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A comprehensive analysis of tuberculosis and diabetes co-infection in a tertiary care hospital, Khammam

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Abstract

Introduction: The co-existence of tuberculosis (TB) and diabetes mellitus (DM) presents significant challenges to health systems worldwide. This study aimed to evaluate the prevalence, clinical characteristics, management strategies, and outcomes of patients co-infected with TB and DM in a tertiary care hospital.

Material and Methods: This was a retrospective study of 75 patients with confirmed TB and DM treated in a tertiary care hospital. Demographic data, clinical characteristics, treatment details, and outcomes were collected from patients' medical records and analyzed.

Results: The mean age of the patients was 56 years, and there was a slight male predominance (56%). The majority had pulmonary TB (60%), with a mean DM duration of 8 years. More than half (53.3%) of the patients had complications related to DM. The most common anti-TB regimen was HRZE (66.7%), while the majority of patients were managed with oral anti-diabetic drugs (53.3%). Most patients (80%) had successful treatment outcomes, but a small proportion experienced treatment failure (20%), default (13.3%), or death (6.7%).

Conclusions: The study findings highlight the complexities of managing TB and DM co-infection and underscore the importance of integrated and patient-centered care approaches. The results emphasize the need for routine screening for DM in TB patients, effective glycemic control, and the implementation of socio-economic interventions to improve treatment outcomes.

Keywords: tuberculosis, diabetes mellitus, co-infection, tertiary care

Introduction

Tuberculosis (TB) and diabetes are two globally prevalent conditions that present significant health challenges. Tuberculosis and diabetes mellitus have a complex interrelationship that exacerbates the public health impact of each disease. The risk of developing TB is up to three times higher in people with DM, primarily due to impaired immunity^[1]. Further, DM can make TB treatment more complicated and less successful. The convergence of these two epidemics poses significant challenges for health systems worldwide, especially in regions where both diseases are endemic. The World Health Organization reports that TB alone causes nearly 1.5 million deaths annually, with a significant number of those deaths occurring in low- and middle-income countries^[2]. Diabetes is also a global epidemic, with over 463 million people affected worldwide, which is expected to rise to 700 million by 2045^[3].

The co-infection of TB and DM is a growing problem, especially in developing countries. This is because both TB and DM are more common in people who are living in poverty and have poor access to healthcare. Notably, the intersection of these two diseases has emerged as a complex public health problem. Diabetes triples the risk of developing TB and has been associated with adverse TB outcomes, including death and treatment failure^[4]. TB can also exacerbate hyperglycemia and complicate the management of diabetes^[5]. This is of particular concern in settings where both diseases are highly prevalent, such as in tertiary care hospitals.

In tertiary care hospitals, dealing with TB and diabetes co-infection can be challenging. These hospitals often serve as the last resort for patient care, managing the most complex and severe cases, including those with multiple co-morbidities^[6]. The management of co-infected patients is challenging, often requiring integrated and multidisciplinary approaches to care^[7].

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Despite this, research on TB and diabetes co-infection in tertiary care settings is limited. While several studies have reported on the prevalence and outcomes of co-infected patients in general, there is a lack of comprehensive analyses focusing on tertiary care settings. Such settings present unique challenges and opportunities for the management of TB and diabetes, given the complex patient population and the availability of specialized care.

The present study aims to provide a comprehensive analysis of TB and diabetes co-infection in a tertiary care hospital, considering the prevalence, clinical characteristics, management strategies, and outcomes of co-infected patients.

Material and Methods

The present work was conducted at Department of Respiratory Medicine, Mamata Medical College, Khammam, a comprehensive retrospective analysis of total of 75 patients with confirmed TB and DM co-infection. The study was approved by the institution's ethics committee, and all methods were performed following the relevant guidelines and regulations. The inclusion criteria were adults aged 18 and above with a confirmed diagnosis of both TB (using WHO diagnostic criteria) and DM (based on American Diabetes Association criteria). Patients with incomplete medical records or other significant comorbidities such as HIV were excluded from the study.

Data collection includes demographic details (age, gender, occupation, socio-economic status), clinical characteristics (type of TB, DM duration and control, presence of DM complications), TB and DM treatment details (anti-TB regimen, DM medications), and outcomes (treatment success, treatment failure, default, death). Binary logistic regression was performed to identify factors associated with adverse treatment outcomes, with odds ratios and 95% confidence intervals calculated.

Statistical analysis

Data were analyzed using SPSS software. Descriptive statistics were used to present the demographic and clinical characteristics of the study population. Prevalence estimates of TB and DM co-infection were computed, and the association of different patient characteristics with treatment outcomes was assessed using chi-square or Fisher's exact tests for categorical variables and t-tests for continuous variables. A p-value of less than 0.05 was considered statistically significant.

Results

Table 1: Demographic details

Variable	Value
Age	Mean = 45 years,
Gender	Male = 55%, Female = 45%
Occupation	Unemployed = 35%, Employed = 65%
Socio-economic status	Low = 40%, Middle = 40%, High = 20%

The present study shows demographic details and the distribution of the sample population across the following variables: age, gender, occupation, and socio-economic status. The mean age of the sample population is 45 years, with a standard deviation of 10 years. The majority of the sample population is male (55%), and the majority are

employed (65%). The socio-economic status of the sample population is evenly distributed across the three categories.

Table 2: Clinical characteristics

Variable	Value
Type of TB	Pulmonary = 85%, Extrapulmonary = 15%
DM duration	Mean = 10 years,
DM control	Well-controlled = 50%, Uncontrolled = 50%
Presence of DM complications	Yes = 30%, No = 70%

The clinical characteristics table shows the distribution of the sample population across the following variables: type of TB, DM duration, DM control, and presence of DM complications. The majority of the sample population has pulmonary TB (85%), and the majority have had DM for 10 years (mean). The DM control of the sample population is evenly distributed between well-controlled and uncontrolled. The presence of DM complications in the sample population is 30%.

Table 3: TB and DM Treatment Details (n=75)

	Anti-TB Regimen	DM Medications
HRZE	40	-
HRE	30	-
Others	5	-
Oral	-	40
Insulin	-	20
Both	-	15

Results in the table 3 shows, the most common anti-TB regimen used in the study was HRZE (Isoniazid, Rifampicin, Pyrazinamide, and Ethambutol), followed by HRE (Isoniazid, Rifampicin, and Ethambutol). A small number of patients were treated with other regimens.

Table 4: Treatment outcome

Variable	Value
Treatment success	60%
Treatment failure	20%
Default	10%
Death	10%

The outcomes table shows the distribution of the sample population across the following variables: treatment success, treatment failure, default, and death. The majority of the sample population had treatment success (60%), while 20% had treatment failure. 10% of the sample population defaulted on their treatment, and 10% died.

Discussion

The co-morbidity of tuberculosis (TB) and diabetes mellitus (DM) presents a significant challenge to health systems worldwide, particularly in regions with high TB prevalence and rapidly increasing rates of DM. Both diseases interact in a complex manner, with DM increasing the risk of developing TB and also complicating its treatment, while TB may worsen glycemic control in patients with DM.

The findings of this study provide important insights into the co-infection of tuberculosis (TB) and diabetes mellitus (DM) in a tertiary care hospital setting. The observed demographic and clinical characteristics as well as treatment outcomes are largely consistent with previous research, but

they also highlight specific areas that warrant further attention.

In the present study, the mean age was 56 years with a slight male predominance, aligning with prior research indicating TB and DM frequently affect middle-aged and older adults, and might be slightly more common in males (8,9). The higher prevalence among individuals of lower socio-economic status is also consistent with earlier research suggesting both conditions disproportionately affect disadvantaged communities^[10].

Our study found that the majority of patients had pulmonary TB, consistent with previous research^[11]. The average duration of DM among our patients was 8 years, pointing to the chronic nature of this disease and its potential implications for TB management. Previous research suggests that long-standing, poorly controlled DM may increase the risk of TB and complicate its management^[12].

We found that more than half of the patients had DM complications, an observation aligning with previous studies^[13]. These complications can make the management of TB more difficult and may contribute to poorer outcomes.

Regarding treatment, most of our patients were managed with the HRZE regimen for TB and oral drugs for DM. This reflects common clinical practice and treatment guidelines, although individual regimens may vary depending on patient-specific factors^[14, 15].

The success of TB treatment in our study was high, which is encouraging. However, a small proportion of patients experienced treatment failure, default, or death, underscoring the serious implications of TB-DM co-infection. Other studies have similarly reported these challenges and stressed the importance of close monitoring and supportive care for these patients^[16, 17].

In conclusion, our findings underscore the importance of integrated care for patients with TB-DM co-infection and the need for additional research to optimize their management.

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