

HIV Co-infection in Tuberculosis Patients Monitored at the Tuberculosis Diagnosis and Treatment Center of the Regional Hospital of Ngaoundere

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Abstract

HIV often paves the way for tuberculosis. These two diseases, tuberculosis and the Human Immunodeficiency Virus (TB/HIV), form a close association. The objective of this study was to determine the prevalence of HIV infection among tuberculosis patients diagnosed at the Tuberculosis Diagnostic and Treatment Center (TDC) of the Ngaoundere Regional Hospital (HRN) and to identify factors associated with TB-HIV co-infection. We conducted a retrospective, cross-sectional, descriptive study over a period of two years, from January 1st, 2022, to December 31st, 2023, by utilizing the database of the TDC service of this hospital. The study focused on patients with pulmonary tuberculosis who had also been tested for HIV. A total of 550 cases of pulmonary tuberculosis were recorded, including 104 cases of co-infection. The prevalence of HIV co-infection among tuberculosis patients was 18.9%. Males were more affected, accounting for 63% of the cases, with a male-to-female ratio of 1.7. The age groups [30-40[years and [40-50[years were the most represented, followed by the [20-30[years group, with respective percentages of 11.64%, 11.64%, and 4.91% ($p < 0.0001$). All patients were treated with anti-tuberculosis and antiretroviral therapy as indicated. Eleven patients were lost to follow-up, representing 2.00% ($p = 0.000$), and four patients resumed treatment, accounting for 0.73% ($p = 0.024$). Mortality was higher among tuberculosis patients not infected with HIV (2.00%) than among those co-infected (0.91%). In conclusion, this study highlights a significant prevalence of TB-HIV co-infection among tuberculosis patients, underscoring the importance of strengthening screening and integrated management strategies for these two diseases.

Key-words: Prevalence, Co-infection, Tuberculosis, HIV, TDC

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INTRODUCTION

Tuberculosis (TB) remains a major public health issue, affecting one in three people globally, with over two billion people infected (**WHO, 2021**). Despite widespread misconceptions, this infection continues to pose a significant global threat. In 2021, nearly 10.6 million new cases were reported, marking a 4.5% increase compared to 2020. Additionally, approximately 1.6 million deaths were recorded, which equates to 4,400 deaths per day (**WHO, 2022**). Furthermore, co-infection with the Human Immunodeficiency Virus (HIV) and tuberculosis also represents a major public health challenge (**François-Xavier, 2023**), particularly in developing countries such as Cameroon. According to a WHO study (2017), individuals infected with HIV have a 20 to 30 times higher risk of developing active tuberculosis compared to others. A retrospective study conducted in Africa from 2010 to 2016 analyzed 245 hospitalization records of co-infection cases in two healthcare units, revealing an average prevalence of 17.8% (**Doe et al., 2017**).

Although significant progress has been made in the fight against HIV and tuberculosis, co-infection remains a persistent and complex issue. Patients co-infected with HIV and tuberculosis often face additional therapeutic challenges, such as drug interactions, increased toxicity, and difficulties in adhering to treatment (**Lawn and Zumla, 2011**). Moreover, co-infection can complicate the diagnosis of tuberculosis, as symptoms may be atypical and standard tests less sensitive (**Getahun et al., 2010**). In Cameroon, specific data on the prevalence and impact of HIV co-infection in tuberculosis patients, particularly in regions such as Ngaoundere, are limited.

Thus, this study aims to address these gaps by answering the following question: what is the prevalence, sociodemographic characteristics, and treatment outcomes of HIV-TB co-infected patients admitted to the Regional Hospital of Ngaoundere between January 2022 and December 2023? The objective of this study is to assess the prevalence and associated factors of HIV co-infection among tuberculosis patients admitted to the tuberculosis treatment center (CDT) of the Regional Hospital of Ngaoundere during the study period. Understanding the implications of this co-infection is crucial for improving patient management in similar settings.

Significance of the Study

This study aims not only to improve the clinical management of co-infected patients at the tuberculosis treatment center (CDT) of the Regional Hospital of Ngaoundere but also to positively influence public health strategies and enrich the scientific knowledge base on this critical issue.

MATERIALS AND METHODS

Study design

The study was a retrospective, cross-sectional, descriptive analysis conducted over a two-year period, from January 1, 2022, to December 31, 2023, involving all tuberculosis patients registered at the Tuberculosis Diagnosis and Treatment

Center (CDT) of the Regional Hospital of Ngaoundéré (HRN) during the study period. Included in this study were all patients of both sexes who were diagnosed with tuberculosis and tested for HIV. Incomplete or unusable records, as well as patients who refused HIV testing, were excluded from the study. A non-probability sampling method was used, and the sample size was determined based on the number of cases available in the registry during the selected study period, thus reflecting the total relevant data collected during that time.

Data Collection and Analysis

The procedure was carried out as follows: using a ballpoint pen on A4 paper, data were collected from the documentation base (laboratory register) of the CDT service at the Regional Hospital of Ngaoundere. Certain numerical data (such as age) were calculated and then entered into our Excel spreadsheet. The following variables were collected: sociodemographic characteristics, paraclinical examination, and diagnostic confirmation. The collected data were encoded, entered, processed, and statistically analyzed using computer software, with XLSTAT 2016 for raw data analysis and MS EXCEL 2021 for creating graphs and tables. The significance threshold was set at 5%. Only factors with a P-value < 0.05 were considered statistically significant.

RESULTS

Sociodemographic Characteristics of Patients

A total of 550 patients living with tuberculosis were recorded.

Overall Distribution of Patients by Sex

Figure 13 below illustrates the overall distribution of patients by sex. This figure reveals a predominance of the male trend, with a total of 348 males, accounting for 63%, and a male-to-female ratio (M/F) of 1.72.



Figure 1: Overall Distribution of Patients by Sex (N=550)

Répartition globale des patients en fonction de leur tranche d'âge

Figure 2 below represents the overall distribution of patients by age groups.

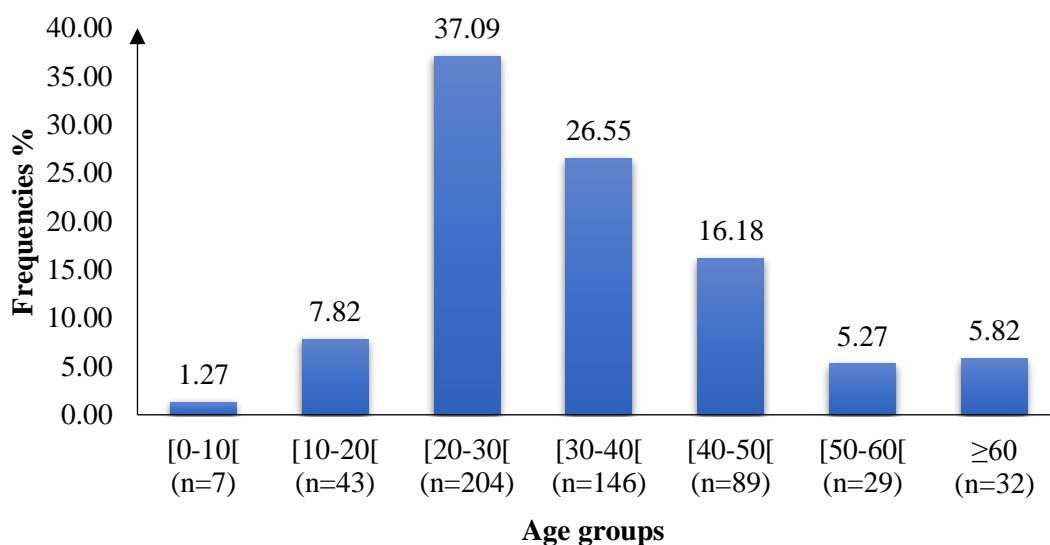


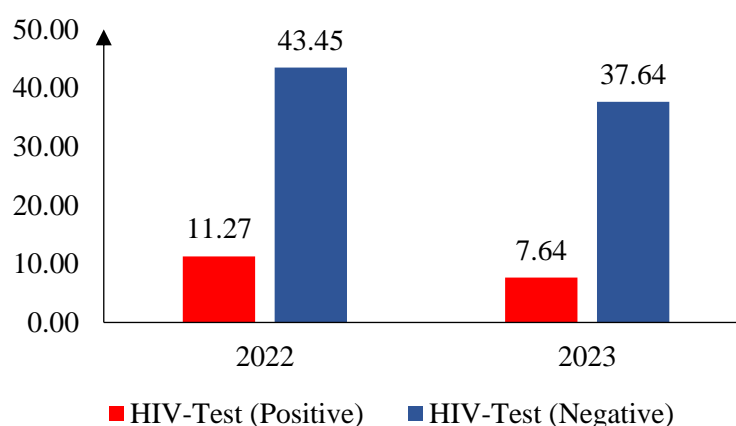
Figure 2: Overall distribution of patients by age group

This figure shows a predominance in the [20-30[age group, which accounted for the largest number of patients (204/550), representing 37.09%, followed by the [30-40[age group with 26.55% (146/550). The [0-10[age group was the least represented, accounting for 1.27% (7).

HIV Prevalence in Tuberculosis Patients and Associated Factors

HIV Prevalence in Tuberculosis Patients by Year

Figure 3 below illustrates the HIV prevalence in tuberculosis patients by year. Out of the 550 TB cases, 104 were co-infected with HIV, yielding an overall prevalence of 18.91%, with 11.27% in 2022 and 7.64% in 2023. The difference in prevalence variation between these two years is not statistically significant ($\text{Chi}^2 = 1.237$, $p = 0.266$).



HIV Prevalence in Tuberculosis Patients by Month

Figure 4 illustrates the HIV prevalence in tuberculosis patients by month.



Figure 3: HIV Prevalence in Tuberculosis Patients by Month

This figure shows that in 2022, the months with the highest representation were August, July, and November, with respective prevalence of 2.55%, 1.64%, and 1.45%. In contrast, in 2023, the most represented months were February and April, with prevalences of 1.45% and 1.09%, respectively. The variation difference between these months is highly significant ($\chi^2 = 45.582$, $p = 0.003$).

Distribution of Tuberculosis Patients Based on HIV Status and Associated Factors

Table 1 below presents the distribution of tuberculosis patients based on HIV results and associated factors.

Table 1: Distribution of Tuberculosis Patients Based on HIV Results and Associated Factors

Variables	HIV-Test				P-value	
		N	%	P		%
Sex	Female	161	29.27%	41	7.45%	0.527
	Male	285	51.82%	63	11.45%	
Age groups	[0-10[5	0.91%	2	0.36%	< 0.0001**
	[10-20[	41	7.45%	2	0.36%
	[20-30[	177	32.18%	27	4.91%
	[30-40[	114	20.73%	32	5.82%
	[40-50[	57	10.36%	32	5.82%
	[50-60[	21	3.82%	8	1.45%
	≥60	31	5.64%	1	0.18%	
Bacilloscopy	Positive	282	51.27%	56	10.18%	0.188
	Negative	56	10.18%	18	3.27%	
	Relapse					
	No	423	76.91%	94	17.09%	0.085
	Yes	23	4.18%	10	1.82%	

		Treatment failure					
<i>Outcome of anti-tuberculosis treatment</i>	No	442	13.98%	104	18.91%	0.332	
	Yes	4	0.76%	0	0.00%		
			Resumptions				
	No	442	80.36%	100	18.18%	0.024*	
	Yes	4	0.73%	4	0.73%		
			Cured				
	No	107	19.45%	38	6.91%	0.009*	
	Yes	339	61.64%	66	12.00%		
			Death				
	No	435	79.09%	99	18.00%	0.201	
Yes	11	2.00%	5	0.91%			
		Lost to follow-up					
No	435	79.09%	93	16.91	0.000**		
Yes	11	2.00%	11	2.00			

*N: Negative; P: Positive; % : percentage ; * : Statistically significant value; ** : Highly statistically significant value*

From this table, it can be deduced that male subjects were approximately more co-infected, with 63/104 patients (11.45%) compared to 41/104 female patients (7.45%), and this difference in variation is not significant ($p > 0.527$). Regarding age, the predominant age groups were [30-40[years and [40-50[years (5.82% each), followed by the [20-30[years group (4.91%). The ≥ 60 years age group had the lowest co-infection rate, with 0.18%. The variation difference between these age groups was very significantly associated with co-infection ($p < 0.0001$). Bacilloscopy was positive in 10.18% of co-infected patients. As for treatment outcomes, 10 relapses were recorded, representing 1.82%. No patient experienced treatment failure. The 4 treatment restarts, representing 0.73%, were statistically significant ($p = 0.024$). The 66 recoveries, representing 12.00%, were also statistically significant ($p = 0.009$). The 5 deaths (0.91%) and the 11 patients lost to follow-up (2.00%) were extremely significant ($p = 0.000$).

DISCUSSION

We conducted a retrospective, cross-sectional descriptive study over a two-year period from January 1, 2022, to December 31, 2023. A total of 550 cases of pulmonary tuberculosis were recorded at the CDT of HRN. Males accounted for 63% of cases, with a male-to-female sex ratio of 1.72. These figures are slightly higher than those reported by **Diarra et al. (2019)** in Mali, which noted 60.42% male cases with a sex ratio of 1.53 in a study of 63 patients. This male predominance may be explained by factors related to certain sociocultural determinants, such as polygamy, levirate marriage, and sororate marriage, as well as by taboos and prejudices.

In our study, the age group of [20-30[years represented 37.09% of cases. Regarding co-infected patients, the prevalence of HIV in 2022 was higher than in 2023, with rates of 11.27% and 7.64%, respectively, resulting in an overall prevalence of 18.91%. This rate is lower than those observed in some previous studies, such as the one conducted in Morocco in 2013 (27.7%) on HIV co-infection among tuberculosis patients followed in the infectious diseases department of the university hospital (**Castro et al., 2013**), and a similar study in Cameroon that reported 26.06% (**Ntemgwa et al., 2013**). A similar trend was observed in Guinea in 2020, where the prevalence was 23% according to the National Tuberculosis Control Program (**National Directorate of Tuberculosis Control, Republic of Guinea**). These results may be influenced by the fact that our study was limited to a CDT service, which could overestimate the number of co-infections.

We observed a peak of 2.55% in August 2022 compared to 0.36% in August 2023. Conversely, 1.45% was observed in February 2023 compared to 0.55% in February 2022, with a statistically significant difference. These variations in co-infection across the months could be explained by access to care, awareness campaigns, as well as socio-economic and environmental factors. The predominant age group associated with co-infection was [30-40[years, followed by [40-50[years (5.82% each), and [20-30[years (4.91%), with a highly significant association ($p < 0.0001$). These results are lower than those reported by **Kouassi et al. (2013)** in Côte d'Ivoire, which found a co-infection rate of 71.1% for the age group of 25 to 45 years. The high rate of co-infection in the 30-40 age group may be due to the fact that this group is the most sexually active and may not use condoms consistently or correctly.

It was observed that the bacilloscopy was positive in only 10.18% of co-infected patients, compared to 51.27% of tuberculosis patients, highlighting a limitation of the direct examination. This result differs from those of **Assiya et al. (2018)** in Morocco, who found 26.1% positivity among co-infected patients and 26.2% among tuberculosis patients. This difference may be explained by the fact that sputum examination after Ziehl-Neelsen staining, although considered a reference technique among direct examinations, is less sensitive than culture. Furthermore, bacilloscopy positivity is less frequent among individuals infected with HIV.

All patients were placed on anti-tuberculosis treatment, and 18.9% received a mixed treatment, including antiretrovirals and anti-tuberculosis medications. Five deaths were recorded, representing 0.91%, a figure that is very low compared to the 68.7% mortality rate reported by **Soumare et al. (2019)** in Senegal. This mortality among tuberculosis patients infected with HIV may be linked to tuberculosis itself, opportunistic infections occurring in these patients, or other causes, raising issues of attribution regarding the exact cause of death. We also observed 10 relapses (1.82%), with 4 patients resuming treatment (0.73%), these cases being significantly associated with co-infection ($p = 0.024$), and 11 patients lost to follow-up, representing 2.00%, a statistically significant variation associated with co-infection ($p = 0.000$).

CONCLUSION

At the conclusion of this study, the objective was to assess the prevalence, sociodemographic and clinical characteristics, as well as the treatment outcomes of HIV-tuberculosis co-infection among patients followed at the CDT of the Regional Hospital of Ngaoundéré. The findings revealed that the prevalence of HIV infection among these tuberculosis

patients remains high in our setting (18.91%), despite efforts made to combat this co-infection. In addition to strengthening preventive actions such as screening, diagnosis, treatment, and follow-up, it is also crucial to address socio-economic factors and genetic determinants associated with this co-infection.

Limitations of the Study: In terms of limitations, this study was confined to a single tuberculosis treatment center, which may limit the generalizability of the results. The quality of available data, which largely depends on medical records, may have influenced the findings. Finally, the lack of data on certain socio-economic or genetic factors may have restricted the depth of the analysis of the determinants of co-infection

Competing Interests

The authors declare that they have no competing interests.

Ethical considerations

This study was conducted in accordance with ethical principles, including the confidentiality and anonymity of patient data. Prior authorization for the research was obtained from the Regional Health Delegation of Adamawa and from the Director of the Regional Hospital of Ngaoundere (RHN).

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