptions in the healthcare system and restricted access to tuberculosis services during the pandemic.

Dehradun TU: The largest TU with patient numbers declining from 2,271 in 2018 to 1,571 in 2020. The lowest positive outcome rates among all TUs, 85.3% (2018), remained relatively stable at 85.4% in 2019 and 2020. Despite having the highest patient load, the proportion of cured cases

declined significantly over the years, suggesting potential gaps in treatment adherence or program reach.
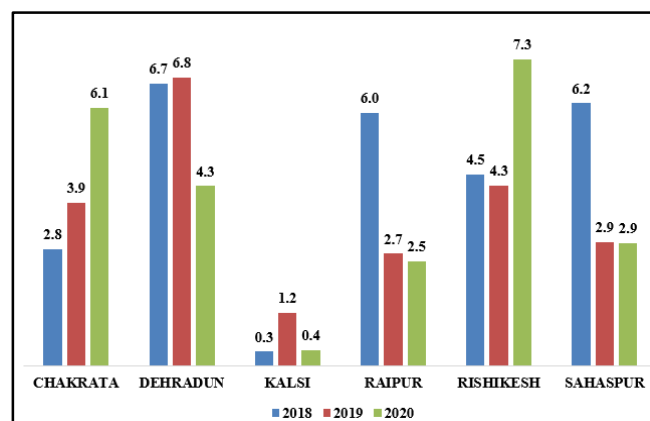

Figure 1: Loss to follow up rate (%) among Pulmonary Tuberculosis Patients in various TUs of Dehradun (2018-2020)

Kalsi TU: Patient numbers decreased from 301 in 2018 to 269 in 2020. Achieved the highest overall positive outcome rate 95.7% (2018) and declined slightly to 91.1% (2020). Maintained steady outcomes, with relatively smaller reductions compared to other TUs, possibly due to better patient management practices

Raipur TU: Patient notification increased slightly over time (100 in 2018 to 121 in 2020). Steady performance: 93.8% (2018) to 87% (2020).

Rishikesh TU: Patient notification declined significantly from 881 in 2018 to 660 in 2020.

Noticeable decline in outcomes: 84.4% (2018) Dropped to 82.1% (2020).

Sahaspur TU: Patient notification declined from 209 in 2018 to 172 in 2020.
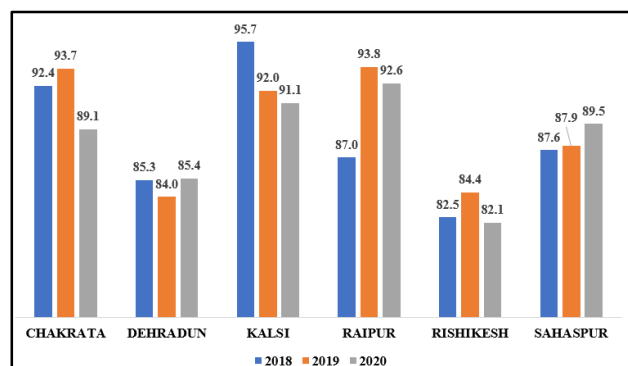

Figure 2: Positive outcome (Cure and Treatment Completed) rate among pulmonary tuberculosis patients in various TUs of Dehradun (2018-2020)

Consistently high positive outcome rates are 87.6% (2018) to 89.5% (2020). These units performed relatively

better, with Raipur showing slight increases in both cured and treatment completion outcomes over the years.

Most TUs, especially larger ones like Dehradun, Chakrata, and Rishikesh, showed a decrease in total patient notifications, cured cases, and treatment completions in 2020, likely due to disruptions caused by the COVID-19 pandemic.

A comparison of Positive Outcomes (Cure and Treatment Completed) among Pulmonary Tuberculosis Patients in various TUs of Dehradun was done and it was noticed that Chakrata, Rishikesh, and Dehradun TUs have a significant change in Positive Outcomes of TB patients from 2018 to 2019 compared to the rest of TUs, As for the year 2018 to 2019, In Dehradun TU, Positive Outcome declined from 85.3% to 84.0% and in Rishikesh TU, Positive Outcome improved from 82.5% to 84.4%. When comparing the year 2019 with 2020, only Raipur TU has a significant change in Positive Outcomes of TB patients (declined from 93.8% to 92.6%) compared to the rest of TUs. When comparing the year 2018 with 2020, only Kalsi TU (declined from 95.7% to 91.1%), Raipur TU (increased from 87% to 92.6%), and Rishikesh TU (decreased from 82.5% to 82.1) TU have a significant change in Positive Outcomes of TB patients compared to the rest of TUs. **Table 4**

5. Discussion

Loss to follow-up (LTFU) among Pulmonary Tuberculosis (PTB) patients is a significant concern, as it can lead to treatment interruptions, increased transmission, and the development of drug-resistant TB. The data from Dehradun's TB Units (TUs) between 2018 and 2020 highlight varying LTFU rates across different areas.

Consistently high positive outcome rates 87.6% (2018) to. 89.5%. (2020) These units performed relatively better, with Raipur showing slight increases in both cured and treatment completion outcomes over the years.

Most TUs, especially larger ones like Dehradun and Rishikesh, showed a decrease in total patient notifications, cured cases, and treatment completions in 2020, likely due to disruptions caused by the COVID-19 pandemic.

In the Current study, LTFU ranged from 0.3% to 6.8%. Which is in contrast to another study that documented LTFU rate between 2% and 6% in Haryana.[12] When compared to the findings of Kant et al.,[13] who used TB registry data from 2008 to 2014 for two PHCs under TU Mohana in the district of Faridabad, Haryana, they found an LTFU rate of 14.3%.

There are several reasons why the reported LTFU rate was greater than present study for example, considering the data included eight years, the LTFU rate may have been higher in the early years and then decreased as the program developed and healthcare services improved. Nonetheless, a high overall LTFU rate resulted from the early years of

elevated LTFU. Another hypothesis is that an LTFU rate of 14.3% was achieved because data for one-third of the patients were lacking; this could have skewed the calculation in favour of an overestimation. This cannot be said with assurance, though. Mundra et al[14] found that a LTFU incidence of 8.6%. Among 503 patients of a TU in Wardha, Maharashtra, in 2017, with outcomes missing for only 1% of the patient participants, while a study conducted in Haryana documented LTFU to be 3.5% with a CI of 2.3% to 5.1%.[15]

In the current study, successful treatment outcomes varied from 82.5% to 95.7%, which varied among different TUs. In comparison, it was more than successful treatment outcomes of 82%, as reported in a comparable study by *Singh M et al.*[16]

6. Conclusion

A significant barrier to achieving the goals of the National Strategic Plan for Tuberculosis Elimination (2017–2025) (NSP) is still the treatment of LTFU. In many parts of India, it remains notably high. Newly recruited Treatment supporter and other healthcare professionals must be oriented with the reasons behind treatment interruption by LTFU patients, and strategies to adapt while dealing with LTFU patients.

Detailed history of the Patient in the beginning gives useful information regarding adherence to treatment later on. Extra attention should be given during counseling to patient who appear more prone to LTFU. Since many patients stop treatment as soon as they feel better or because they feel worse due to drug side effects, at-risk patients and their caregivers must receive repeated counseling with scientifically sound content that is tailored to each patient's particular circumstances. Since LTFU raises the risk of negative outcomes like mortality, drug resistance, and ongoing infection dissemination, the DOTS method should be strictly adhered to for these patients in order to ensure adherence and treatment completion. To avoid negative consequences for the TB patient, it is the responsibility of all healthcare personnel to ensure treatment adherence and to motivate patients. More incentives for DOTS providers (Treatment Supporter) and regular disbursement of funds are important to motivate the DOTS providers.

7. Recommendations

1. Providing comprehensive counselling about TB and its treatment can address myths and reduce stigma.
2. Involving community leaders and family members in awareness programs can foster a supportive environment for patients.
3. Implementing robust tracking systems to monitor patients throughout their treatment journey can reduce LTFU rates.

4. Integrating substance abuse treatment with TB care may improve adherence among patients struggling with addiction.

8. Source of Funding

9. Conflict of Interest

None.

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