

Research Article

EPIDEMIOLOGICAL AND CLINICAL PROFILE OF HIV/TB CO-INFECTED PATIENTS IN TWO DEPARTMENTS OF THE NGOUNIÉ PROVINCE IN SOUTHERN GABON

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ABSTRACT

Background: The onset of the HIV-AIDS pandemic has contributed to the rapid progression of latent tuberculosis to active multidrug-resistant tuberculosis in infected individuals. However, to our knowledge, there are no published reports on TB-HIV co-infection in the provinces of Gabon. It is in this context that this study aimed to investigate the epidemiological and clinical profile of HIV/TB co-infected patients in two departments of the Ngounié province in southern Gabon.

Material and methods: In order to establish this profile, two diagnostic methods, namely microscopic examination and GeneXpert MTB/RIF, were performed on two sputum samples from each patient suspected of having tuberculosis (TB). **Results:** One thousand one hundred and thirty-two (1132) patients were included in this study. With a sex ratio of 1.23, there was a male predominance with 624 or 55.12% of males and 508 or 44.88% of females suspected of having TB. 268 or 23.67% of patients were diagnosed as TB positive (HIV-/TB+), 73 or 6.4% were HIV+/TB+ co-infected, and 52 or 4.6% of TB positive patients had an unknown HIV status. HIV positive status had a prevalence of 25.2% or 286 patients. During 2018 and 2019, while females were more infected with HIV 15.55% (n=176) compared to males 9.72% (n=110), TB affected more males 56.7% (n=115) than females 43.3% (n=88). Co-infection affected more men with 47 patients or 64.38% than women with 26 or 35.62%. We observed a change in the prevalence of HIV to 163 cases, i.e. 57%, leading to an increase in the prevalence of HIV+/TB+ co-infection to 48 cases, i.e. 51.7%. The Douya-Onoye department recorded 72.6% (n=53) of co-infected patients compared to 27.4% (n=20) in the Tsamba-Magotsi department. All the co-infected patients had pulmonary tuberculosis, i.e. 100% (n=73), and in the mono-infected patients, pulmonary tuberculosis was found in 95.52% (n=256) of the cases, compared to 3.8% (n=12) of the patients with extra pulmonary tuberculosis. 341 patients, of which 78.6% (n=268) were mono-infected and 21.40% (n=73) co-infected, took antituberculosis treatment. Among the mono-infected, the therapeutic success was 21.64% (n=58), the number of lost to follow-up was 60.08% (n=161) and the number of deaths was 1.12% (n=3) while among the co-infected, the therapeutic success was 5.48% (n=4), the number of lost to follow-up was 78.08% (n=57) and the number of deaths was 6.85% (n=5). By locality, mortality was estimated at 62.5% (n=5) in co-infected patients versus 37.5% (n=3) in mono-infected patients. In the Douya-Onoye department, of which Mouila is the capital, tuberculosis caused 75% (n=6) of deaths and 25% (n=2) in the Tsamba-Magotsi department, of which Fougamou is the capital. **Conclusion:** The results of this study show that HIV/TB co-infection is a major public health problem in the Ngounié province in particular and in Gabon in general.

Keywords: HIV, Tuberculosis, Co-infection, Ngounié, Douya - Onoye, Tsamba -Magotsi.

INTRODUCTION

Since 1993, the World Health Organization (WHO) has declared tuberculosis (TB) as a global emergency because, this disease is among the top ten causes of death in the world (Singh et al., 2018). Despite being cited as a very old disease, it is nowadays a major public health problem (Lima et al., 1997, Knechel, 2009). Halting the TB epidemic by 2035 is part of the World Health Organization's Sustainable Development Goals (Mabhula and Singh, 2019). However, factors such as immigration, poverty, and HIV infection are impeding the total eradication of this infection (Lima et al., 1997). In addition to this list, there is the development of strains resistant to anti-tuberculosis drugs and the lack of quality equipment for the early diagnosis of tuberculosis (Singh et al., 2018). Therefore, its high presence in resource-limited countries is noted (Neves et al., 2010).

In Africa, the estimated death rate of 81 per 100,000 population is the highest in the world (Dagnra et al., 2011). As if the negative impact of TB was not enough, its association with HIV (HIV/TB co-infection) is a formidable duo as HIV significantly increases the risk of progression to active TB [7] and the mortality, morbidity, and transmissibility associated with this disease, thus compromising the control of this burden. TB is the most common opportunistic infection and the leading cause of death among people living with HIV (PLHIV) in many low-income countries [8]. Gabon, a developing country, is very concerned by tuberculosis. The number of cases of this disease has been on the rise for several years. According to the World Health Organization the incidence of tuberculosis has increased from 485 cases per 100,000 inhabitants in 2016 to 525 cases per 100,000 inhabitants in 2018 [9] However, no or very few studies in this country and particularly in the provinces, concern the Co-infection by the HIV/TB association. It is with this in mind that this study was undertaken to provide a set of data characteristic of patients Co-infected by the HIV/TB duo in two departments of the province of

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Ngounié in southern Gabon, in order to provide strategies and effective means of control of this Co-infection.

MATERIAL AND METHODS

Material

Study site

The study took place in the province of Ngounié, the fourth largest province in Gabon. It covers an area of 37,750 km² and had 100,838 inhabitants in 2013. Its capital is Mouila. This province is subdivided into 9 departments whose heads are between brackets: Boumi - Louetsi (Mbigou), Dola (Ndendé), Douya-Onoye (Mouila), Louetsi-Bibaka (Malinga), Louetsi- Wano (Lebamba), Mougoula (Guiétsou), Ndolou (Mandji), Ogoulou (Mimongo), Tsamba - Magotsi (Fougamou). Located in the south of Gabon, its relief is characterized by large forest plains that separate the crystalline Chaillu massif from the Ikoundou Mountains. Steep mountains, plains, thick forests, savannahs, rivers and lakes, cliffs, deep caves and vast agricultural areas shape a landscape dotted with hamlets and villages. Estimated at 101,415 inhabitants, the population of Ngounié has been ethnically diverse for several centuries. It is composed of Eshira, Apindji, Punu, Mitsogo, Nzebi, Massango, and Eviya, who have arrived in successive waves of migration and have been living together for several centuries. All the ethnic groups of Ngounié belong to the Bantu group.

Type and period of study

This retrospective, descriptive, prospective and analytical study was carried out on the one hand from consultation registers and on the other hand, with patients diagnosed with tuberculosis from the Mouila regional hospital center, and the Great Endemic of Mouila, taken care of in these different centers of diagnosis and treatment of tuberculosis of the province during the period from January 2018 to October 2019. The Mouila Ambulatory Treatment Center (CTA-MLA) being the only structure that takes care of people living with HIV (PLHIV) in the entire province of Ngounié, it served as a base for us to obtain the results of the "Determine" rapid HIV test, as well as the result of the ELISA HIV confirmation test. After chart reviews, we extracted demographic data on gender, age range, and place of residence. We also collected clinical, pathological and therapeutic data of the patients.

Study population

One thousand one hundred and thirty-two 1132 patients from two departments of the province of Ngounié the department of Douya - Onoye of which Mouila is the capital and the department of Tsamba - Magotsi of which Fougamou is the capital, were enrolled in this study. The only inclusion criterion was the search for acid-fast bacilli (AFB) and patients who arrived for a control of acid-fast bacilli (AFB) were excluded.

METHODS

Diagnosis Of Tuberculosis

Microscopic examination

It was performed from two sputum samples of each patient suspected of having tuberculosis (TB), which he provided on the first day of the consultation as well as on the following day, as recommended by the WHO. The Ziehl-Neelsen staining of a sputum smear was performed using fuchsin to stain the bacilli pink, acid-alcohol to decolorize, and

methylene blue to counter stain. Indeed, after spreading the sputum on a slide and fixation in an oven/incubator at 40°C for about 5 min, the smear was stained with fuchsin for about 5 min. Then the slide was decolorized with acid-alcohol for about 20 seconds. Finally, the slides were re-stained with methylene blue and waited for about 5 to 10 min. Each step was preceded by a wash with drinking water. The dried slides were then scanned under a light microscope at X100 objective with immersion oil from which pink bacilli could be observed on a blue background. The patient was considered bacilloscopy positive if at least one of the two sputum samples was positive.

GeneXpert MTB/RIF

Sample preparation for the Xpert test was performed in several steps. The first step was to carefully open the lid of the sputum container, then using a Pasteur pipette, 2 volumes of sample reagent (to reduce bacillus viability) were poured directly into 1 volume of sputum in the sputum container. With the lid tightly closed, the mixture was shaken vigorously 10-20 times, agitating the container. After incubation at room temperature for 10 minutes, the sample was again vigorously shaken 10-20 times. After more than 5 minutes of incubation, the sample should be perfectly fluid before testing, with no visible sputum aggregates. As long as the sample was still viscous, one should wait another 5-10 minutes before inoculating into the cartridge (2-4 ml of the final volume).

Ethical considerations

The data collected did not include patient identity or personal information. They were processed anonymously for all patients after obtaining their consent.

Data collection and analysis

As it had been done in other works, the data were encoded and analyzed using Epi Info® 3.5.1 and Excel 2007 software. Statistically we used the mean, standard deviation, uncorrected Chi-square test of Pearson with a significance level at 95% and a p-value [11].

RESULTS

Prevalence and distribution of HIV and TB infections according to the study population

One thousand one hundred and thirty two (1132) patients were included in this study. With a sex ratio of 1.23, we noted a male predominance with 624 or 55.12% of males, over 508 or 44.88% of females all suspected of having tuberculosis. 268 patients or 23.67% were diagnosed positive for tuberculosis (HIV-/TB+), 73 patients or 6.4% were HIV+/TB+ co-infected and 52 or 4.6% of tuberculosis-positive patients had an unknown HIV status HIV positive status had a prevalence of 25.2% or 286 patients (Table 1).

Table 1: Prevalence and distribution of HIV and tuberculosis (TB) infections by sex and age groups

	VIH+	VIH+/TB+	VIH-/TB+	VIHinc/TB+
	(n=286)	(n=73)	(n=268)	(n=52)
Sex	Number (%)	Number (%)	Number (%)	Numberf (%)
Male	110 (9.71)	41(3.62)	139 (12,28)	34 (3)
Female	176 (15.54)	32 (2.82)	129 (11.65)	18 (1.59)
Age groups (years)				

[0-19]	8 (2.79)	2 (2.74)	24 (8.95)	6 (11.53)
[20-29]	29 (10.13)	3 (4.11)	86 (32.10)	12 (23.07)
[30-39]	59 (20.63)	25 (34.24)	51 (19.03)	16 (30.76)
[40-49]	84 (29.39)	17 (23.29)	43 (16.04)	6 (11.53)
[50-59]	67 (23.42)	16 (21.92)	35 (13.06)	7 (13.5)
[60-69]	26 (9.1)	5 (6.85)	18 (6.72)	3 (5.77)
≥ 70	13 (4.54)	5(6.85)	11 (4.10)	2 (3.84)
Sex ratios	0.62	1.28	1.07	1.9
Age2± SD	44.4 ± 3.1	46.6 ± 13.5	37.1 ± 15.9	36.6 ± 16.6

Distribution of tuberculosis and HIV patients by year according to gender

While women were more infected with HIV with 73 cases or 59.4% against 50 cases or 40.6% for men in 2018 and 103 cases or 63.2% for women against 60 cases or 36.8% for men in 2019, tuberculosis affected more men 152 or 56.7% than women 116 or 43.3% in both years (Table 2).

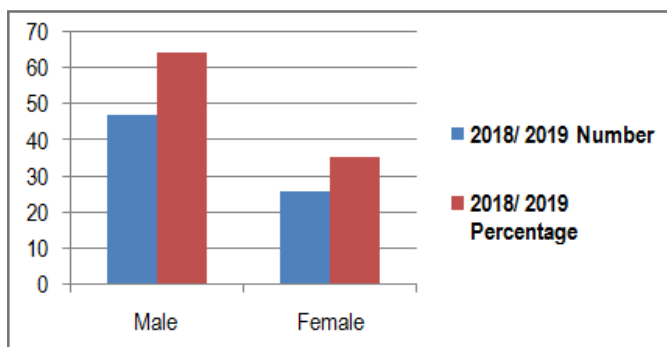
Table 2: Prevalence and distribution of HIV and tuberculosis (TB) infections by gender by year.

	HIV			Tuberculosis		
	Numb er (%) 2018	Numb er (%) 2019	Total (%)	Numb er (%) 2018	Number(%) 2019	Total %
Male	50 (40.6)	60 (36.8)	110(38.47)	70 (53.84)	82 (59.42)	152(56.7)
Femal e	73 (59.4)	103 (63.2)	176(61.53)	60 (46.16)	56 (40.58)	116(43.3)
Total (%)	123 (43)	163 (57.0)	286(100)	130 (48.5)	138 (51.5)	268 (100)
	p=0.24			p=0.2		

Distribution of co-infected patients by year and gender

During the years 2018 and 2019, Co-infection affected more males with 47 patients or 64.38% respectively than females with 26 or 35.62%, Figure 1.

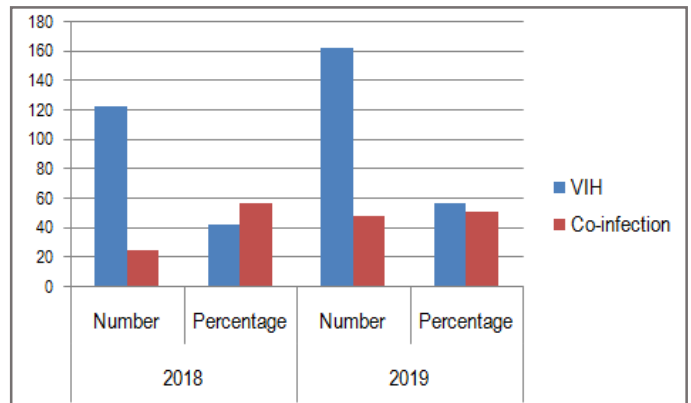
Figure 1: Co-infected patients in 2018 and 2019, by gender.



Evolution of HIV+/TB+ Co-infection according to HIV

In 2018, the HIV seroprevalence was 123 cases or 43% while that of HIV+/TB+ Co-infection was 25 cases or 48.3%. In 2019, there was a change in HIV prevalence to 163 cases or 57%, resulting in an increase in HIV+/TB+ co-infection to 48 cases or 51.7% Figure 2.

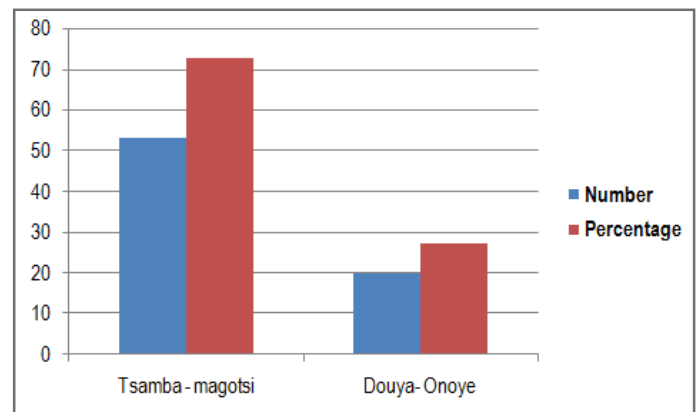
Figure 2: Evolution of HIV+/TB+ co-infection according to HIV (p=0.07).



Distribution of HIV/TB co-infection by locality

The Douya-Onoye department, of which Mouila is the capital, recorded 72.6% (n=53) of co-infected patients, compared to 27.4% (n=20) in the Tsamba-Magotsi department, of which Fougamou is the capital (Figure 3).

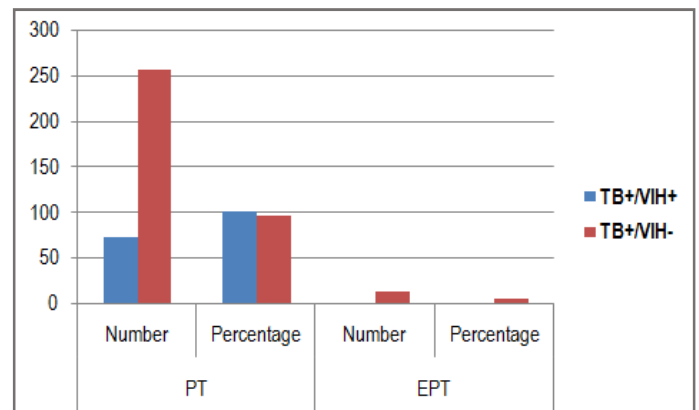
Figure 3: Distribution of co-infected patients according to locality



Forms of tuberculosis encountered in the patients of our study

All co-infected patients had 100% pulmonary tuberculosis (PT) n=73. In mono-infected patients, pulmonary tuberculosis was found in 95.52% (n=256) of cases, compared to 3.8% (n=12) of patients with extra pulmonary tuberculosis (EPT) (figure 4).

Figure 4: Different forms of tuberculosis encountered in this study (Figure 4)



Treatment of tuberculosis

Treatment of tuberculosis involved 341 patients of whom 78.6% (n=268) were mono-infected and 21.40% (n=73) co-infected. In the mono-infected patients, the therapeutic success was 21.64% (n=58),

the number of patients lost to follow-up was 60.08% (n=161) and the number of deaths was 1.12% (n=3), whereas in the co-infected patients, the therapeutic success was 5.48% (n=4), the number of patients lost to follow-up was 78.08% (n=57) and the number of deaths was 6.85% (n=5) (Table 5)

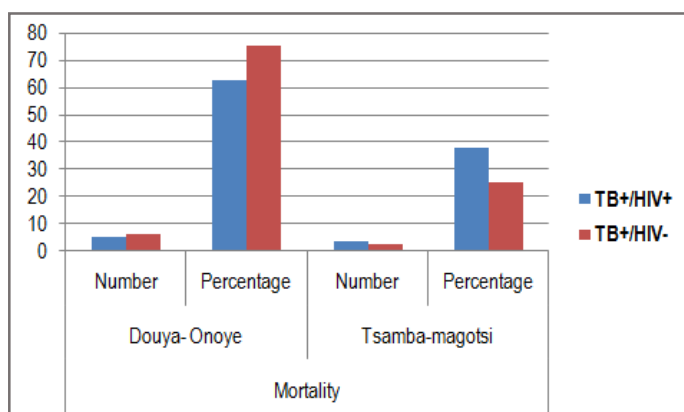
Table 5: Therapeutic outcomes of patients with tuberculosis

	HIV-/TB+		HIV+/TB+	
	(n=268)	%	(n=73)	%
Reported cured	58	21,64	4	5,48
Ongoing treatment	28	10,45	5	6,85
Discontinued treatment	18	6,71	2	2,74
Lost to follow-up	161	60,08	57	78,08
Deaths	3	1,12	5	6,85
Total	268	100	73	100

Tuberculosis mortality according to HIV serology in each locality

62.5% (n=5) of co-infected patients died compared to 37.5% (n=3) of mono-infected patients. In the Douya-Onoye department, of which Mouila is the capital, tuberculosis caused 75% (n=6) of deaths and in the Tsamba-Magotsi department, of which Fougamou is the capital, tuberculosis caused 25% (n=2). Figure 5.

Figure 5: Tuberculosis mortality by HIV status in each locality



DISCUSSION

The aim of this study was to describe the epidemiological and clinical profile of HIV/TB co-infected patients in two departments of the Ngounié province, in southern Gabon. Contrary to the results of some studies [12, 13] which showed that HIV prevalence was higher in men than in women, our results are superimposed on those of [14] indicating that, despite a predominance of men in our study sample, 559 men against 464 women, HIV prevalence was higher in the latter with 61.53% (n=176) than in men with 38.47% (n=110). This difference was not significant ($p=0.24$), as HIV seroprevalence in our patients was 25.2% (n=286) and involved all age groups. With 84 patients, i.e. 29.39%, the 40-49 age group was the most affected. Moreover, the consultation of the files of the seropositive patients showed that the only risk factors that were requested concerned exposure to one or more partners and protected or unprotected sexual intercourse, oriented more towards women than men. The difference between the results of their work [12, 13] and ours in terms of HIV seroprevalence may be due to the fact that their studies enrolled a sample that was 10 and 20 times larger than that of our study. Tuberculosis affected more men (n=152) or 56.7% than

women (n=43.3%). With a sex ratio of M/F=1.31 and $p=0.2$. These results are close to those of the work of [11, 14, 15] who also indicated that the frequency of tuberculosis was higher in men than in women. This could be explained by the fact that men are more exposed to certain risk factors such as alcoholism and smoking, and difficult working conditions outside the home sometimes in a context of widespread poverty. Women, thanks to their domestic work which may be a protective factor, are less exposed to tuberculosis [16]. Among the 341 TB patients, 29.3% (n=73) were HIV positive. This prevalence was higher in men 56.8% (n=25) than in women 43.2% (n=19) and the age group 30-39 years with 34.1% (n=15) was the most affected. This difference could be explained by the high frequency of 5.3% (n=52) of tuberculosis patients with unknown serostatus, which could tip the prevalence in both men and women. However, in an internal document entitled "Integration of HIV & TB care in MSF projects", Doctors Without Borders states that early diagnosis of HIV, treatment and monitoring are effective in combating HIV+/TB+ co-infection [17]. These results are similar to those obtained in Brazil which showed a predominance of men in co-infection [18]. This study noted an increase in HIV seroprevalence 42.9% (n=91) in 2018 versus 57.1% (n=121) in 2019. This increase went hand in hand with the increase in TB incidence among HIV+ 34.1% (n=15) in 2018 versus 65.9% (n=29) in 2019 showing the impact of HIV infection on the increase of TB. Patients from the locality of Douya - Onoye department had a predominance in Co-infection 72.7% (n=32) compared to those from Tsamba - Magotsi department who were recorded 27.3% or 12 patients. The difference observed can be explained by the fact that the study took place in Mouila, the capital of the Douya-Onoye department, which had a higher concentration of patients than those from the Tsamba-Magotsi department. Pulmonary tuberculosis was the only form of tuberculosis encountered in this study among the co-infected. Regarding the therapeutic outcome, the results obtained are far from meeting the expectations of the WHO, which in a report of June 30, 2021, aims at curing 85% of patients suffering from tuberculosis in low-income countries [19]. Of the 73 co-infected patients, we noted a high frequency of loss of sight 79.5% (n=35) against 4.6% (n=2) of cured patients. This confirms the statement of the Director of the National Tuberculosis Control Program in Gabon (PNLT) who, during a workshop on tuberculosis, mentioned that 40% of tuberculosis patients lost to follow-up escape detection and continue to spread the disease in the country [20]. A higher cure rate of 21.7% (n=23) and a lower frequency of lost to follow-up of 60.4% (n=64) compared to co-infected patients were found in mono-infected patients. The drug interaction between antiretroviral and anti-tuberculosis drugs results in biological toxicity if the choice of combination therapy is not well done [21]. HIV infection has an impact on the treatment of co-infected patients, which could explain the high frequency of loss to follow-up in co-infected patients compared to mono-infected patients, which also leads to a lower cure rate. The overall mortality rate for tuberculosis was 2.7% and is for 2018 only. However, in 2019, the study did not record any deaths. Since the study did not cover the entire year 2019, the lack of mortality cases can be explained in a concrete way during this year. To assess mortality among co infected patients, the study used Mono-infected patients as the control population. Although the prevalence of Mono-infected 23.67% (n=268) was higher than that of Co-infected 4.3% (n=73), the mortality rate of Co-infected patients was higher 62.5% (n=5) compared to Mono-infected 37.5% (n=3) of Mono-infected patients showing the impact of tuberculosis mortality in HIV+ compared to HIV-. These results are superimposed on those obtained by some studies which have shown that TB mortality was higher in co-infected patients than in mono-infected patients [22]. Due to the lack of traceability of the registers that were made available to us for the realization of this work, the present study did not record any resistance to antituberculosis drugs. However, patients with

pulmonary tuberculosis do not necessarily reflect the prevalence of HIV in the entire Ngounié province in southern Gabon. Therefore, a study is needed to determine the prevalence in the provincial population. In addition, this study did not include data from all health facilities in the province. Therefore, our results may not be generalizable to all patients with pulmonary TB in the province. Some limitations of the study were also marked by a partial retrospective analysis of the data. The absence or poor quality of some data in the 2019 registries did not facilitate the design of a uniform database.

CONCLUSION

HIV/TB co-infection is a major public health problem. In this epidemiological study, the acquired immunodeficiency virus (HIV) was identified as the infection that allows the incidence of tuberculosis to be revised upwards. Thus, in areas with high HIV prevalence, a high incidence of TB is to be expected. In addition, TB causes more deaths in HIV-positive people than in HIV-negative people. To fight HIV/TB co-infection effectively, it is necessary to put in place appropriate facilities for early diagnosis of HIV and TB for joint control. To do this, it would be necessary to set up prevalence studies of this co-infection in order to design intervention strategies aimed at limiting the spread of HIV among the populations of the Ngounié province in southern Gabon.

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Interests

The authors declare that they have no interests.

Authors' contribution

The data reported in the study were available to the authors and they contributed equally to the preparation and writing of this manuscript.

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