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## Rational Use of Drugs in Patients with Pulmonary Tuberculosis at a Tertiary Care Teaching Hospital

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### ABSTRACT

To meet global healthcare demands, a tertiary care teaching hospital studies pulmonary TB patients' drug use. Respiratory TB is a major problem in poor nations. The study optimizes anti-tuberculosis medicine use to improve patient outcomes and prevent transmission. Due to dosage and duration, optimization influences drug effectiveness, side effects, and resistance. The study emphasizes medication adherence and patient compliance to prevent treatment failure and drug-resistant strains. Pulmonary TB is infectious yet hard to identify due to its mild symptoms. Diagnostics and treatment include clinical and laboratory tests and long-term antibiotics. Immunization and latent TB therapy prevent TB. Healthcare professionals, governments, and international organizations must collaborate to eliminate pulmonary TB. During the 8-month study period, a group of 600 patients with PTB was examined. The group of 30-50 years revealed more males than females with PTB among them. The drug isoniazid was by far the most heavily recommended first-line treatment. In contrast to Isoniazid, it couldn't adhere to Levofloxacin efficiently. In one of the tests, it was observed that there were undernourished persons that are protein and micronutrient deficient also. The study showed most mental comorbidities as depression. Multidrug resistance preceded non-resistance. From this study, we determined the high rate of PTB relapse and partial healing. The study suggested approaches to improving protein-energy deficit and mental depression as well as to multi-drug resistance and for treating patients. The study suggested collaboration and research to reduce PBA mortality rates and produce tablets, medications, and treatments to help doctors treat, change diets, and counsel PTB patients.

**Keywords:** Tuberculosis, Rational Drug Use, Tertiary Care Teaching Hospital, Adherence Rate, Treatment Outcomes.

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## INTRODUCTION

TB is a global health issue with millions of new cases each year. TB therapy is difficult despite medical advances, thus sensible medication administration is essential to enhance patient outcomes and minimize disease transmission. This publication seeks to explain reasonable medication usage in pulmonary TB therapy and emphasize problems and options for better treatment results. TB affects society, economics, and health worldwide, especially in low- and middle-income nations. Poverty, congestion, and poor healthcare spread the illness quickly in these locations. TB is linked to other health issues like HIV/AIDS, affecting worldwide TB control. The WHO's End TB Strategy aims to reduce TB incidence and death, however drug-resistant strains and healthcare infrastructure difficulties persist.<sup>1,2</sup>

### **Causes and symptoms:**<sup>3,4</sup>

Mycobacterium tuberculosis causes pulmonary TB, which can damage several bodily systems. After inhaling microorganisms, the illness causes coughing, chest discomfort, weight loss, and weariness. Early identification of pulmonary TB is difficult due to its subtle symptoms. TB diagnosis requires clinical assessment, chest X-rays, and lab investigations. To eliminate the germs, a mixture of antibiotics is given over time.

### **Current PTB drug regimens:**<sup>5,6,7</sup>

Isoniazid, rifampicin, ethambutol, and pyrazinamide are first-line medicines for drug-susceptible pulmonary TB. These medications kill Mycobacterium tuberculosis at distinct stages of its life cycle to decrease treatment resistance. Drug-resistant TB is treated with second-line medicines, which have a smaller therapeutic window and increased toxicity. Preventing treatment failure and drug-resistant strains requires medication regimen adherence.

### **Rational Drug Use in Tuberculosis Studies:**<sup>8,9</sup>

Many TB studies have focused on rational drug use to improve therapy and fight antibiotic resistance. It examined pharmaceutical resistance, adherence, efficacy, safety, and the effects of innovative therapies including directly observed therapy (DOT) and digital health technology. Second-line drugs work, customized therapy is vital, and socioeconomic factors impact adherence in drug-resistant TB. Filling research gaps requires patient-centered outcomes research, long-term follow-up studies, and digital health solutions in routine treatment. Many factors hinder TB medication management and therapy. Multidrug-resistant and extensively drug-resistant microorganisms threaten TB control. Poor anti-TB medicine use, treatment, and adherence induce drug resistance. Poor patient education, unpleasant effects, and economic constraints often lead to

pharmaceutical non-compliance. Stockouts, anti-TB medicine shortages, and inefficient drug supply chains hinder drug management. HIV/AIDS complicates TB treatment.

## MATERIALS AND METHOD

The study conducted was a retrospective observational study in the Department of Pulmonary Medicine, focusing on patients with Pulmonary Tuberculosis. The study aimed to analyze the treatment outcomes and identify the rational use of drugs among the patients. Data collection was done using a patient data collection form and through patient questionnaires/interviews. The Naranjo Causality Assessment scale was also used. The study was conducted at SVS Medical College Hospital, and all relevant information from admission to discharge was collected and analyzed using suitable statistical methods. WHO criteria were used to classify treatment outcomes. Patients with PTB were considered cured if they finished treatment within 6-9 months and had two negative sputum cultures. A treatment was completed. Patients who finished the anti-TB therapy for 6-9 months. Patients who died during therapy, regardless of the cause, were considered to have died.

### Method of Diagnosis<sup>10,11,12</sup>

Diagnostics comprised sample collection, disinfection, and homogenization. Patients provided clinical samples like sputum. To minimize viscosity and air bubbles, sputum was centrifuged with 5% NaOH and homogenized. Smear preparation was done by placing a portion of the homogenized sputum on a microscopic slide, heating it to degenerate mycolic acids, staining, decolorizing, and observing under a microscope. Culture preparation involved adding another portion of the homogenized sputum to the Lowenstein Jensen (LJ) medium and incubating it. The growth of *Mycobacterium tuberculosis* confirmed TB infection. Chest X-rays were indicated after negative sputum testing. Chest X-rays were taken to look for lung consolidations.

## RESULTS AND DISCUSSION

**Table 1: Age Group Distributions in PTB**

Age	No. Of patients	Percentage
<18	82	13.67%
18-30	168	28%
30-50	193	32.17%
50-70	107	17.83%
>70	50	8.33%

Pulmonary TB (PTB) patients by age are shown in the table. The 600 patients studied were divided by age: With 82 patients under 18, 13.67% of the total was under 18. 168 patients were 18-30 years old, 28% of the total. Most patients, 32.17%, were aged 30-50, with 193 in this group.

Following this, 17.83% of the study population was 50–70 years old, with 107 patients. Finally, 8.33% of patients were beyond 70, with 50. The study's PTB patients were most common in the 30-50 age group, followed by the 18-30 age group.

**Table 2: Gender Wise Distributions in PTB**

Gender	Number of patients	Percentage
Male	368	61.33%
Female	232	38.67%

This table shows the gender distribution of study patients with pulmonary TB (PTB). 600 patients were investigated, with 368 males (61.33%). In comparison, 38.67% of patients were female (232). This shows that males in the study sample had a higher PTB prevalence than females. TB exposure, susceptibility, and healthcare-seeking behaviour may differ between men and women, as shown by the gender gap in PTB prevalence. Further research may be needed to determine what causes this gender discrepancy in PTB instances.

**Table 3: Prevalence of Previous TB Treatment**

Previous TB treatment	Number of patients	Percentage
Percentage of patients on first-line drugs	314	52.33%
Percentage of patients on second-line drugs	286	47.67%

The incidence of past TB therapy among study patients is shown in Table 3. Out of 600 Pulmonary TB (PTB) patients assessed 314 (52.33%) were on first-line TB medicines. Most TB patients receive these first-line treatments, which are successful. However, 286 individuals (46.77% of the total) were on second-line TB medicines. If the disease is resistant to first-line treatments or treatment fails, second-line drugs are utilized. This distribution implies that a considerable fraction of the study's patients had first-line therapy failure or drug-resistant TB, requiring more specialized second-line therapies.

**Table 4: frequency distribution based on severity in PTB**

Severity	Number of patients	Percentage
Mild	287	62%
Moderate	163	25%
Severe	150	38%

Table 4 shows the severity-based frequency distribution of Pulmonary TB (PTB) patients in the research. Out of 600 individuals tested, 287 (62%), had mild PTB. TB patients with moderate severity have less lung involvement and milder symptoms. Additionally, 163 patients—25% of the total—had moderate PTB. Moderate severity may cause greater symptoms and lung involvement than mild severity. The statistics may be off, but 150 patients (38% of the total) had severe PTB. In severe PTB, lung damage, symptoms, and consequences may increase. The study's PTB cases'

clinical presentation and categorization can inform treatment techniques and patient care based on illness severity.

**Table 5: Prevalence Based On Overall Adherence Rate**

<b>Prescription adherence</b>	<b>Drugs</b>	<b>Drugs prescribed to no. Of patients</b>	<b>Percentage</b>
Adherent	Isoniazid	287	47.83%
Adherent	Rifampin	176	29.33%
Non-adherent	Ethambutol	24	4.00%
Non-adherent	Levofloxacin	21	0.33%
Adherent	Ciprofloxacin	92	15.30%

Table 5 indicates pulmonary TB study subjects' treatment adherence. The table lists drugs by patient adherence. The greatest adherence rate was 287 (47.83%) with isoniazid. The second-highest adherence rate was 176 Rifampin patients (29.33%). Ethambutol had a small non-adherence rate of 24 (4.00%). The non-adherence rate for levofloxacin was considerably lower, with 21 patients (0.33%). Ciprofloxacin had moderate adherence in 92 patients (15.30%). This study shows PTB patients follow therapy differently. To avoid treatment failure, relapse, and drug-resistant strains, TB patients must take Isoniazid and Rifampin. Lower Ethambutol and Levofloxacin adherence rates suggest interventions may enhance patient compliance and results. To optimize therapy and avoid drug-resistant TB, medication adherence must be addressed.

**Table 6: Distribution Based On BMI**

<b>BMI category</b>	<b>No.of patients</b>	<b>Percentage</b>
Underweight	193	32.10%
Normal Weight	168	28%
Over Weight	127	21.60%
Obese	112	18.60%

Pulmonary TB (PTB) patients' BMIs are shown in Table 6. BMI-wise, 193 (32.10%) of 600 patients were underweight. Nutritional deficiencies can weaken the immune system and increase TB risk in underweight people. Additionally, 168 patients (28% of the total) were normal weight. Health and TB immunity depend on normal weight. BMI identified 127 (21.60%) individuals as overweight. Fat people may have health concerns that affect TB treatment and outcomes. The study's PTB patients' BMI distribution shows dietary status and health hazards. Holistic PTB care requires nutritional support for underweight individuals and appropriate weight management for overweight patients. Nutritional support and BMI-matched medicines improve TB treatment results.

**Table 7: Prevalence Based On Nutritional Deficiencies**

<b>Nutritional deficiencies</b>	<b>No. Of cases</b>	<b>Percentage</b>
Protein-Energy Malnutrition (PEM)	203	33.83%
Micronutrient Deficiencies	117	19.50%
Omega-3 Fatty Acids	106	17.67%
Caloric Deficiency	110	18.33%
Other Nutrient Deficiencies	63	10.5%

Table 7 demonstrates dietary deficiencies in pulmonary TB patients. In 203 of 600 patients, 33.83% had PEM. Insufficient protein and calories promote weight loss and muscle wasting in PEM, affecting immune health. In addition, 117 cases (19.50%) showed Micronutrient Deficiencies, lacking essential vitamins and minerals for physiological processes and immune responses. Omega-3 fatty acid deficiencies, which reduce inflammation and enhance immunity, were found in 106 (17.67%) cases. Low calories can influence energy and nutrition, as 110 instances (18.33%) showed calorie deficiency. Finally, 63 cases (10.5%) showed Other Nutrient Deficiencies, which may affect PTB patients' health and immune function.

**Table 8: Frequency Distribution Based On Psychosocial Factors**

<b>Psychosocial factors</b>	<b>No. Of patients</b>	<b>Percentage</b>
Depression	280	46.67%
Anxiety	112	18.67%
Post-traumatic stress disorder	142	23.66%
Psychotic disorders	66	11%

Table 8 shows psychosocial factor frequency distribution in PTB study subjects. Out of 600 tested, 280 (46.67%) experienced depression. Depression can impact TB patients' treatment adherence, quality of life, and health outcomes. 112 patients (18.67%) expressed anxiety, which may worsen stress and mental health during TB treatment. PTSD was found in 142 patients (23.66%). Traumatic events may impact mental health and coping. TB treatment should address past traumas and give psychosocial support because PTB patients have high PTSD rates. PTB management for mental and physical health can be complicated by psychotic issues in 66 patients (11% of total).

**Table 9: Distribution Based On Drug Resistance Patterns**

<b>Drug resistance</b>	<b>Drugs prescribed to no. Of patients</b>	<b>Percentage</b>
MDR	180	30.00%
XDR	110	18.33%
Drug Susceptible	146	24.34%
Non-Resistance	164	27.33

Table 9 demonstrates the treatment resistance distribution of pulmonary TB patients. 180 (30.00%) of 600 patients developed MDR-TB, suggesting resistance to at least two first-line anti-TB drugs,

isoniazid and Rifampin. MDR-TB is hard to treat due to limited medication options and lengthy treatment regimens. XDR-TB, which resists first- and second-line drugs, was detected in 110 (18.33%), making treatment harder. XDR-TB had poor treatment outcomes and fewer options, highlighting the need for novel drugs and comprehensive management.

**Table 10: Prevalence Of Treatment Outcomes For PTB Patients**

<b>Treatment outcome</b>	<b>Drugs prescribed to no. Of patients</b>	<b>Percentage</b>
Cured Rates	287	47.83%
Complete Treatment Rates	175	29.17%
Incomplete Treatment Rates	82	13.67%
Relapse Treatment Rates	56	9.33%

Table 10 displays the study's PTB participants' treatment outcomes. Of 600 tested, 287 (47.83%) were Cured, indicating TB infection eradication and therapy effectiveness. To limit disease progression, transmission, and drug-resistant strains, TB care requires cure rates. Additionally, 175 patients (29.17%) achieved Complete Treatment Rates. Complete treatment rates suggest that these individuals completed their treatment plan, but it can also mean no active disease. Treatment must be complete to prevent relapse and last.

## DISCUSSION

The study's findings on tuberculosis management have significant implications for patient care. The high rates of cure and full treatment demonstrate that current treatment methods are effective for many individuals. However, the presence of adherence rate and drug resistance patterns highlights the need for personalized treatment and close monitoring. The study emphasizes the importance of a patient-centric approach that considers individual patient profiles, comorbidities, and risk factors for adverse reactions to ensure successful therapy. Understanding the rates of incomplete treatment and relapse allows for targeted measures such as improved patient education, support networks, and follow-up to enhance treatment adherence and prevent recurrence. These findings also have implications for tuberculosis management policymakers and providers. Successful treatment outcomes align with existing treatment standards, and the identification of drug resistance patterns necessitates constant surveillance and policy adaptation. To combat medication resistance, policymakers may change treatment methods, introduce new ones, or strengthen diagnostic and monitoring systems. The study emphasizes the necessity for a flexible and responsive policy framework to match TB epidemic dynamics. Adherence rate responses also emphasize the need for pharmacovigilance and safety monitoring in national TB control programs. This study helps improve TB management and patient outcomes.



## CONCLUSION

The study focused on the management of pulmonary tuberculosis in a tertiary care teaching hospital. We found several essential things about drug usage, clinical symptoms, diagnostic methods, and treatment hurdles. The rise in pulmonary TB highlights the need for medication efficiency. Side effects, non-compliance, and drug shortages hamper TB treatment despite advances in diagnosis and treatment. These challenges require a comprehensive approach that addresses clinical and societal variables. Next, drug use must be reasonable. Drug selection, dose, duration, and patient adherence influence anti-tuberculosis therapy outcomes. To avoid treatment interruptions and improve efficacy, monitor and manage side effects and drug interactions. Our study underscores the need for patient-centered interventions to promote drug adherence and eliminate socioeconomic determinants of health that may hinder TB therapy. Patient education, counseling, and social assistance address poverty, homelessness, and stigma, which can impair treatment success. In conclusion, managing pulmonary tuberculosis medicine is tough, but reasonable drug use, treatment adherence, and socioeconomic determinants of health enhance patient outcomes and help eradicate the disease. Healthcare providers, policymakers, and community stakeholders must collaborate to develop effective TB preventive and treatment techniques.

## REFERENCES

1. Marieke J. Van der Werf. Miranda W. Langendam. Knowledge of tuberculosis-treatment prescription of health workers: a systematic review. 2012 May; 39(5): 1248–1255.doi: 10.1183/09031936.00125611
2. Rotimi Adigun; Rahulkumar Singh. Tuberculosis July 11, 2023.Tuberculosis – Stat Pearls - NCBI Bookshelf (nih.gov)
3. Ian A Campbell, and Oumou Bah-Sow, Pulmonary tuberculosis: diagnosis and treatment2006 May 20; 332(7551): 1194–1197.
4. Brändli The clinical presentation of tuberculosis1998;65(2):97-105. doi: 10.1159/000029238.
5. Ginenus Fekadu ,Dilys Yan-Wing ChowThe pharmacotherapeutic management of pulmonary tuberculosis: an update of the state-of-the-art022 Jan; 23(1):139-148. doi: 10.1080/14656566.2021.1967930.



6. Mohd Khairul Nizam Mazlan,<sup>1</sup> Mohammad Hafizie Dianel Mohd Tazizi, Anti-tuberculosis Targeted Drug Delivery as a Potential Future Treatment Approach 2021 Jul 25. doi: 10.3390/antibiotics10080908
7. Katherine M Coyne, Anton L Pozniak, Mohammed Lamorde, Marta Boffito Pharmacology of second-line anti-tuberculosis drugs and potential for interactions with antiretroviral agents 2009 Feb 20;23(4):437-46. doi: 10.1097/qad.0b013e328326ca50.
8. Zumla, F. Blasi, M. Raviglione Rational use of anti-tuberculosis drugs in the EU: better patient care and less drug resistance 2012 39: 802-804; doi: 10.1183/09031936.00171611
9. Jerome H. Chin Evidence gaps and future directions January 2020 doi:10.1016/B978-0-12-818825-5.00008-5
10. Asmaa Mohammed Elbrolosy, Rana H. El Helbawy, Diagnostic utility of GeneXpert MTB/RIF assay versus conventional methods for diagnosis of pulmonary and extra-pulmonary tuberculosis 13 May 2021
11. Zhiyi Li The Value of GeneXpert MTB/RIF for Detection in Tuberculosis: A Bibliometrics-Based Analysis and Review 2022 Oct 15;2022:2915018. doi: 10.1155/2022/2915018.
12. Huseyin A Terzi Özlem Aydemir . Comparison of the GeneXpert ® MTB/RIF Test and Conventional Methods in the Diagnosis of Mycobacterium tuberculosis January 2019 DOI:10.7754/Clin.Lab.2018.180613)

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