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Original Article

Prevalence and Pattern of Medical Comorbidities in New Tuberculosis Patients in Nepal: A Cross-Sectional Study

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Abstract

Background

Tuberculosis (TB) remains a major public health challenge in Nepal. Medical comorbidities can adversely impact the outcomes of TB treatment. This study aims to assess the prevalence and pattern of major medical comorbidities among newly diagnosed TB patients in Nepal.

Materials and Methods

This cross-sectional study was conducted from March 2023 to April 2025 at Tribhuvan University Teaching Hospital, Nepal. Adults aged ≥18 years with newly diagnosed TB were enrolled. Patients with incomplete data, prior TB treatment, or pregnancy were excluded. Data on demographic features, smoking history, anemia status, and comorbidities, including diabetes mellitus, chronic liver disease, chronic kidney disease, ischemic heart disease, hypothyroidism, and COPD, were collected. Statistical analysis was performed using SPSS v. 25.

Results

Among 140 TB patients (mean age: 48.56 years; 69% male), 80 (57%) had pulmonary TB and 60 (43%) had extrapulmonary TB. A total of 72.1% were anemic. Comorbidities were found in 40 patients: COPD (10.7%), CKD (9.3%), hypothyroidism (5.7%), CLD (3.6%), and IHD (1.4%). Comorbidities were more common in patients aged >60 years and in males. Bagmati Province had the highest proportion of cases (47.9%) and comorbidities.

Conclusion

A high burden of comorbidities exists among patients diagnosed with tuberculosis in Nepal. Early detection and integrated management of these conditions are essential for optimizing TB care.

Keywords: *Tuberculosis, Co-Morbidities, Nepal*

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Introduction

Tuberculosis remains a major public health concern globally and is a leading cause of morbidity and mortality, especially in low- and middle-income countries like Nepal [1]. While the disease primarily affects the lungs, its interplay with chronic medical comorbidities has gained increasing attention due to the bidirectional impact on disease outcomes and management [2-4]. Conditions such as diabetes mellitus (DM), chronic liver disease (CLD), chronic kidney disease (CKD), ischemic heart disease (IHD), and hypothyroidism can significantly influence the clinical course of TB by affecting host immunity and altering treatment outcomes [3-5].

Nepal bears a significant burden of TB, with many patients also affected by lifestyle-related or age-associated comorbidities [6].The estimated prevalence of tuberculosis (TB) in the country is 416 per 100,000 population, with approximately 117,000 individuals currently living with the disease. Likewise, the incidence rate is reported at 245 per 100,000, accounting for an estimated 69,000 new cases [7].However, data on the prevalence of such comorbidities among newly diagnosed TB patients is sparse. Understanding these co-existing conditions is crucial for integrated care approaches, timely interventions, and improving treatment success rates.

This study aims to determine the prevalence and pattern of medical comorbidities among newly diagnosed TB patients attending a tertiary care hospital in Nepal and to explore their distribution across demographic variables such as age, sex, and geographical region.

Materials and Methods

Study design: hospital based cross sectional study Study site and duration: The study was conducted from March 20, 2023 to April 20, 2025 Tribhuvan University Teaching Hospital, a tertiary care center in Nepal.

Ethical approval and Patient consent:Approval of the study is taken from the Institutional Review Committee(IRC) of the Institute of Medicine. Details of the study were explained to all patients and written informed consent was taken from participants or their caretakers wherever applicable.

Sample size (SS):Sample size is calculated by using the following formula

SS= Z2pq/e2; Where

For a 95% confidence interval z square =1.96

Incidence of DM among Pulmonary TB p= 9.1%

Precision e = 0.05

Sample size: 128

Considering a 10% dropout rate, sample size SS = 140

Inclusion criteria:

1. Adultsof age ≥18years
2. Who were case of newly detected tuberculosis
3. Gives informed consent to participate in the study were included.

Exclusion criteria:

1. Pregnant women
2. Those who have incomplete data
3. Who enrolled in similar studies were excluded.

With informed consent from eligible primary TB patients, investigations were performed by trainedmedical personnel.

The data collected in this study included basic demographiccharacteristics (sex, age, address), smoking history, laboratory parameters like complete blood count, renal function test, blood sugar level, thyroid function test. In addition, we collectedinformation on whether the participants had any of the followingdiseases: Diabetes Mellitus, Chronic Liver Disease, Chronic Kidney Disease, Ischemic Heart Disease, Hypothyroidism.

Study definitions:

Laboratory diagnosis of tuberculosis was made on the basis of the acid-fast bacilli obtained from sputum AFB or a positive result from molecular diagnosis like GeneXpert. The clinical diagnosis was based on chest radiographs, clinical symptoms, and other relevant tests. The comorbidities investigated in this study included, Diabetes Mellitus, Chronic Liver Disease, Chronic Kidney Disease, Ischemic Heart Disease, Hypothyroidism, which were diagnosed by physicians based on standard diagnostic criteria, or as reported by participants whetherthey had been diagnosed with one or more diseases previously.

Statistical analysis:

The data was entered in a Microsoft Excel sheet and was analyzed using SPSS version 25 software. The categorical data was represented in the form of percentages and frequency. Results of continuous data are presented as mean and standard deviation.

Results

Out of 150 potentially eligible patients, 10 denied consent, and 140 were included in the study. All 140 patients were included in the statistical analysis. There were 96 (68.6%) male and 44 (31.4%) female participants, with a male and female ratio 2.18:1.

The age group >60 years represents the highest

percentage of patients comprising of 32.9 % (n=46) followed by the age group <30 years. The mean age was 48.56 years with a minimum age of 18 years and a maximum age of 95 years.
There were 67 (47.9%) patients from Bagmati, 24 (17.1%) from Madhesh and 15 (10.7%) from Gandaki Province.

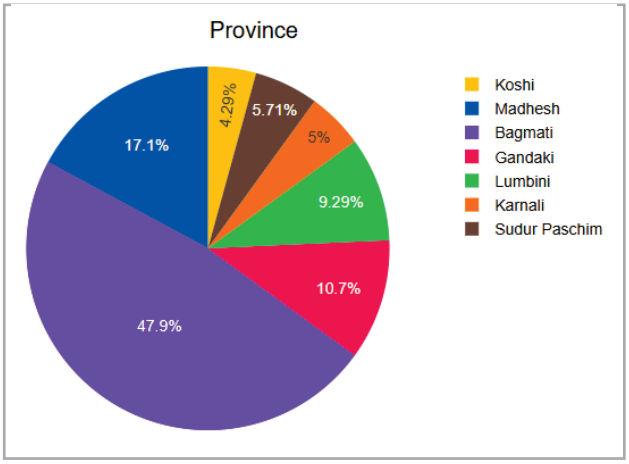

Figure 1: Geographical distribution of the patients

Out of a total of 140 TB patients, 80 were pulmonary and 60 were extrapulmonary (EP). Out of pulmonary tuberculosis patients, 63 were bacteriologically confirmed and 17 were clinically diagnosed. Out of 60 EPTB cases, 31 cases were pleural TB, 11 were abdominal TB, 12 were CNS TB and 4 cases were disseminated TB involving two or more non-contagious sites.Among the study patients, total of 80 (57.1%) patients were smokers and 60 (42.9%) were non-smokers.72.1 % patients were anemic as per the diagnostic criteria of WHO.
15 (10.7%) patients had chronic obstructive pulmonary disease (COPD) as a comorbidity followed by chronic kidney disease (CKD) in 13 (9.3%) patients, hypothyroidism in 8 (5.7%) patients, chronic liver disease (CLD) in 5 (3.6%) patients, ischemic heart disease (IHD) in 2 (1.4%) patients.

Table 1: Comorbidities in TB patient admitted to TUTH

Comorbidities	Frequency (n)	Percentage
CKD	13	9.3%
CLD	5	3.6%
IHD	2	1.4%
COPD	15	10.7%
Hypothyroid	8	5.7%
Others	13	9.3%

Comorbidities were increased with age as shown in figure below.

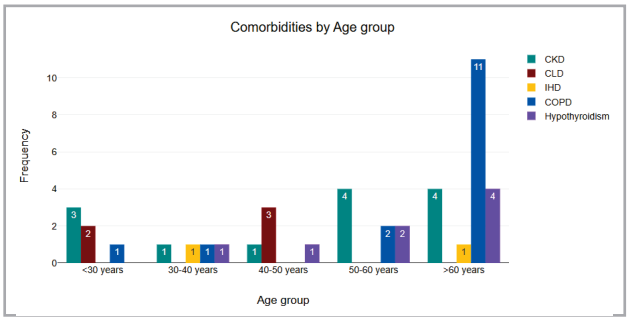

Figure 2: Bar-graph showing co-morbidities frequency by age group

All five comorbidities were higher in male population.There was no case of IDH and CLD among female TB patients.

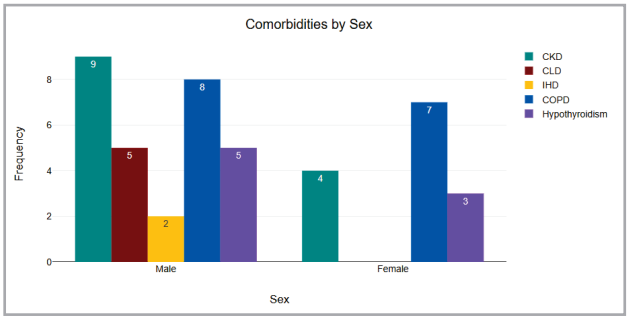

Figure 3: Bar-graph showing co-morbidities frequency by sex

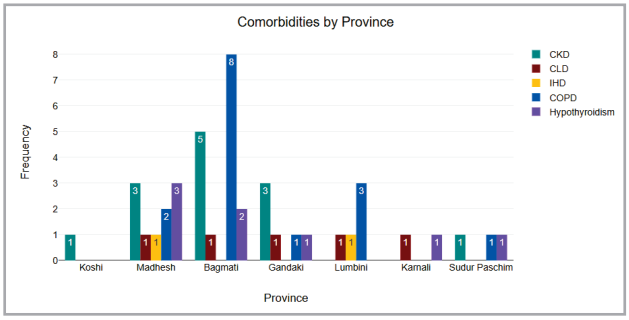

Figure 4: Bar-graph showing co-morbidities frequency by provinces

TB patients with any one of the five comorbidities were higher in Bagmati Province.

Discussion

This cross-sectional study provides valuable insight into the burden and distribution of medical comorbidities among newly diagnosed tuberculosis (TB) patients in a tertiary care setting in Nepal. Our findings reveal a high prevalence of coexisting chronic illnesses in TB patients, particularly among older adults and males, with notable public health implications for integrated disease management.
Among the 140 TB patients studied, the most

common comorbidities were chronic obstructive pulmonary disease (COPD) (10.7%), chronic kidney disease (CKD) (9.3%), hypothyroidism (5.7%), chronic liver disease (CLD) (3.6%), and ischemic heart disease (IHD) (1.4%).A similar study done in south India showed anemia followed by malnutrition and diabetes were the most common comorbidities while COPD was the most common respiratory comorbidities [8]. These results highlight the multifactorial health burden faced by TB patients in Nepal, particularly as non-communicable diseases (NCDs) are becoming increasingly prevalent.

COPD, the most frequent comorbidity, is not unexpected, given the shared risk factors such as smoking and air pollution [1,9]. The prevalence of COPD in Nepal is 11.7% [10]. Smoking was prevalent in 57% of patients in our cohort, which may contribute significantly to both TB risk and COPD pathogenesis. Previous studies showed the prevalence of COPD between 4% to 6% [11,12]. COPD can exacerbate respiratory symptoms, reduce pulmonary reserve, and complicate TB treatment by increasing susceptibility to infections. Cessation of smoking would be beneficial in the management of both COPD and TB patients.

CKD, observed in nearly 1 in 10 patients, represents another significant challenge. CKD can impair immunity, delay TB diagnosis, and alter drug metabolism, especially renal-excreted TB medications like ethambutol and streptomycin, potentially necessitating dosage adjustments [13]. Moreover, the co-occurrence of CKD can heighten the risk of adverse drug reactions and treatment failure.Proportion of CKD patients in our study is higher compared to previous studies; this could be because of our study population being admitted patients in ward of one of the largest referral centers of Nepal and CKD patients being more likely to be admitted for the diagnosis and management [12,14]. In a previous study done in similar center prevalence of TB in CKD patient were 13.7% [15]. For the better management of TB with CKD, a clear understanding of the relationship between these 2 conditions needs to be established, and consistent, evidence-based screening and treatment guidelines need to be developed as a national guideline of Nepal.

Hypothyroidism, though less frequently discussed in TB literature, was seen in 5.7% of patients. There is also a bidirectional relationship between TB and hypothyroidism. Patients with hypothyroidism have shown to have higher risk of developing TB than the general population. Physicians should be aware of the risk of developing hypothyroidism when treating patients with TB [4].

Chronic liver disease (CLD), present in 3.6% of patients, is particularly relevant due to its potential to impair hepatic drug metabolism.Similar observation was made by Kunoor et al(4%) [12]. TB treatment typically involves hepatotoxic medications such as isoniazid and rifampicin [16]. Patients with CLD may be at higher risk of drug-induced liver injury and may require closer monitoring or alternative regimens [17].

Importantly, ischemic heart disease (IHD), although seen in only 2 patients (1.4%), deserves attention. TB and IHD share overlapping risk factors such as age, smoking, and chronic inflammation. Symptoms such as chest pain or dyspnea can complicate the clinical picture and delay accurate diagnosis. The coexistence of TB and IHD can also predict worse functional status and prognosis, especially in older adults [18].

Anemia was observed in 72.1% of patients, indicating a profound burden of nutritional deficiency, inflammation, or chronic disease-related hematological compromise. In a systematic review done in Africathe prevalence of anemia among people with TB was 69%which is comparable to our study [19]. Anemia can worsen fatigue and decrease immunity, further impairing TB recovery. Treating anemia alongside TB is crucial for comprehensive care [20]. Some studies have shown that anemia could be a biomarker of tuberculosis severity [20]. The health professionals should treat anemia as early as possible and policy makers should consider anemic patients as risk for TB and established screening guideline [21].

Older patients (>60 years) accounted for the highest proportion of comorbidities. Aging is naturally associated with a higher prevalence of chronic diseases, and when combined with TB, it can significantly worsen morbidity and mortality [22]. These findings support the urgent need for geriatric-focused TB care protocols in Nepal.

Gender-wise, all comorbidities were more prevalent in males. This might be because of higher number of TB patients were male. Interestingly, IHD and CLD were exclusively found in men in our sample. This disparity may reflect higher rates of smoking, alcohol use, and occupational exposure in males in Nepal, as well as potential gender biases in healthcare access and reporting [23].

The majority of TB patients with comorbidities were from Bagmati Province, likely due to the hospital's location in Kathmandu. The lower

representation from other provinces could be due to access barriers, underdiagnosis, or lower referral rates.

The coexistence of TB with non-communicable diseases such as COPD, CKD, hypothyroidism, IHD, and CLD underscores the need for integrated, multidisciplinary TB care. Comorbidities can increase diagnostic complexity, and adverse prognosis. For instance, IHD requires careful cardiovascular monitoring during TB treatment, and CKD may necessitate drug dose adjustments.Routine screening for common NCDs in TB patients should be implemented at diagnosis and during follow-up. National TB programs must collaborate with NCD services to address these overlapping burdens. Developing TB-NCD management guidelines can significantly improve outcomes.

This study was conducted in a single tertiary hospital and may not fully represent the national population. The sample size, while adequate for an initial assessment, may not capture less frequent comorbidities. Additionally, some conditions were self-reported or based on previous diagnoses, which may introduce recall or misclassification bias.

Conclusion

A significant proportion of newly diagnosed TB patients in Nepal present with comorbid medical conditions, particularly COPD, CKD, and hypothyroidism. These comorbidities are more prevalent in older males and are most commonly seen in Bagmati Province. Integrating comorbidity screening into TB control strategies is vital for holistic patient care and improved outcomes.

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Conflict of interest: None

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