Evaluating the Influence of Comorbidities on Drug-Resistant TB Treatment Efficacy in LiwaHospital

Abstract

Background: Drug-resistant tuberculosis (DR-TB) poses significant challenges to public health, with poor outcomes frequently observed in affected patients.

Aim: This study aims to evaluate the characteristics and factors associated with poor outcomes in patients with drug-resistant pulmonary tuberculosis at Liwa Hospital from January 2018 to May 2023.

Methods:A retrospective, cross-sectional single-center analysis was conducted on 408 patients admitted to Liwa Hospital. Among these, 28 patients diagnosed with drug-resistant tuberculosis (DR-TB) were selected for detailed analysis based on their treatment outcomes and clinical data. Inclusion criteria encompassed patients aged 18 years or older with confirmed drug-resistant TB, while patients younger than 18, those with latent tuberculosis, and those with extra-pulmonary tuberculosis were excluded.

Results: The majority of patients were between 18-40 years old (60.7%), predominantly male (85.7%), and Asian (96.4%). Comorbidities included diabetes (46.4%) and hypertension (21.4%). Clinical characteristics revealed cough (28.6%) and fever with cough (7.1%) as common symptoms. Primary resistance was observed in 92.9% of cases, with 96.4% being newly diagnosed TB cases. Adverse drug events were minimal, with 7.1% experiencing nausea and vomiting. Radiological findings showed unilateral TB in 53.6% and cavitary TB in 57.1% of cases. Laboratory analysis indicated elevated HbA1c (9.83 ± 3.25), CRP (25.94 ± 5.16 mg/L), and white blood cell count (9.94 ± 4.59 x 10^9 cells/L). Rifampicin resistance was the most prevalent (42.9%), followed by isoniazid resistance (25.0%). Regarding treatment outcomes, age, hypertension, and diabetes mellitus were found to be significantly associated with poor outcomes in patients(p=0.05).

Comment [RABK1]: The title accurately reflects the study's overall aim. The focus on Liwa Hospital is clear, providing a specific context for the study. However, the title could be more precise by explicitly mentioning that the study investigates factors associated with poor treatment outcomes. E.g. "Investigating factors associated with poor treatment outcomes on Drug-Resistant TB in Liwa Hospital"

Comment [RABK2]: The aim should stand out clearly.

Comment [RABK3]: A retrospective design is efficient for analyzing existing data but may be limited by the accuracy and completeness of recorded data. It is important for you to discuss potential biases related to data collection from hospital records. Also clearly state which research approach (qual, quant, or mix method) and the sampling technique used.

Comment [RABK4]: The study design is suitable for a detailed analysis of patient characteristics and outcomes, the relatively small sample size (28 patients with drug-resistant TB) may limit the statistical power and generalizability of the findings. IF you can consider a larger sample or multicenter approach could enhance the robustness of the findings.

Comment [RABK5]: The criteria are clearly defined, focusing on adult patients with confirmed drug-resistant TB. The exclusion of younger patients and those with latent or extra-pulmonary TB is appropriate for the study's focus.

Conclusion: The study identified significant associations between treatment outcomes and age, hypertension, and diabetes status, with higher proportions of poor outcomes observed in patients. Comprehensive management strategies targeting these factors are essential to improve outcomes in patients with drug-resistant TB. Further research is warranted to develop tailored interventions for this population.

Keywords: Drug-resistant tuberculosis, epidemiology, factors, treatment outcomes

Comment [RABK6]: Use key words that could be easily search for the article in search engines. Could you try additional words likemultidrug-resistant TB, Salamtak databases etc.

1. Introduction

Comment [RABK7]: The introduction clearly outlines the global burden of TB and MDR-TB, however, it could benefit from a more detailed discussion on the significance of studying comorbidities, specifically in the context of Liwa Hospital. If only you can include regional or hospital-specific data on TB prevalence would strengthen the introduction's relevance and context.

Comment [RABK8]: When doing numeric intex citation, please use the square bracket , cross reference and super script the numeral, however it is advisable to follow specific journal requirement.

Tuberculosis is a significant global health issue, ranking among the top 10 causes of illness and death worldwide. It is responsible for more deaths than any other single infectious agent(1). According to the 2020 WHO Global Tuberculosis Report, there were a staggering 10 million cases of TB worldwide in 2019, with 1.4 million of those cases tragically resulting in death(2). The majority of cases were reported in Europe, the Americas, the Mediterranean, the Western Pacific, Africa and South-East Asia(3).

Despite the declining global incidence of TB, the rise of multidrug-resistant TB in recent decades is a serious public health crisis and a threat to health security(3). According to estimates from the WHO, more than half a million new cases of MDR-TB and RIF-resistant are reported every year(4). In 2015, there were 10.4 million new cases of tuberculosisdisease. Among these cases, 480,000 were confirmed to be multidrug-resistant TB, and 100,000 individuals received treatment with second-line TB drugs because they were rifampicin-resistant (4). In addition, HIV/AIDS is a widely recognized factor that increases the risk of TB disease, drug resistance, and death related to TB(5). Out of the 1.8 million TB deaths in 2015, a significant 22% were HIV coinfected(6). Additionally, an alarming 35 percent of HIV expiries were attributed to TB, according to the World Health Organisation(7). MDR-TB has been linked to several risk factors. Bilateral lung disease, higher bacilli burden on sputum microscopy, history of having a previous TB treatment, HIV infection, contact with a known TB patient, and receipt of multiple treatment courses have been identified as factors in various studies(8, 9).

Regarding treatment, MDR-TB can be effectively treated with the use of second-line anti-TB drugs for a period of 9 to 20 months(3). On the other hand, the treatment outcomes of MDR-TB cases are worse when compared to drug-susceptible TB cases(10). In 2019, the success rate for

treating patients with MDR-TB was only 57% worldwide(2). Managing MDR-TB can be quite challenging for countries and national health systems(11). As an illustration, culture-based methods may require a significant amount of time to yield results(12). Additionally, these tools can be quite costly and demand advanced laboratory facilities, skilled personnel, and rigorous quality and infection control measures(10).

Numerous case-control studies or cohorts have documented the clinical characteristics and outcomes of patients with drug-resistant tuberculosis(6, 10). The study aims to evaluate various characteristics and factors associated with poor outcomes in patients with drug-resistant pulmonary tuberculosis. This study is a retrospective, cross-sectional single-center study that involves 28 patients over the age of 18 who have been diagnosed with drug-resistant TB. The patients were admitted to Liwa hospital between January 2019 and May 2023.

Comment [RABK9]: Please include relevant data of previous researches done in other areas to support your arguments

Comment [RABK10]: This should come under the methodology part.

2. Methodology

Comment [RABK11]: Please see previous comments on methodology in the abstract section. Please add relevant areas on this part such as study area, design, sampling method, data collection tools and methods, data validity and reliability, data management and analysis methods etc.

2.1 Study Design Population and Sample

A retrospective, cross-sectional single-center analysis was conducted at Liwa Hospital to evaluate various characteristics and factors associated with poor outcomes in patients with drug-resistant pulmonary tuberculosis. The study period spanned from January 2018 to May 2023.

The study included a total of 408 patients who were admitted to Liwa Hospital during the specified timeframe. Among these, 28 patients were diagnosed with drug-resistant tuberculosis (DR-TB) and selected for detailed analysis based on their treatment outcomes and clinical data(Figure 1).

2.2 Inclusion and Exclusion Criteria

Inclusion criteria included patients aged 18 years or older with confirmed drug-resistant TB based on sputum AFB culture and DST, GeneXpert MTB/RIF, and admitted to Liwa Hospital from January 2018 to May 2023.

We excluded patients younger than 18 years old, those with latent tuberculosis, and those with extra-pulmonary tuberculosis.

2.3 Data Collection Procedure

Comment [RABK12]: The comprehensive data collection approach is commendable. However, Clarification on the reliability and completeness of the Salamtak databases would enhance confidence in the data quality.

Data was extracted from Salamtak databases. A standardized data collection form was used to gather relevant information from eligible patients. Data items included demographic details (age, sex, race, marital status), clinical characteristics (BMI, smoking, alcohol consumption, comorbidities such as diabetes mellitus and hypertension, history of TB), symptoms (fever, cough, loss of appetite, weight loss, hemoptysis), clinical signs (hypotension, respiratory rate > 24/min, temperature > 38°C, SpO2 < 94%), laboratory findings (CRP, hemoglobin, white blood cell count, creatinine, platelet count, AST, ALT), radiological findings (unilateral/bilateral disease, presence of cavitation on chest X-ray), microbiological data (sputum AFB microscopy results), drug resistance details (type, pattern), TB treatment history (new case/relapse/re-treatment), treatment regimen (directly observed treatment, number of drugs administered), adverse drug events (nausea, vomiting, abdominal pain, joint pain, weakness, jaundice/elevated liver enzymes), and treatment outcomes (death, cure, treatment completed, treatment failure, loss to follow-up/default).

2.4 Primary and Secondary Objectives:

2.4.1 Primary Objectives:

To identify the epidemiological characteristics (age, sex, smoking, co-morbidities) associated with drug-resistant TB.

To evaluate the clinical characteristics associated with drug-resistant TB.

To assess the radiological and laboratory parameters associated with drug-resistant TB.

2.4.2 Secondary Objectives

To identify epidemiological, clinical, radiological, and laboratory characteristics associated with treatment outcomes in drug-resistant TB.

2.5 Treatment Protocol

Treatment for isoniazid-resistant TB involved rifampicin, pyrazinamide, ethambutol, and levofloxacin over a 6-month duration. Ethambutol-resistant TB was managed with rifampicin and isoniazid for 6 months, with pyrazinamide included for the initial 2 months. Pyrazinamide-resistant TB required rifampicin and isoniazid for 9 months, with ethambutol continued until rifampicin and isoniazid susceptibility were confirmed.

Comment [RABK13]: Specific objectives/research questions should come immediately after the introduction section followed by theoretical/conceptual framework.

Comment [RABK14]: The description of the treatment protocol is concise. However, additional information on specific drug regimens and adherence strategies would provide a thorough understanding of the efficacy of treatment

For multidrug-resistant TB (MDR-TB), the treatment protocol begins with an intensive phase using a combination of moxifloxacin or levofloxacin, linezolid, clofazimine/Cycloserine, ethambutol, and pyrazinamide. This phase continued for 5-7 months beyond culture conversion, aiming to eradicate the resistant TB strains. The continuation phase then involved moxifloxacin or levofloxacin, linezolid, ethambutol, and pyrazinamide, maintained for a total duration of approximately 18-20 months after culture conversion.

Similarly, for rifampicin-resistant TB, the intensive phase included levofloxacin or moxifloxacin, linezolid, isoniazid, ethambutol, and pyrazinamide administered for 5-7 months following culture conversion. The subsequent continuation phase comprised levofloxacin or moxifloxacin, isoniazid, ethambutol, and pyrazinamide, with a total treatment duration extending to approximately 18-20 months post-culture conversion.

2.6 Statistical Analysis

Data was analyzed using SPSS V27. Descriptive statistics including frequency tables were used to summarize categorical variables such as demographic characteristics (age, sex, marital status), clinical features (symptoms, comorbidities), and treatment outcomes (cure, treatment completed, treatment failure, loss to follow-up). Continuous variables like age, laboratory parameters (e.g., CRP, hemoglobin), and BMI were presented as mean ± SD.

To assess associations between categorical variables (e.g., treatment outcomes and demographic, clinical, and other factors), the Chi-square test was used.

Comment [RABK15]: The use of descriptive statistics and Chi-square tests is appropriate for the study's objectives. However, additional statistical methods, such as logistic regression, could be employed to control for confounding factors and better understand the relationships between variables and treatment outcomes.
Also clarifying how statistical significance was determined and how the study addressed potential confounding variables would strengthen the analysis.

3. Results

3.1 Distribution Of TB patients

Out of a total of 408 tuberculosis (TB) patients, 380 (93.1%) had non-resistant TB and 28 (6.9%) have DR-TB.

Comment [RABK16]: The presentation of results is clear, but please add non revealing demographic data and present the tables in scientific writing format.

Characteristics	Domain	N=28
Age		
	18-40	17(60.7%)
	41-60	10(35.7%)
	>60	1(3.6%)
Body Mass Index		20.95± 3.76
Gender		
	Male	24(85.7%)

Fig 1: Distribution of TB patients

3.2 Epidemiological characteristics of MDR TB patients

The majority of patients were aged between 18-40 years (60.7%), followed by those aged 41-60 years (35.7%), and only one patient was over 60 years old (3.6%). The gender distribution showed a predominance of males (85.7%) compared to females (14.3%). Most patients were Asian (96.4%) with only one patient being African (3.6%).

The average Body Mass Index (BMI) among the patients was 20.95 ± 3.76. In terms of marital status, a slight majority were married (53.6%) compared to unmarried (46.4%).

Regarding comorbidities, a notable proportion of patients had diabetes (46.4%), while a smaller percentage had hypertension (21.4%). All patients were HIV-negative. A significant portion of the population data reported being smokers (35.7%), while alcohol consumption was less common (14.3%). A history of previous TB was reported by 10.7% of the patients, with the majority (89.3%) having no history of TB.

Table 1: Epidemiological Characteristics

	Female	4(14.3%)
Race		
	Asian	27(96.4%)
	African	1(3.6%)
Marital Status		
	Married	15(53.6%)
	Unmarried	13(46.4)
Comorbidities	Hypertension	6(21.4%)
	Diabetes	13(46.4%)
	HIV(Negative)	28(100%)
Smoking Status	Smokers	10(35.7%)
Alcohol Status	Alcohol Consumers	4(14.3%)
History of TB	Yes	3(10.7%)
	No	25(89.3%)

3.3 Clinical Characteristics of Patients

The study revealed that among the patients diagnosed with drug-resistant tuberculosis (TB), cough was the most common symptom, reported by 28.6% of individuals. Fever with cough was observed in 7.1% of cases, while 7.1% presented with cough accompanied by loss of appetite and weight loss. The rest of the symptom's percentages can be seen in Table 2.

Regarding drug resistance type, primary resistance was predominant, affecting 92.9% of patients, while acquired resistance was noted in 7.1% of cases. The majority of patients (96.4%) had newly diagnosed TB, with only one case (3.6%) classified as TB relapse.

Directly observed treatment (DOT) was implemented for 75% of patients, while 7.1% did not undergo DOT, and it was unavailable for 17.9% of patients. More than four drugs were prescribed to 82.1% of patients, indicating complex treatment regimens.

Adverse drug events were reported in a minority of cases, with nausea and vomiting affecting 7.1% of patients, and elevated liver enzymes, neuritis, and hepatitis each observed in 3.6% of patients. The majority (82.1%) did not experience any adverse drug events.

All patients (100%) had positive sputum smear results, indicating active TB infection at the time of diagnosis.

Table 2: Clinical Characteristics Of Patients

Clinical Characteristics	Domain	N=28
Symptoms	Cough	8(28.6%)
	LOW	2(7.1%)
	Fever +Cough	2(7.1%)
	Cough+ Loss of Appetite+ Loss of weight	2(7.1%)
	Fever + Cough +Loss of Appetite +Loss of Weight	8(28.6%)
	Hemoptysis	1(3.6%)
	Loss of Appetite +Loss of weight	2(7.1%)
	All symptoms	1(3.6%)
	None	2(7.1%)
Drug resistance Type	Primary	26(92.9%)
	Acquired	
Type of TB	New	27(96.4%)
	Relapse	1(3.6%)
Directly Observed Treatment	Yes	21(75%)
	No	2(7.1%)
	Not available	5(17.9)
Number of Drugs Prescribed	<4	5(17.9%)
	>4	23(82.1%)
Adverse Drug Events	Nausea and Vomiting	2(7.1%)
	Elevated Liver Enzymes	1(3.6)
	Neuritis	1(3.6%)
	Hepatitis	1(3.6%)
	None	23(82.1%)
Sputum Smear	Positive	28(100%)
	Negative	0(0%)

3.4 Radiological Characteristics of Patients

Disease distribution revealed that 53.6% of individuals had unilateral TB involvement, while 46.4% exhibited bilateral disease. Cavitary TB was present in 57.1% of cases, indicating the presence of cavities in the lungs, while 42.9% did not show signs of cavitary TB.

Table 3: Radiological Characteristics

Radiological Characteristics	Domain	N=28
Disease Side	Unilateral	15(53.6%)
	Bilateral	13(46.4%)
Cavitary TB	Yes	16(57.1%)
	No	12(42.9%)

3.5 Laboratory Characteristics of Patients

HbA1c was measured in 14 patients, with a mean of 9.83 ± 3.25. C-reactive protein (CRP) levels were available for 19 patients, averaging 25.94 ± 5.16 mg/L. Hemoglobin levels were assessed in 24 patients, showing a mean of 129.46 ± 19.65 g/L. White blood cell count (WBC) results from 24 patients averaged 9.94 ± 4.59 x 10^9 cells/L. Creatinine levels were measured in 25 patients, with a mean of 69.18 ± 19.88 µmol/L. Platelet counts from 23 patients averaged 358.57 ± 99.75 x 10^9 cells/L. Aspartate aminotransferase (AST) levels were recorded in 25 patients, with a mean of 24.74 ± 21.35 U/L. Alanine aminotransferase (ALT) levels were also assessed in 25 patients, averaging 29.29 ± 34.09 U/L.

Table 4: Laboratory Characteristics

Laboratory Characteristics	N	Mean ±SD

HB1AC	14	9.8307±3.25323
CRP	19	25.94212±5.16363
Hemoglobin	24	129.4583±19.65126
WBC	24	9.9442±4.58622
Creatinine	25	69.1760±19.88373
Platelets	23	358.5652±99.74551
AST	25	24.7400±21.34520
ALT	25	29.2922±34.08677

3.6 Drug Resistance Patterns

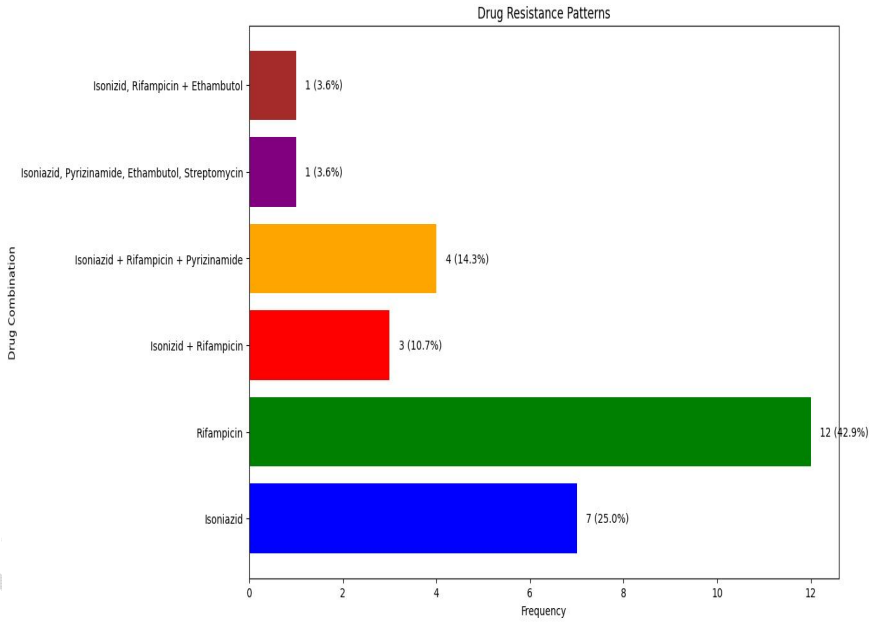

Fig 2. Drug Resistance Patterns

The graph shows the distribution of drug resistance patterns observed in the studied cases. Among the cases of tuberculosis analyzed, rifampicin resistance was the most prevalent, observed in 42.9% of cases. Isoniazid resistance followed closely, affecting 25.0% of cases. Resistance to both isoniazid and rifampicin was found in 10.7% of cases, while resistance to

isoniazid, rifampicin, and pyrazinamide was seen in 14.3% of cases. More complex resistance patterns, such as resistance to isoniazid, pyrazinamide, ethambutol, and streptomycin combined, were present in 3.6% of cases. Additionally, a similar percentage showed resistance to isoniazid, rifampicin, and ethambutol.

3.7 Treatment Outcomes

Comment [RABK17]: The high loss-to-follow-up rate is concerning and warrants further investigation into potential causes, such as socioeconomic factors or healthcare accessibility. Again the analysis of age and diabetes correlations is ok, but finding out other potential predictors of outcomes would provide a more comprehensive understanding.

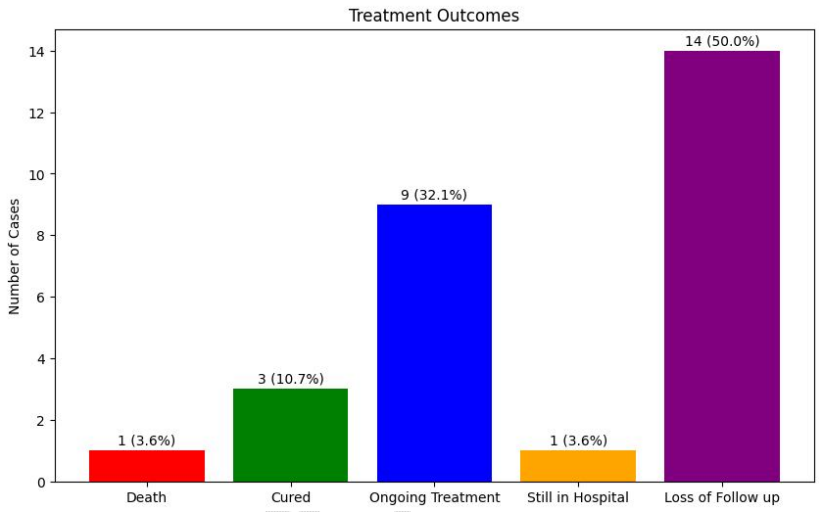

Fig 3. Treatment Outcomes

Regarding treatment outcomes for tuberculosis patients, 3.6% of the patients died. 32.1% of the patients were cured, followed by 10.7% who are still undergoing treatment. A small number of patients (3.6%) were still in the hospital, and (50%) were lost to follow-up.

3.8: Treatment Outcomes by Epidemiological Characteristics

Table 5: Distribution of Treatment Outcomes by Epidemiological Characteristics in Tuberculosis Patients

Characteristics	Treatment Outcomes					X^2	P value
Age Category	**Death**	**Cured**	**Ongoing treatment**	**Loss of Follow up**	**Still in hospital**		
18-40	0 (0.0%)	0 (0.0%)	6 (21.4%)	10 (35.7%)	1 (3.6%)	34.40	<0.01
41-60	0 (0.0%)	3 (10.7%)	3 (10.7%)	4 (14.3%)	0 (0.0%)		
>60	1 (3.6%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)		
Gender Distribution							
Male	1 (4.2%)	2 (8.3%)	8 (33.3%)	12 (50.0%)	1 (4.2%)	1.29	0.862
Female	0 (0.0%)	1 (25.0%)	1 (25.0%)	2 (50.0%)	0 (0.0%)		
Race Distribution							
Asian	1 (3.7%)	3 (11.1%)	9 (33.3%)	13 (48.1%)	1 (3.7%)	1.03	0.90
African	0 (0.0%)	0 (0.0%)	0 (0.0%)	1 (100.0%)	0 (0.0%)		
Marital Status							
Married	1 (6.7%)	3 (20.0%)	5 (33.3%)	6 (40.0%)	0 (0.0%)	5.28	0.260S
Unmarried	0 (0.0%)	0 (0.0%)	4 (30.8%)	8 (61.5%)	1 (7.7%)		
Smoking Status							
Yes	0 (0.0%)	1 (10.0%)	3 (30.0%)	6 (60.0%)	0 (0.0%)	1.45	0.835
No	1 (5.6%)	2 (11.1%)	6 (33.3%)	8 (44.4%)	1 (5.6%)		
Alcohol Status							
Yes	0 (0.0%)	0 (0.0%)	2 (50.0%)	2 (50.0%)	0 (0.0%)	1.29	0.862
No	1 (4.2%)	3 (12.5%)	7 (29.2%)	12 (50.0%)	1 (4.2%)		
Diabetes							
Yes	1 (7.7%)	3 (23.1%)	5 (38.5%)	4 (30.8%)	0 (0.0%)	7.57	0.05
No	0 (0.0%)	0 (0.0%)	4 (26.7%)	10 (66.7%)	1 (6.7%)		
Hypertension							
Yes	1	2	2 (33.3%)	1 (16.7%)	0 (0.0%)		

	(16.7%)	(33.3%)				9.28	0.05
No	0 (0.0%)	1 (4.5%)	7 (31.8%)	13 (59.1%)	1 (4.5%)		
History Of TB							
Yes	0 (0.0%)	1 (33.3%)	1 (33.3%)	1 (33.3%)	0 (0.0%)	2.03	0.730
No	1 (4.0%)	2 (8.0%)	8 (32.0%)	13 (52.0%)	1 (4.0%)		

The analysis of treatment outcomes in tuberculosis (TB) patients revealed significant associations with age category, diabetes and hypertension status. Specifically, patients aged 18-40 years exhibited a notable relationship with treatment outcomes ($\chi^2 = 34.40$, $p < 0.01$), showing higher proportions in ongoing treatment. Additionally, hypertension status ($\chi^2 = 9.28$, $p = 0.05$),and diabetes status ($\chi^2 = 7.57$, $p = 0.05$) demonstrated significant associations with treatment outcomes showing higher proportions in the death, cured, and still in hospital categories compared to those without hypertension and Diabetes. A considerable proportion of patients were lost to follow-up during the study period.

3.9: Treatment Outcomes by Epidemiological Characteristics

Table 6: Distribution of Treatment Outcomes by Clinical Characteristics in Tuberculosis Patients

Clinical Characteristics	**Death**	**Cured**	**Ongoing treatment**	**Loss of Follow up**	**Still in hospital**	**X^2**	**P value**
Symptoms							
Cough	0 (0.0%)	0 (0.0%)	3 (37.5%)	5 (62.5%)	0 (0.0%)		
LOA	0 (0.0%)	0 (0.0%)	0 (0.0%)	1 (50.0%)	1 (50.0%)		
Fever + Cough	1 (50.0%)	0 (0.0%)	0 (0.0%)	1 (50.0%)	0 (0.0%)		
Cough + LOA + LOW	0 (0.0%)	0 (0.0%)	1 (50.0%)	1 (50.0%)	0 (0.0%)		
Fever + Cough + LOA + LOW	0 (0.0%)	2 (25.0%)	3 (37.5%)	3 (37.5%)	0 (0.0%)	43.72	0.081
Hemoptysis	0 (0.0%)	1 (100.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)		
LOA + LOW	0 (0.0%)	0 (0.0%)	0 (0.0%)	2 (100.0%)	0 (0.0%)		
ALL	0 (0.0%)	0 (0.0%)	1 (100.0%)	0 (0.0%)	0 (0.0%)		
NONE	0 (0.0%)	0 (0.0%)	1 (50.0%)	1 (50.0%)	0 (0.0%)		
Drug resistance Patterns	Death	Cured	Ongoing treatment	Loss of Follow up	Still in hospital		
Isoniazid	1 (14.3%)	0 (0.0%)	2 (28.6%)	3 (42.9%)	1 (14.3%)		
Rifampicin	0 (0.0%)	3 (25.0%)	5 (41.7%)	4 (33.3%)	0 (0.0%)		
Isoniazid +	0 (0.0%)	0 (0.0%)	0 (0.0%)	3 (100.0%)	0 (0.0%)		

Rifampicin							
Isoniazid + Rifampicin + Pyrizinamide	0 (0.0%)	0 (0.0%)	1 (25.0%)	3 (75.0%)	0 (0.0%)	16.886	0.660
Isoniazid, Pyrizinamide, Ethambutol, Streptomycin	0 (0.0%)	0 (0.0%)	0 (0.0%)	1 (100.0%)	0 (0.0%)		
Isoniazid, Rifampicin + Ethambutol	0 (0.0%)	0 (0.0%)	1 (100.0%)	0 (0.0%)	0 (0.0%)		
Type of TB							
New case	1 (3.7%)	3 (11.1%)	9 (33.3%)	13 (48.1%)	1 (3.7%)	1.037	0.904
Relapse	0 (0.0%)	0 (0.0%)	0 (0.0%)	1 (100.0%)	0 (0.0%)		
Directly Observed Treatment							
Yes	0 (0.0%)	3 (14.3%)	7 (33.3%)	10 (47.6%)	1 (4.8%)		
No	0 (0.0%)	0 (0.0%)	0 (0.0%)	2 (100.0%)	0 (0.0%)	7.80	0.453
Number of drugs							
<4	<4	1 (3.6%)	0 (0.0%)	1 (3.6%)	3 (10.7%)		
>4	>4	0 (0.0%)	3 (10.7%)	8 (28.6%)	11 (39.3%)	5.87	0.209
Adverse Drug Events							
Nausea and Vomiting	0 (0.0%)	1 (33.3%)	0 (0.0%)	1 (7.1%)	0 (0.0%)		
Elevated liver enzymes	0 (0.0%)	1 (33.3%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	15.31	0.51
Neuritis	0 (0.0%)	0 (0.0%)	0 (0.0%)	1 (7.1%)	0 (0.0%)		
Hepatitis	0 (0.0%)	0 (0.0%)	0 (0.0%)	1 (7.1%)	0 (0.0%)		
None	1 (100.0%)	1 (33.3%)	9 (100.0%)	11 (78.6%)	1 (100.0%)		

Regarding clinical characteristics none of the clinical characteristics was found to be significantly associated with treatment outcomes.

3:10: Treatment Outcomes by Radiological Characteristics

Table 7: Distribution of Treatment Outcomes by Radiological Characteristics in Tuberculosis Patients

Radiological Characteristics	Death	Cured	Ongoing treatment	Loss of Follow up	Still in hospital	X^2	P value
Disease Side							
Unilateral	1 (6.7%)	3 (20.0%)	4 (26.7%)	7 (46.7%)	0 (0.0%)	4.99	0.288
Bilateral	0 (0.0%)	0 (0.0%)	5 (38.5%)	7 (53.8%)	1 (7.7%)		
Cavitary TB							

Yes	1 (6.3%)	1 (6.3%)	6 (37.5%)	7 (43.8%)	1 (6.3%)	2.81	0.588
No	0 (0.0%)	2 (16.7%)	3 (25.0%)	7 (58.3%)	0 (0.0%)		

None of the radiological characteristics was found to be associated with treatment outcomes.Additionally, For laboratory characteristics, we employed a linear regression test. None of the laboratory parameters predicted poor or better treatment outcomes for TB patients having resistant type as p values of >0.05 were obtained.

Discussion

Comment [RABK18]: This part is well written, you may just check out for very long sentences and other grammatical structure

This retrospective, cross-sectional study conducted at Liwa Hospital aimed to evaluate various characteristics and factors associated with poor outcomes in patients diagnosed with drug-resistant pulmonary tuberculosis.The study period spanned from January 2018 to May 2023, encompassing a total of 400 TB patients, among whom 28 were diagnosed with multidrug-resistant TB and selected for detailed analysis based on their treatment outcomes and clinical data.

In our study, the majority of patients were aged between 18-40 years (60.7%), A study also revealed that individuals in the age range of 21-30 years and 31-40 years were more frequently impacted, with an average age of 28.43 ± 14.32 years, compared to other age groups(13).

Similarly, in researchdirected by Mukherjee et al(14) a group of individuals between the ages of 21-30, with an average age of 32.52 years, were found to be frequently affected by MDR-TB. Studies conducted by Gaude et al. and Kapadia et al. also found that individuals in similar age groups were commonly affected(14, 15). Increased participation from the middle age group may be attributed to their active lifestyles and interactions with individuals who have various health conditions.

In the present study, there were a total of 28 patients. Out of these, 24 (85.7%) were males and 4 (14.3%) were females and had MDR TB.Studies conducted by Gaude and Kapadia have consistently shown a significant male presence in the research(14, 15). Male dominance can be explained by their greater participation in outdoor activities compared to females.

Regarding resistance patterns, in a study out of a total of 277 cases, multidrug-resistant/rifampicin-resistant tuberculosis (MDR/RR-TB) accounted for 265 cases (95.67%), cases of isoniazid monoresistance were 8 (2.89%), and extensively drug-resistant tuberculosis (XDR-TB) cases were 4 (1.44%). In the present study, among the cases of drug resistance tuberculosis analyzed, rifampicin resistance was the most prevalent, observed in 42.9% of cases. Isoniazid resistance followed closely, affecting 25.0% of cases. Resistance to both isoniazid and rifampicin was found in 10.7% of cases, while resistance to isoniazid, rifampicin, and pyrazinamide was seen in 14.3% of cases. More complex resistance patterns, such as resistance to isoniazid, pyrazinamide, ethambutol, and streptomycin combined, were present in 3.6% of cases.

Regarding treatment outcomes, in our study, 3,6% of the patients died. 32.1% of the patients were cured, followed by 10.7% who are still undergoing treatment. A small number of patients (3.6%) were still in the hospital, and (50%) were lost to follow-up.

Likewise,in a study, a significant majority of 177 (63.9%) cases were able to achieve successful treatment outcomes. Out of these, 153 individuals (55.2%) successfully recovered, while 24 individuals (8.7%) finished their treatment. Out of the remaining 100 patients who did not have successful outcomes, 60 unfortunately passed away, 32 were lost to follow-up, and 8 were deemed to have treatment failure(16).

In the present study, the researchers discovered that having other medical conditions was linked to a higher chance of experiencing a negative treatment outcome in patients with drug-resistant tuberculosis. This study result aligns with a meta-analysis (17) and a study conducted in Brazil and Yemen(18, 19). In our study, both hypertensive and diabetic patients were associated with negative outcomes as they were still receiving the treatment and were not fully recovered. Additionally, in the present study, both age (18-40) and (41-60)groups were still receiving treatment and were not cured. This finding is aligned with another study, in which the middle age group faced poorer treatment outcomes(16).

This study has several limitations. First, the retrospective design relies on existing records. Second, being a single-center study, the findings may not be generalizable to other settings with different patient populations or healthcare systems. Third, the relatively small sample size of 28 MDR-TB cases limits the statistical power to detect significant associations. Despite these

limitations, the study has notable strengths. It provides a comprehensive analysis of various epidemiological, clinical, radiological, and laboratory characteristics associated with drug-resistant TB, contributing valuable insights to the existing body of knowledge. Furthermore, the use of standardized data collection forms ensures consistency and reliability in the gathered data. To enhance future research, we recommend conducting multi-center studies with larger sample sizes to improve generalizability and statistical power. Additionally, prospective studies could provide more accurate and detailed data, helping to identify and mitigate factors associated with poor outcomes in drug-resistant TB patients more effectively.

Conclusion:

The study identified significant associations between treatment outcomes and age, hypertension, and diabetes status, with higher proportions of poor outcomes observed in patients. Comprehensive management strategies targeting these factors are essential to improve outcomes in patients with drug-resistant TB. Further research is warranted to develop tailored interventions for this population.

Comment [RABK19]: The conclusion effectively summarizes the study's findings. However it failed to clearly state recommendations for clinical practice.

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Comment [RABK20]:
The citation style appears inconsistent, with some citations lacking complete information (e.g., missing journal names or page numbers). Ensuring uniformity in formatting is essential for clarity and professionalism. The style should align with a recognized citation format, such as APA, MLA, or AMA, depending on the journal requirements.
Some references lack detailed information that would allow readers to locate the sources easily. For example:

- Reference 14: "Lahiri SK. Sociodemographic and clinical profile of multi-drug resistant tuberculosis patients: a study at drug-resistant tuberculosis centers of Kolkata." This reference lacks publication details such as the year, journal, and page numbers.
- Reference 15: "KapadiaVishakha K, Tripathi Sanjay BJDJNP. Analysis of 63 patients of MDR TB on DOTS plus regimen: An LG hospital, TB Unit, Ahmedabad experience." This also lacks full journal details.

Some references are incomplete or incorrectly formatted, which can make it difficult for readers to locate the original work. For example:

- Reference 2 and 4 have publication titles, but the citation style lacks consistency and completeness compared to others in the list.

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