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PREVALENCE, TREATMENT OUTCOMES AND FACTORS ASSOCIATED WITH TUBERCULOSIS AMONGST PATIENTS AT REGIONAL HOSPITAL LIMBE, CAMEROON: A RETROSPECTIVE STUDY

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ABSTRACT

Background: Tuberculosis (TB) remains a major global health concern, especially in low and middle-income countries where poverty, HIV co-infection, and weak health systems increase vulnerability. Despite being preventable and treatable, TB continues to cause high morbidity and mortality. The main aim of this study was to determine the prevalence and factors associated with tuberculosis among patients at the Regional Hospital Limbe from 2020 to 2024.

Methods: A retrospective, cross-sectional hospital-based study was conducted through the review of TB patient records admitted between January 1st 2020, and December 31st 2024. Data was collected for a period of eight months, from November 2024 to June 2025. Data analysis was performed using the Statistical Package for Social Sciences version 20. Significance was set $p < 0.05$ at a 95% confidence interval.

Results: The overall prevalence of TB at the health facility was 3.5%. The prevalence of tuberculosis at the health facility was particularly higher among internally displaced persons (11%) and prisoners (2.3%). Pre-treatment co-morbidities included HIV (18.6%) and diabetes (12.1%), while co-morbidities during treatment included arthritis (3.1%) and diabetes (2.1%). Treatment outcomes showed a mortality rate of 3.1%, treatment failure of 17.3%, and relapse rate of 18.3%.

Conclusion: Tuberculosis remains a public health challenge among vulnerable populations in Limbe, with internally displaced persons, prisoners, and patients with chronic illnesses being disproportionately affected. Targeted interventions should be prioritized for internally displaced persons and prisoners, alongside strengthened monitoring of co-morbidities to improve treatment outcomes.

Keywords: Prevalence, Tuberculosis, Associated factors, Complications, Limbe Regional Hospital, Cameroon

HIGHLIGHTS

What is already known on this topic

Tuberculosis remains a major public health challenge in low- and middle-income countries, especially where HIV co-infection, poverty, and overcrowding increases transmission risks. Vulnerable groups such as internally displaced persons and prisoners face disproportionately higher infection rates.

Aim of the Study

The study aimed to determine the prevalence of tuberculosis among patients at the Regional Hospital Limbe from 2020–2024. It also sought to identify the factors associated with TB occurrence within this population.

Key Findings

The overall five-year prevalence of TB was 3.5%, with the highest rate recorded in 2020. The prevalence was particularly higher in Internally displaced persons (11.0%) and prisoners (2.3%). Treatment outcomes revealed a mortality rate of

3.1%, a 17.3% treatment failure rate, and an 18.3% relapse rate.

Implications for future practices, policies, and research

Targeted preventive strategies should prioritize vulnerable groups such as IDPs, prisoners, and patients with chronic conditions. Future policies and research should strengthen early diagnosis, continuous monitoring of co-morbidities, and improved adherence support to reduce TB burden.

INTRODUCTION

Tuberculosis (TB) is an infectious disease affecting both pulmonary and extra-pulmonary sites, caused mainly by *Mycobacterium tuberculosis*. The organism is transmitted through airborne droplet nuclei of 1–5 microns released when infected individuals cough, sneeze, or spit, making TB highly infectious, though only active TB cases can transmit the disease [1]. Globally, TB remains a major public health challenge, particularly in low- and middle-income countries. In 2021, an estimated 10.6 million people developed TB and 1.6 million died from

the disease, reflecting its continued burden despite being both preventable and treatable [2]. The disease predominantly affects the lungs but can involve multiple organs, complicating diagnosis and management [4]. TB's global burden is strongly linked to socioeconomic determinants, with poverty recognized as a major factor influencing infection and mortality. Significant gaps exist in TB outcomes between the world's poorest and richest populations, emphasizing the role of inequity in disease transmission and outcomes [3]. Efforts to control TB vary across regions, and the World Health Organization's End TB Strategy aims for a 95% reduction in TB deaths and a 90% reduction in incidence by 2035 [5].

Africa faces a disproportionate share of TB cases, accounting for nearly a quarter of the global burden. High HIV prevalence contributes significantly to TB incidence, resulting in a dual epidemic that complicates treatment. In 2021 alone, Africa recorded an estimated 2.6 million new TB cases, with more than 450,000 co-infected with HIV [1,6]. Healthcare systems across the continent often experience resource limitations, contributing to delayed diagnosis, inadequate treatment, and limited follow-

up care. These challenges, combined with stigma, transportation barriers, and financial constraints, result in late presentation and increased risk of complications among TB patients [7]. In Cameroon, TB remains a critical public health issue, with the country listed among the 30 high-burden TB nations worldwide. The incidence rate stands at approximately 182 cases per 100,000 population [8]. The Regional Hospital Limbe plays a vital role in TB diagnosis and management in the Southwest Region, yet complications associated with TB continue to pose significant challenges. Multiple factors contribute to these complications, including co-morbidities such as HIV, diabetes, and malnutrition, which are commonly observed among patients and aggravate disease severity [9]. Limited diagnostic tools, treatment delays, and shortages in healthcare resources also contribute to worsening outcomes. Addressing these factors is crucial to reducing TB-associated morbidity and improving treatment success in the region.

METHODS

Study Design and duration

This study was a retrospective study involving the review of patient records from the Tuberculosis (TB) unit of the

Regional Hospital Limbe. The study covered a five-year period from January 1st, 2020 to December 31st, 2024. The study lasted for over eight months, from November 2024 to June 2025.

Study Area

The study was conducted at the Regional Hospital Limbe, located in Fako Division in the Southwest Region of Cameroon. The Regional Hospital Limbe serves as a major referral facility in the region and has multiple clinical units including maternity, medical ward, outpatient department, mortuary, COVID-19 unit, surgical ward, paediatric ward, TB unit, pharmacy, and laboratory. The TB unit, located at the rear end of the hospital, maintains a dedicated registry for all TB cases and is recognized as one of the most equipped TB management centers in the Southwest Region, with a high patient admission density for tuberculosis.

Sample Size Determination

A census sampling approach was employed. All available records of patients diagnosed with pulmonary or extra-pulmonary TB during the study period (January 1, 2020 to December 31, 2024) were included. No statistical formula was used since the study reviewed the entire

population of eligible TB cases documented within the five-year interval.

Eligibility Criteria

Records with incomplete registration information that could affect the accuracy of the analysis were excluded.

Data Collection

Data collection was conducted using a structured data extraction sheet designed based on literature review and aligned with the study objectives. The tool captured information on the prevalence of TB, factors associated with the disease, and outcomes of TB management. Data extracted included socio-demographic characteristics, year of diagnosis, type of TB, co-morbidities, risk status factors, and treatment outcomes. Confidentiality was maintained throughout the process, and no patient names or identifiers were recorded.

Data Analysis

Collected data were entered into Microsoft Excel 2019 and analyzed using SPSS version 20 for analysis. Descriptive statistics, including frequencies and percentages, were used to summarize categorical variables such as sex, risk status, co-morbidities, and treatment outcomes. Continuous variables like age were also summarized using descriptive measures. Associations between

independent variables (such as socio-demographic factors and co-morbidities) and the dependent variable (TB status or outcomes) were assessed using Chi-square tests. Cross-tabulations were applied to determine significant relationships. Statistical significance was set at a 95% confidence interval with a p-value < 0.05.

Ethical Considerations

This study was approved by the Ethics Committee for Human Health Research of the Regional Delegation of Public Health for the South West Region (Approval number: 34/CRERSH/SW/C/01/2025).

RESULTS

Prevalence of tuberculosis cases at the Regional Hospital Limbe over a 5-year period (2020 – 2024)

In a retrospective assessment, the prevalence of TB cases registered at the OPD of the Limbe Regional Hospital was determined. As shown on table 1, the highest prevalence, 4.08%, was recorded in the year 2020 while the least, 3.21% was recorded in both 2021 and 2024. The prevalence of 4.08% in 2020 was greater than the overall prevalence over 5 years of 3.50%; while the prevalence in 2021, 2022, 2023 and 2024 were all below the overall prevalence. However, there was no statistical significance difference in the annual prevalence rate of TB cases over the 5-year study periods with $p = 0.0841$.

Table 1: Distribution of the prevalence of TB cases registered at RHL over 5 years

Years	Total number of patients received at the OPD	Number of registered TB cases	Prevalence (%)	p-value
2020	5391	220	4.08	0.0841
2021	5771	185	3.21	
2022	5482	190	3.47	
2023	6337	229	3.62	
2024	6295	202	3.21	
Overall	29276	1026	3.50	

OPD: Outpatient Department, TB: Tuberculosis

Trend in the prevalence of tuberculosis cases at the Regional Hospital Limbe over 5 years (2020 – 2024)

As shown in figure 1, there was no specific trend in the prevalence rate of TB over the 5-year study period. From the year 2020 to 2024, including the overall prevalence, no significant increasing and no significance decreasing trend was notice over the 5-year period. As observe from the X^2 - value of 1.602, there was no association between the annual prevalence rate within the study period and also no significant difference in the prevalence rates ($p > 0.05$).

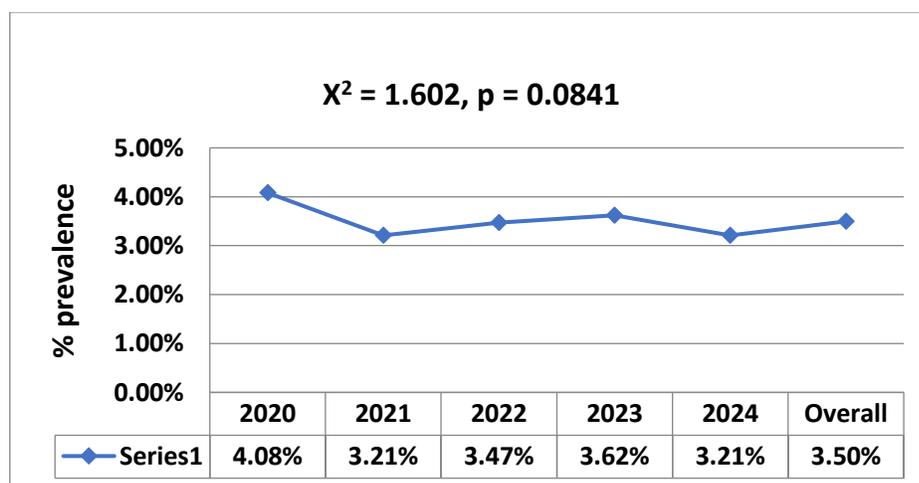


Figure 1: Trend in the prevalence of TB over a 5-year period

Socio-demographic factors associated to tuberculosis cases

Data analysis revealed that gender, diagnostic procedure and regimen were significantly associated with TB cases ($p < 0.05$). Majority, 647(63.1%) of the TB patients were males. Most 689(67.2%) of the cases have been diagnosed bacteriologically. At the date of registration, 188(19.2%) of the patients were already in phase 2 treatment regimen. Weight

and other demographic parameters had no significant association with the TB cases ($p > 0.05$) as shown on table 2.

Risk factors associated to tuberculosis cases

Data analysis revealed that all the risk factors recorded by the hospital were significantly associated with TB with all $p < 0.05$. Internally displaced persons were the most registered cases 113(11.0%) followed by prisoners with 23(2.3%). HIV was the most common co-morbidity associated with TB before treatment with 191(18.6%) of the TB cases also having HIV; while arthritis was the most common co-morbidity during treatment with 32(3.1%) as shown on table 3.

Table 2: Association between demographic data and tuberculosis at the Regional Hospital Limbe

Parameters	Variables	n	%	X²-value	p-value
Gender	Male	647	63.1	5.7210	0.0365
	Female	379	36.9		
	Total	1026	100		
Diagnostic procedure	Clinical	337	32.8	6.0824	0.0410
	Bacteriological	689	67.2		
	Total	1026	100		
Weight (Kg)	Below 40	103	10.1	1.6623	0.0639
	40 – 50	255	24.8		
	51 – 60	379	36.9		
	Above 60	289	28.2		
	Total	1026	100		
Address	Within Limbe	615	59.9	2.1980	0.0732
	Outside Limbe	411	40.1		
	Total	1026	100		
Referral	Community Health Worker	421	41.1	1.9351	0.0537
	Other hospitals	386	37.6		
	Self	219	21.3		
	Total	1026	100		
Regimen	Phase 1	829	80.8	5.8253	0.0380
	Phase 2	188	19.2		
	Total	1026	100		

Table 3: Association between risk factors of tuberculosis at the Regional Hospital**Limbe**

Parameters	Variables	n	%	X²-value	P-value
Risk status	Prisoner	23	2.3	6.3082	0.0383
	IDP	113	11.0		
	Health worker	9	0.88		
	None	881	85.9		
	Total	1026	100		
Co-morbidity before treatment	HIV	191	18.6	5.9504	0.0401
	Diabetes	124	12.1		
	Hypertension	62	6.0		
	None	649	63.3		
	Total	1026	100		
Co-morbidity during treatment	Diabetes	22	2.1	5.2904	0.0216
	Hypertension	13	1.3		
	Arthritis	32	3.1		
	None	959	93.5		
	Total	1026	100		
Case status	New	735	71.6	6.2548	0.0280
	Relapse	188	18.3		
	Retreatment	103	10.0		
	Total	1026	100		

IDP: Internally displaced person, **HIV:** Human immune deficiency virus

Treatment outcome of tuberculosis at Regional Hospital Limbe within 5 years (2020 – 2024)

Following TB treatment only 32(3.1%) of deaths were recorded within the study period of 2020 to 2024. A total of 79.6% of the patients were successfully treated while 17.3% suffered treatment failure and went into retreatment as shown on figure 2.

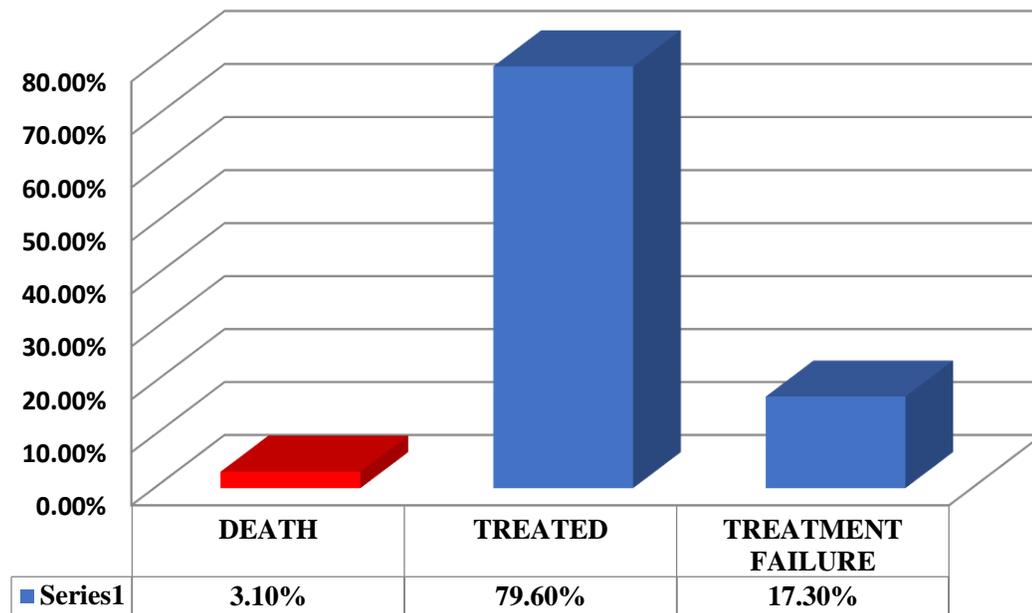


Figure 2: treatment outcome of TB cases at the RHL (2020 – 2024)

DISCUSSION

Tuberculosis (TB) remains a major public health challenge in many low- and middle-income countries, including Cameroon. The present study assessed the five-year prevalence of TB, factors associated with TB, and treatment outcomes among patients managed at the Regional Hospital Limbe (RHL). The findings were compared with findings from similar studies within Cameroon, Sub-Saharan Africa, and other high-burden settings to determine similarities, differences, and potential explanations for observed patterns.

The socio-demographic characteristics revealed that the majority of TB cases occurred in males, who accounted for 63.1% of all diagnosed patients. This finding aligns with several reports from low- and middle-income countries,

including Azza *et al.* (2025) and other population-based studies, which consistently show higher TB prevalence among men [9]. A meta-analysis involving 56 prevalence surveys across 28 countries also concluded that TB is significantly more common among males than females [10]. Possible explanations include higher occupational exposure, smoking rates, alcohol consumption, limited health-seeking behaviour among men, and greater social mobility which increases exposure to infection. Diagnostic procedures also contributed significantly to case distribution, with 67.2% of diagnoses being bacteriologically confirmed. This is a reflection of improved laboratory capacity at RHL. Other variables such as body weight and some demographic parameters did not show significant associations, suggesting

that biological factors alone may not fully explain susceptibility patterns.

The study reported an overall TB prevalence of 3.5% between 2020 and 2024. The highest prevalence was recorded in 2020 (4.08%), and the lowest (3.21%) occurred in 2021 and 2024. However, no statistically significant differences were observed across the five-year period ($p > 0.05$), showing an overall stable burden of TB within the facility. A similar lack of significant yearly variation was reported by Ane *et al.* (2006), who observed TB prevalence patterns within household contacts in Cameroon [11]. The slight peak in 2020 may be attributed to disruptions caused by the COVID-19 pandemic, which might have increased delayed care-seeking and worsened access to routine TB services. Moreover, increased social interactions and use of public transportation prior to COVID-19 restrictions may have also contributed to the higher prevalence reported in that year. Nonetheless, the prevalence recorded in this study remains lower than IGRA-based prevalence estimates in Sub-Saharan Africa, which range between 24% and 36% [12]. This is possibly due to methodological differences and the hospital-based nature of this study.

Several factors were found to be significantly associated with TB. Internally displaced persons (IDPs) and prisoners were disproportionately affected, accounting for 11% and 2.3% of TB

cases respectively. This is consistent with earlier studies that identify overcrowding, poor ventilation, undernutrition, and socioeconomic vulnerability as major contributors to TB transmission in such groups [13]. Co-morbidities also played a significant role where HIV was the most frequent co-morbidity before treatment (18.6%), aligning with findings from Jones *et al.* (2023), who reported 27% TB prevalence among HIV patients in South-East Nigeria [14]. The high burden among PLHIV is expected due to weakened immunity and frequent hospital exposures. Arthritis and diabetes were notable co-morbidities during treatment, suggesting that chronic diseases may complicate management. Together, these findings highlight the need for targeted interventions, especially TB preventive therapy and routine screening for high-risk groups.

As per the treatment outcomes findings indicated that 79.6% of patients were successfully treated, while 17.3% experienced treatment failure and 3.1% died. The mortality rate in this study is lower than the 5.5% reported in a systematic review involving 95 studies from low- and middle-income settings [14]. The relatively low mortality observed may be attributed to the structured TB program at RHL, which provides free diagnosis and treatment. However, the treatment failure rate of 17.3% and relapse rate of 18.3% are concerning.

Treatment failure has been linked to poor adherence, inadequate follow-up, drug resistance, and co-morbidities such as HIV and diabetes [15]. Previous literature also emphasizes the contribution of subclinical TB to ongoing transmission, as documented in earlier studies where asymptomatic individuals had abnormal radiographs and bacteriological evidence of TB [16]. This highlights the importance of early detection and the strengthening of community-based case finding.

Limitations

This study was based on secondary data from hospital registers, and therefore the completeness and accuracy of records could not be fully controlled. The study was also hospital-based, which limits generalizability to the wider community since individuals who did not seek care at RHL were not included.

Conclusion

This five-year retrospective analysis revealed an overall TB prevalence of 3.5% at the Regional Hospital Limbe from 2020 to 2024. Significant associated factors included being an internally displaced person (11%), imprisonment (2.3%), and co-morbidities such as HIV (18.6%) and diabetes (12.1%). Treatment outcomes showed a mortality rate of 3.1%, a treatment failure rate of 17.3%, and a relapse rate of 18.3%. These findings underscore the need for strengthened TB prevention, early detection, and targeted

interventions for high-risk groups, particularly IDPs, prisoners, and individuals with chronic illnesses.

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Conflict of Interest

Collaborators showed no conflict of interest

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