Acta Scientific Microbiology (ISSN: 2581-3226)

Volume 7 Issue 7 July 2024

Research Article

Genexpert MTB/RIF Contribution to the Diagnosis of Pulmonary Tuberculosis in People Living with HIV at the Siguiri Prefectural Hospital (Republic of Guinea)

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DOI: 10.31080/ASMI.2024.07.1395

Received: April 05, 2024

Published: June 25, 2024

Abstract

Introduction: Tuberculosis (TB) is an infectious disease transmitted from person to person and caused by the bacillus Koch (BK). It is a major public health problem throughout the world, despite the numerous tuberculosis control strategies (TCS).

Objective: To evaluate the value of Genexpert MTB/RIF in the diagnosis of pulmonary tuberculosis in PLHIV at Siguiri prefectural hospital, with a view to improving patient care.

Method: This is a prospective, descriptive, cross-sectional study lasting six months, from 15 February to 15 August 2023.

Results: Biological diagnosis of 200 patients revealed 85 Genexpert-positive patients, i.e. a prevalence of 42.5%, compared with 79 fluorescence microscopy-positive patients, i.e. 39.5%. The variation in viral load in the 85 patients tested positive for HIV-TB co-infection was significant in HIV-TB co-infected patients with a mean of (59277copies/ml). Immunosuppression was advanced overall, with the majority of patients in our study having an LTCD4+ level of less than 200 cells/µl. The mean LTCD4+ level was 124.52 cells/µl, with extremes ranging from 5 to 349 cells/µl. Patients with a mean LTCD4+ level ≥ 200 cells/µl accounted for 72% of cases. Married patients were the most represented at 62%, the majority being blue-collar workers (42%), followed by housewives (19%). The 31-40 age group was the most affected, with a prevalence of 31%. The Siguiri Koura 1 and 2 neighbourhoods were the most affected by HIV-MTB co-infection, with 26% and 21% respectively.

Conclusion: The present study proves that the Genexpert MTB/RIF method is the best method for diagnosing pulmonary tuberculosis compared with Microscopy (Fluorescence and Ordinary) and plays a major role in predicting multi-drug resistance, particularly to Rifampicin, in Mycobacterium tuberculosis. Its systematic use in conjunction with.

Keywords: HIV; Tuberculosis; Microscopy; PCR GeneXpert MTB/RIF; Siguiri

Introduction

Tuberculosis (TB) is a human-to-human transmission infectious disease caused by the bacillus Koch (BK). It is a major public health problem throughout the world, despite the many strategies employed in the fight against tuberculosis (TB) [1]. It is one of the most widespread human infectious diseases in the world, and the most serious mainly in developing countries. Due to widespread poverty, inequality and conflict, sub-optimal health services in many countries and the impact of the HIV/AIDS pandemic, there are more cases of TB today than at any time in human history. Almost 95% of cases and 98% of deaths due to tuberculosis occur in tropical countries [2]. Tuberculosis is the most common life-threatening opportunistic infection and one of the leading causes of death in people living with HIV. HIV-positive people with latent TB infection have a 10% annual risk and a 50% lifetime risk of developing active TB [3]. Similarly, around 79% of HIV-positive clients have been screened for TB, 11% of whom were found to have active TB. The World Health Organisation (WHO) recently introduced the algorithm for intensifying tuberculosis case-finding in PLHIV [4-6]. The WHO recommends intensified TB case-finding in all human immunodeficiency virus (HIV) testing and counselling services for HIV-positive clients using a simple set of questions for early identification of suspected TB cases [7-9]. Diagnosis of tuberculosis is difficult in HIV-positive people, particularly when the disease is at an advanced stage. Standard diagnostic approaches and clinical algorithms should be followed to guide the diagnosis of TB in PLHIV. Sputum smear microscopy with rapid bacilli (AFB) has been used for decades to diagnose TB, and its sensitivity varies between 30 and 70%. In people co-infected with HIV, it varies between 20 and 50% [10-12]. The development of GeneXpert represents a paradigm shift in the diagnosis of tuberculosis and drug resistance. It simplifies molecular testing by fully integrating and automating the three processes required for real-time PCR-based molecular testing (i.e. sample preparation, amplification and detection) and detects both live and dead bacteria [10]. GeneXpert detects *M. tuberculosis* and its rifampin resistance mutations using three specific primers and five unique molecular probes to ensure a high level of specificity [11]. The test provides results directly from sputum in less than 2 hours [10,11]. The sensitivity of the GeneXpert test is much better than that of smear microscopy and comparable to that of solid culture. Previous studies have shown that the sensitivity and specificity of the GeneXpert test were 72-77% and 99% respectively in smear-negative adults and 98-99% and 99-100% in smear-positive adults. The negative predictive value (NPV) was 90.6% and the positive predictive value (PPV) 100%. The detection limit is 5 genomic copies of purified DNA per reaction or 131 colony-forming units/ml in *M. tuberculosis-enriched* sputum, whereas microscopic identification of tubercle bacilli requires at least 10,000 bacilli per ml of sputum [10-17]. Since 2020, the Republic of Guinea, like other countries, has been using Genexpert as its first line of defence. The medical biology laboratory at Siguiri prefectural hospital carries out all Genexpert MTB/RIF tests from screening and treatment centres (CDT), health centres and various private clinics in the prefecture, as part of the diagnosis of tuberculosis in people living with HIV (PLHIV) [18]. The current policy of the National Tuberculosis Control Programme (PNLAT) is to extend the use of Genexpert as a first-line test nationwide. However, in Guinea, there is little data on the contribution of Genexpert compared with conventional methods (light microscopy and fluorescence microscopy). The aim of this study is to evaluate the value of Genexpert MTB/RIF in the diagnosis of pulmonary tuberculosis in PLHIV at Siguiri prefectural hospital, with a view to improving their health care.

Materials and Working Methods

Our study was carried out in the mining prefecture of Siguiri. The medical biology laboratory at Siguiri prefectural hospital, the microbiology laboratory at Gamal Abdel Nasser University in Conakry, the medical biology laboratory at Mahatma Gandhi University in Conakry and the Faculty of Health Sciences and Techniques at Gamal Abdel Nasser University in Conakry were used for the study. The bio-material consisted of sputum and gastric tube products from HIV patients. This was a prospective, descriptive, cross-sectional study lasting six months, from 15 February to 15 August 2023. Our study population consisted of all HIV-positive patients of both sexes and all ages seen in consultation at Siguiri prefectural hospital during the study period. Sampling was simple random and the sample size (N=200) was calculated according to the Schwartz formula using the national prevalence of tuberculosis. All HIV-positive patients seen at the laboratory were included in our study, provided with an examination note mentioning Genexpert and Microscopy with patient information.

Biological variables

- Sputum,
- Gastric tube products
- Viral load
- -CD4 count

Epidemiological variables

- Age,
- Sex,
- Occupation,
- Residence.

Data collection method

- Pre-prepared survey forms
- Examination booklets and bulletins
- Laboratory records

Clinical diagnosis: The diagnosis is based on the following functional signs

- Persistent cough without improvement (>14 days)
- Night-time fever
- Altered general condition with a break in the growth curve (weight/height), reduced appetite, weight loss, etc.

Gastric tubing is performed on an empty stomach on rising in hospital. It is most commonly used in children and the elderly.

Collection of samples

A sample of 2 specimens should be taken within 2 days from any patient with symptoms of pulmonary tuberculosis.

Diagnostic methods

The Genexpert MTB/RIF and the staining techniques chosen by the NTP for microscopy to detect tuberculosis bacilli (Acid-Alcolo-Resistant Bacilli «AARB») are the Ziehl-Neelsen hot stain and the auramine stain (for fluorescence microscopy). CD4 count and viral load were determined using the BD FACS Presto Near-patient CD4 counter which is an automated system, designed for *in vitro* diagnostic use, for the direct measurement of absolute CD4 count, percentage of CD4 among lymphocytes, as well as haemoglobin concentration in human whole blood.

Ethical considerations

Before carrying out the study, we obtained the agreement and consent of the patients, confidentiality was respected throughout the data collection procedure and the results were used strictly for therapeutic and scientific purposes. Our study complied with the Declaration of Helsinki on Ethical Principles for Medical Research Involving Human Subjects of 1975, amended in 2008.

Computer analysis of data

The data were collected on pre-established survey forms, entered, processed and analysed using Epi-info version 7.0, the 2013 Office pack, Word and Excel.

Limitations and difficulties

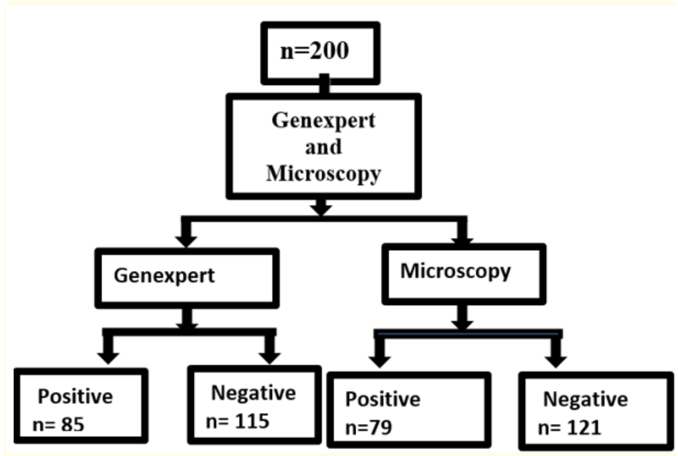
The relative smallness of the sample size and the breakage of the Genexpert MTB /RIF test cartridge were our limitations and difficulties.

Results

The application of the research methodology produced the following results in the form of figures, graphs and tables, which were interpreted, commented on and discussed on the basis of the available bibliographical data.

Variation in results according to the methods used to diagnose pulmonary tuberculosis in people living with HIV

In this figure, we can see that of the 200 HIV patients examined using the different methods for diagnosing pulmonary tuberculosis, 85 patients were BAAR positive using Genexpert, i.e. a prevalence of 42.5%, compared with 79 patients positive using fluorescence microscopy, i.e. 39.5%.



Graph 1: Flow of results according to methods used.

Table 1: Prevalence of tuberculosis among PLHIV in the laboratory according to PCR Genexpert.

N°	PCR Genexpert	Number	Percentage
1	Negative	115	57.5
2	Positive	85	42.5
Total		200	100

In this table, of the 200 HIV-positive patients examined by the Genexpert molecular PCR method, 85 HIV patients were diagnosed as positive for tuberculosis, representing a prevalence of 42.5%, compared with 115 negative cases, or 57.5%.

This high prevalence of tuberculosis among PLHIV could be explained by the neglect of preventive measures against the opportunistic germ *(Mycobacterium tuberculosis*) responsible for the disease.

Table 2: Prevalence of tuberculosis in PLHIV in the laboratory according to microscopy.

N°	Microscopy	Number	Percentage
1	Negative	121	60.5
2	Positive	79	39.5
Total		200	100

In this table, we see that of the 200 HIV-positive patients examined by microscopy, 85 were diagnosed as positive for tuberculosis, i.e. a prevalence of 39.5%, compared with 121 negative cases, i.e. 60.5%.

The high prevalence of tuberculosis in PLHIV by Genexpert PCR compared with microscopy could be explained by the higher sensitivity in the diagnosis of tuberculosis compared with microscopy, which was of the order of 1.07 in this study, corresponding to 6 patients who were negative by microscopy but positive by Genexpert PCR.

These results clearly show that Genexpert is the method of choice for a better diagnosis of pulmonary tuberculosis.

Sensitivity to Rifampicin Among the 85 HIV-positive and GeneXpert MTB/RIF-positive patients, 80 patients were sensitive to Rifampicin, i.e. 94.12%, compared with 5 patients with resistance, i.e. 5.88%. This resistance, which remains high in HIV/TB co-infected subjects, could be due to the bioresistance of *Mycobacterium tuberculosis* to Rifampicin in these patients as a result of poor medication and diet.

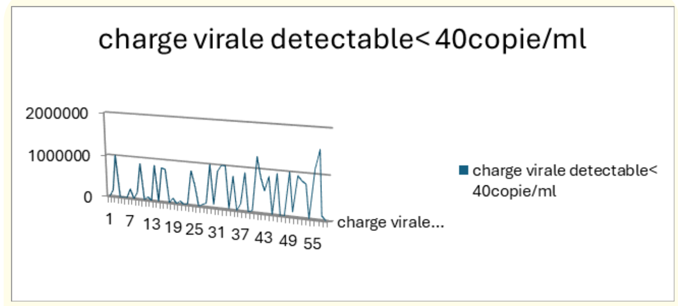


Figure 1: Determination of HIV/AIDS viral load and CD4 count in TB-HIV co-infected patients.

This figure shows the variation in viral load in the 85 patients tested positive for HIV-TB co-infection. All patients had a detectable viral load (CV≤40 copies/ml) with a mean of (59277copies/ml) compared with 30% of patients with an undetectable viral load.

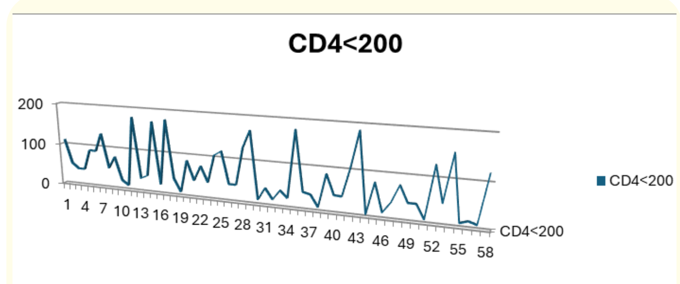


Figure 2: Distribution of HIV-TB co-infected patients according to LTCD4+ rate.

This figure shows that immunosuppression was advanced overall, with the majority of patients in our study having an LTCD4+ level of less than 200 cells/µl. The mean LTCD4+ level was 124.52 cells/µl, with extremes ranging from 5 to 349 cells/µl. Patients with a mean LTCD4+ level ≥ 200 cells/µl represented 72% of cases (n = 85).

This figure shows the relationship between CD4 count and viral load studied using correlation tests. These tests were applied after selecting TB-HIV co-infected patients. This method makes it possible to monitor patients undergoing antiretroviral treatment in order to assess the progress made with treatment. A comparison of the results shows that when the number of CD4 lymphocytes increases, the viral load gradually decreases and becomes undetec-

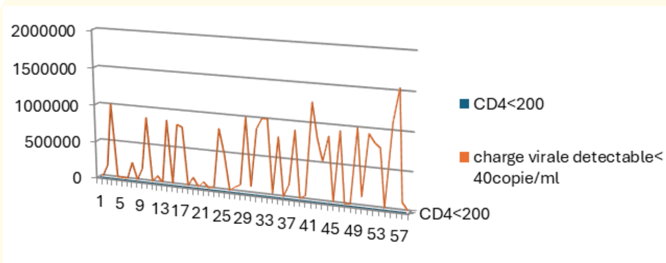


Figure 3: Variation in CD4 count and viral load in patients co-infected with TB-HIV.

table, and that when the number of CD4 lymphocytes decreases, the viral load increases and becomes detectable (therapeutic failure).

Table 3: Breakdown of PLHIV with pulmonary tuberculosis by sex.

N°	Sex	Number	Percentage
1	Male	36	42
2	Female	49	58
Total		85	100

In this table, we note that of the 85 patients living with HIV with pulmonary tuberculosis, the female sex is the most represented in this series with 49 cases, i.e. a prevalence of 58%, against 36 cases, i.e. 42% for the male sex.

This high prevalence among females is uncertain, as it may be due to their exposure to the disease as a result of their living conditions.

Our results are different from those reported by Traoré B.Y., in 2015, at Point "G" hospital in Bamako, Mali, who found 54% in males compared to 46% in females.

Table 4: Distribution of PLHIV with pulmonary tuberculosis by marital status.

N°	Situation matrimoniale	Number	Percentage
1	Single	24	28
2	Married	53	62
3	Widowed	8	10
Total		85	100

In this table, we see that of the 85 patients living with HIV, married people are the most affected by pulmonary tuberculosis, with 53 cases, i.e. a prevalence of 62%, compared with 24 cases among single people, i.e. 28%, and 8 cases among widowers, i.e. 10%.

This can be explained by the multiplicity of sexual partners, the lack of information on how the disease is transmitted and, above all, the absence of tests for early diagnosis of the disease.

Table 5: Breakdown of PLHIV with pulmonary tuberculosis by age group.

N°	Age group	Number	Percentage
1	≤20 years	22	26
2	21 – 30 years old	24	28
3	31- 40 years old	26	31
4	41 years and over	13	15
Total		85	100

In this table, we see that of the 85 patients living with HIV, all age groups are affected by pulmonary tuberculosis. The age group with the highest prevalence of pulmonary tuberculosis was 31-40 years, with 26 cases, i.e. a prevalence of 31%, followed by 21-30 years, with 24 cases, i.e. 28%, and ≤20 years, with 22 cases, i.e. 26%. The least represented age group was 41 and over, with 13 cases (15%).

The high prevalence in these age groups could be explained by the fact that these people live in precarious conditions (exposed to all diseases).

Table 6: Breakdown of PLHIV with pulmonary tuberculosis by socio-professional category.

N°	Socio-professional category	Number	Percentage
1	Housewives	16	19
2	Commercial agents	9	10
3	Pupils/students	4	5
5	Administrative staff	11	13
6	Workers	36	42
7	Health workers	4	5
8	Farmers	5	6
Total		85	100

In this table, we see that of the 85 patients living with HIV, all socio-professional categories are affected by pulmonary tuberculosis, with a high prevalence among manual workers with 36 cases, i.e. 42%, followed by housewives with 16 cases, i.e. 19%, administrative workers with 11 cases, i.e. 13% and commercial workers with 9 cases, i.e. 10%. Health workers, pupils/students and farmers are the least affected, with 5%, 5% and 6% respectively.

The high prevalence among workers could be explained by a lack of knowledge about how tuberculosis is transmitted, due to their sometimes precarious living and working conditions.

Table 7: Breakdown of PLHIV with pulmonary tuberculosis by place of residence.

N⁰	Residence	Number	Percentage
1	Dankakoro	7	8
2	Siguiri koura 1	22	26
3	Siguiri koura 2	18	21
4	Bolibana 1	2	2
5	Bolibana 2	4	5
6	Saint Alexis	11	13
7	Doko	10	12
8	Kouroudakoro	11	13
Total		85	100

In this table, we see that of the 85 patients living with HIV, patients from the Siguiri Koura 1 and 2 neighbourhoods are the most affected by pulmonary tuberculosis, with 26% and 21% respectively, followed by those from Saints Alexis and Kouroudakoro (13% each), Doko (12%) and Dankakoro (8%). The localities of Bolibana 1 and 2 are the least affected by HIV-MBT co-infection, with 2% and 5% respectively.

The high prevalence of pulmonary tuberculosis among HIV-positive patients in Siguiri Koura 1 and 2 may be due to their high representation in our sample, and they are the most densely populated neighbourhoods in Siguiri.

Discussion

Our study is based essentially on the role of Genexpert in the notification of pulmonary tuberculosis cases as part of the WHO programme to intensify tuberculosis research in people living with HIV. GeneXpert is a relatively new diagnostic modality in the fight against TB, a global public health problem, and is thought to improve bacteriology-confirmed TB cases in shorter timeframes, as shown in previous studies by Maynard-smith., *et al*. in 2019 and Rasool., *et al*. in 2019 [2,5]. In our study, the detection rate of Mycobacterium tuberculosis by the GeneXpert PCR method was compared with that of microscopic examination (fluorescence microscope) by smear and revealed that the detection rate by the first method was slightly higher than that of the second, i.e. 85 cases (57.5%) and 79 cases (39.5%) respectively for 200 HIV-positive patients (Tables 1 and 2). In a study carried out by Camara TD., *et al*. in 2022 at the Ignace Deen University Hospital in Conakry, out of 402 patients, Genexpert detected 112 positive cases, i.e. 28%, fluorescence microscopy 16% and Ziehl-Neelsen microscopy 14% [19].

The frequency found by Gounder A., *et al*. in 2014 in Fiji was relatively low at 18.7% in a sample of 415 patients [20]. This variation could be explained by the difference in methodology applied and above all by the risk factors associated with HIV infection. According to the WHO, of the 10 million new cases of tuberculosis worldwide, 8.2% were HIV-positive in 2019 [3]. In our series, the prevalence of HIV/TB co-infection was relatively higher than that of the WHO. This confirms the strong correlation between HIV/TB co-infection and HIV prevalence in a region.

In several previous studies, the authors agreed that all AFB smear-positive patients were also Genexpert-positive, meaning that it can replace conventional AFB smears in the clinical management of TB [10,13,14]. Genexpert detected an additional 31.6% of AFB smear-negative cases, which was consistent with the results of the Northwest Ethiopia study and other multicentre studies [2,5,8,14]. However, the study results reported by Habte., *et al*. indicated that the incremental detection of TB cases by GeneXpert among AFB smear-negative cases was 64.3% [21], which is lower than the results reported from the Cochrane review and the meta-analysis by Steingart., *et al*. as well as studies from other regions, which were in the range of 25%, which was lower than our results [6,7,10,15]. The difference may be related to the recruitment criteria for study participants, as our study used the revised protocol of the national/WHO screening tool for TB-HIV co-infection.

The sensitivities and specificities of the diagnostic methods used were 90% for Genexpert, 47% for fluorescence microscopy and 43% for ordinary microscopy in the study by Camara T.D., *et al*. in 2022 [19]. These results are higher than our study which was 39.5% for fluorescence microscopy but comparable to those reported by the Ministry of Health of the Federation of Ethiopia, in 2018ab of PPV and NPV which are revised WHO national screening tools in 2011 [7-9].

In the studies by Camara TD., *et al*. in 2022, positivity was significantly higher for the Genexpert MTB/RIF than for the Ziehl-Neelsen and auramine staining, particularly in HIV-positive individuals. Compared with the GeneXpert MTB/Rif test, the Ziehl-Neelsen test had a low sensitivity (42.86). However, compared with the Ziehl-Neelsen test, the sensitivity of the Genexpert MTB/Rif was not maximal (87.3%) and the specificity was 97.59% [19]. These results differ from those found in Rwanda by Jean Claude Semuto Ngabonziza., *et al*. who reported a sensitivity of 55.1 for the Ziehl-Neelsen and 77.6% for the Genexpert [24].

Compared with the Genexpert MTB/RIF test, fluorescence microscopy had a sensitivity of 47.32%, while fluorescence microscopy compared with Genxpert had a sensitivity of 89.8% and a specificity of 95.86% in the study by Camara TD., *et al*. in 2022 [19]. These results could be considered consistent with the results of recent disease reports, which have shown that Genexpert has a higher sensitivity for detecting TB cases in people living with HIV. Chakravorty., *et al*. (2017) reported a similar overall sensitivity of 88% for Genexpert MTB/Rif. However, this high sensitivity of Genexpert MTB/Rif led to a specificity of 95.86% [25]. The use of Genexpert MTB/Rif allowed early detection of rifampicin resistance in 7.14% of cases with rapid adaptation to multidrug-resistant therapy.

In studies by Camara TD., *et al*. in 2022, they performed a systematic review to summarise the accuracy of fluorescence microscopy compared to conventional microscopy. In the HIV-infected group, the sensitivity of LED microscopy was superior to that of Ziehl-Neelsen microscopy (85%). The contribution of fluorescence microscopy was 10 patients or 15.38% compared with Ziehl-Neelsen microscopy. This frequency appeared significantly higher than those found in other studies and far exceeds the WHO estimate of 10% [19]. Their results differ from those found by Ngabonziza., *et al*. who also demonstrated an overall sensitivity of 55% for ordinary microcopy and 37% for LED microscopy [24].

In our study, we found in HIV-TB co-infected patients that the variation in viral load in the 85 patients who tested positive for HIV-TB co-infection was significant. All patients had a detectable viral load (CV≤40 copies/ml) with a mean of (59277copies /ml) (Figure 1). Immunosuppression was advanced overall, with the majority of patients in our study having an LTCD4+ level of less than 200 cells/µl. The mean LTCD4+ level was 124.52 cells/µl, with extremes ranging from 5 to 349 cells/µl. Patients with a mean LTCD4+ level ≥ 200 cells/µl accounted for 72% of cases (n=85) (Figure 2).

In previous studies and in the context of the diagnosis of pulmonary tuberculosis in patients living with HIV, several authors had also measured viral load and CD4 count and concluded that HIV viral load above 1000copy/ml was significantly associated with the occurrence of tuberculosis. CD4 was not associated with the diagnosis of tuberculosis, implying that HIV viral load was a more reliable indicator of the degree of HIV/AIDS infection and opportunistic infections [26-28].

In our study, we found in HIV-TB co-infected patients that the relationship between CD4 count and viral load studied using correlation tests. These tests were applied after selection of TB-HIV co-infected patients. This method makes it possible to monitor patients undergoing antiretroviral treatment in order to assess the progress of the treatment. Comparison of the results shows that when the number of CD4 lymphocytes increases, the viral load gradually decreases and becomes undetectable, and that when the number of CD4 lymphocytes decreases, the viral load increases and becomes detectable (therapeutic failure) (Figure 3).

In our study, females predominated by 58%, with a female/male sex ratio of 1.36 and the difference being statistically significant (p = 0.03) (Table 3). HE Hassan., *et al*. in a study carried out in Morocco in 2021, reported a male sex ratio of 58.1% [21], which is comparable with the results of research carried out by Camara T.D., *et al*. in 2022, when the male sex ratio was 53% compared with 47% for females [19]. This is contrary to our results. The average age of our patients was 28 years, with extremes ranging from 10 to 60 years.

In our study, almost all socio-professional categories affected by HIV were affected by pulmonary tuberculosis, with a high prevalence among manual workers (42%), followed by housewives (19%), administrative workers (13%) and commercial workers (10%). Health workers, pupils/students and farmers were the least affected, with 5%, 5% and 6% respectively (table 6). For ABOU SAID in his doctoral thesis in medicine, the social stratum most represented was that of shopkeepers with a frequency of 31%, followed by manual workers with 22%, with a link between the predominance of the male sex and housewives with 15% [22]. In the studies by Camara T.D., *et al*. in 2022, almost all socio-professional categories were affected. Commercial agents were the most represented at 31%, followed by blue-collar workers at 22%, housewives at 15%, drivers at 10%, administrative staff at 9%, pupils/students at 7% and security guards at 6% [19].

In our study, HIV-positive married people were the most affected by pulmonary tuberculosis, with a prevalence of 62%, compared with 28% among single people and 10% among widowers (table 4).

In our study, all age groups of people living with HIV were affected by pulmonary tuberculosis. The age group with the highest prevalence of pulmonary tuberculosis was the 31-40 age group with 31%, followed by the 21-30 age group with 28%, and the ≤20 age group with 26%. The least represented age group was 41 and over with 15% (table 5). David Lupande., *et al*. in their study in Bukavu, Democratic Republic of Congo (DRC), reported that the 21-39 (57.3%) and 40-59 (23.2%) age groups were the most represented [23]. In the work by Camara TD., *et al*. in 2022, all age groups were equally affected by HIV-TB co-infection, but prevalence was highest in the 21-40 age group with 56%, followed by the 41-60 age group with 30%. The age groups least affected were the under-20s and the over-60s, with 9% and 5% respectively [19].

People living with HIV in the Siguiri Koura 1 and 2 wards were the most represented by pulmonary tuberculosis in our study with 26% and 21% respectively, followed by those from Saints Alexis and Kouroudakoro with 13% each, Doko with 12% and Dankakoro with 8%. The districts of Bolibana 2 and 1 were the least represented by HIV-TB co-infection, with 5% and 2% respectively (table 7).

In the study by Camara TD., *et al*. in 2022, they noted that patients from the communes of Matoto and Ratoma were the most affected, at 31% and 23% respectively. They were followed by HIV-positive patients from outside Conakry (21%) and Matam (11%). Patients from the commune of Dixinn were the least affected or least represented at 5%. This high prevalence in the communes of Ratoma and Matoto can be explained by the fact that they are the two largest and most densely populated communes in Conakry. More patients came from these two communes than from other communes in Guinea [19].

Conclusion

At the end of our research on the contribution of Genexpert MTB/RIF in the diagnosis of pulmonary tuberculosis in people living with HIV at the Siguiri prefectural hospital, we came to the following conclusion: The biological diagnosis carried out on 200 patients revealed 85 Genexpert MTB/RIF PCR-positive patients, i.e. a prevalence of 42.5%, compared with 79 fluorescence microscopy-positive patients, i.e. 39.5%.

This study confirms the higher sensitivity and specificity of GeneXpert MTB/RIF compared with Ziehl Neelsen staining in the detection of tuberculosis and its role in predicting the multi-drug resistance of Mycobacterium tuberculosis to the anti-tuberculosis drugs used in the treatment of pulmonary tuberculosis. Its systematic use in conjunction with Ziehl Neelsen would enable better control of this disease, in general, and of people living with HIV, in particular, in their health care.

Current state of Knowledge on the Subject

- The GeneXpert MTB/Rif is an automated system that significantly improves the diagnosis of pulmonary tuberculosis, particularly in HIV-positive patients and children who are unable to expectorate, as only Ziehl Neelsen was able to do;
- The epidemiology of resistance to Rifampicin is well documented with the GeneXpert MTB/Rif, enabling us to anticipate management by using anti-tuberculosis molecules that are more effective against multi-resistant strains in the event that the bacterium is resistant to Rifampicin.

Our study's contribution to knowledge

- Our study confirms the need to intensify and generalise the use of the GeneXpert MTB/Rif PCR system in the diagnosis and surveillance of pulmonary tuberculosis in all health facilities;
- It has been clearly demonstrated that in Siguiri, the use of the Genexpert MTB/Rif has shown the same evidence as that described elsewhere in the literature and justifies the WHO's recommendations to adopt it and recommend it in the various national programmes for the use of Genexpert PCR in the management of people living with HIV;
- Determination of viral load and CD4 count in all patients in the study in order to assess the therapeutic success of those already receiving antiretroviral treatment in achieving the UNAIDS 3-90 targets by 2030.

Statement from the Institutional Review Board

The Ethics Committee of the Gamal Abdel Nasser University of Conakry, together with the Ministry of Higher Education, Scientific Research and Innovation, approved this study in June 2023.

Transparency

The authors state that the manuscript is honest, truthful, and transparent, that no key aspects of the investigation have been omitted, and that any differences from the study as planned have been clarified. This study followed all writing ethics.

Data Availability Statement

The data is available.

Competing Interests

The authors declare that they have no conflicts of interest.

Authors' Contributions

All the authors have contributed to this work; they have read and pproved the final version of the manuscript.

Acknowledgements

The authors would like to thank the managers of the Siguiri prefectural hospital, the partner laboratories and the Ministry of Health and Public Hygiene as well as the Ministry of Higher Education and Scientific Research of the Republic of Guinea for their efforts to provide free HIV and tuberculosis care in the Republic of Guinea.

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