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Seroprevalence of *Toxoplasma gondii* in people living with HIV/AIDS on antiretroviral therapy

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Abstract

Introduction: Human immunodeficiency virus (HIV) infection is associated with progressive immune suppression, predisposing patients to opportunistic infections such as toxoplasmosis. This study aimed to determine the seroprevalence of *Toxoplasma gondii* among people living with HIV/AIDS (PLHIV) receiving antiretroviral therapy (ART) who underwent viral load testing at the Matam Communal Medical Center, Conakry, Guinea.

Material and Methods: A prospective descriptive study was conducted from October 1, 2021 to October 31, 2023 among PLHIV followed at the Matam Communal Medical Center. Sociodemographic, immunological (CD4+ T-cell count), virological (HIV viral load), and serological data for *Toxoplasma gondii* were collected and analyzed.

Results: A total of 203 PLHIV were enrolled, with a predominance of females (67.49%) and a mean age of 39 years (range: 18–76 years). Among the 81 patients who underwent viral load testing, 70% (57/81) had a detectable viral load. Advanced immunodeficiency was common, with a mean CD4+ T-cell count of 124.52 cells/µL (range: 5–349 cells/µL). Nearly half of the patients with a detectable viral load (49%, 28/57) were seropositive for *Toxoplasma gondii*. Toxoplasma infection was more frequent among patients aged 21–40 and 41–60 years, females, and single individuals, and was predominantly associated with low CD4+ T-cell counts.

Conclusion: The study reveals a high prevalence of *Toxoplasma gondii* infection among PLHIV with detectable viral load and advanced immunosuppression. These findings highlight the need for strengthened biological monitoring and integrated management strategies to prevent and control opportunistic infections in PLHIV.

Keywords: Toxoplasma Gondii; HIV/AIDS; Seroprevalence; CD4+ T Lymphocytes; Viral Load; Guinea

1. Introduction

Human Immunodeficiency Virus (HIV) is a retrovirus belonging to the genus Lentivirus of the family Reoviridae. It causes a chronic infection characterized by progressive destruction of CD4+ T lymphocytes, leading to severe

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immunodeficiency and the development of acquired immunodeficiency syndrome (AIDS) [1–3]. This immune dysfunction renders infected individuals highly susceptible to opportunistic infections and certain malignancies, which remain major causes of morbidity and mortality among people living with HIV/AIDS (PLHIV), particularly in sub-Saharan Africa [2,3].

Among opportunistic infections, toxoplasmosis—caused by the intracellular protozoan Toxoplasma gondii—represents a significant public health concern in immunocompromised individuals. While infection is often asymptomatic in immunocompetent hosts, it may lead to severe and potentially fatal complications in PLHIV, especially in cases of advanced immunosuppression [4]. Cerebral toxoplasmosis is one of the most frequent and severe opportunistic infections of the central nervous system in AIDS patients, commonly occurring when CD4+ T-cell counts fall below 200 cells/µL [9–13].

In developing countries, microbial infections continue to be among the leading causes of medical consultations and hospitalizations, contributing substantially to disease burden and mortality [5,6]. The prevalence of HIV and associated opportunistic infections varies widely across regions and populations. In sub-Saharan Africa, HIV infection disproportionately affects socioeconomically vulnerable populations, where access to early diagnosis, biological monitoring, and effective treatment remains limited [6].

Several studies have reported high seroprevalence rates of Toxoplasma gondii infection among PLHIV, although considerable geographical variability exists. For instance, studies conducted in Ethiopia and Zambia have shown seroprevalence rates ranging from moderate to very high among both HIV-positive and HIV-negative individuals [7,8]. In West Africa, data indicate that HIV/toxoplasmosis coinfection remains common and constitutes a major clinical challenge [9–13].

In Guinea, despite the recognized burden of HIV infection, data on the seroprevalence of Toxoplasma gondii among PLHIV remain scarce and fragmented [14]. Limited access to routine viral load testing and immunological monitoring further complicates the early detection and management of opportunistic infections in this population.

The present study was therefore conducted to determine the seroprevalence of Toxoplasma gondii among people living with HIV/AIDS receiving antiretroviral therapy at the Matam Communal Medical Center in Conakry, with particular emphasis on patients who underwent viral load testing. The findings aim to contribute to improved understanding of HIV/toxoplasmosis coinfection in Guinea and to support the implementation of appropriate preventive and therapeutic strategies.

1.1. Study area

This study was conducted at the laboratory of the Belgian Doctors Without Borders project (Médecins Sans Frontières–Belgium, MSF/B) located at the Matam Communal Medical Center (CMC), Conakry, Republic of Guinea. The laboratory comprises three main units: the HIV unit, the GeneXpert unit, and the Biocentric unit dedicated to viral load analysis.

1.2. Study design and duration

A prospective, descriptive cross-sectional study was carried out over a period of two years, from October 1, 2021 to October 31, 2023.

1.3. Study population

The study population consisted of people living with HIV/AIDS (PLHIV) receiving antiretroviral therapy (ART) and followed at the Matam Communal Medical Center under the MSF/B HIV care program during the study period.

1.4. Sampling technique

An exhaustive sampling method was used. All PLHIV receiving ART at the Matam Communal Medical Center during the study period who met the inclusion criteria were enrolled.

1.5. Inclusion and exclusion criteria

1.5.1. Inclusion criteria

All PLHIV receiving antiretroviral therapy at the Matam CMC under the MSF/Belgium program who provided informed consent and agreed to comply with the clinical and biological follow-up schedule were included.

1.5.2. Exclusion criteria

PLHIV not enrolled in the MSF/Belgium HIV care program and outpatients not undergoing regular follow-up at the Matam CMC were excluded.

1.6. Data collection

Sociodemographic, clinical, immunological, and virological data were collected using standardized data collection forms. The variables analyzed included age, sex, marital status, profession, place of residence, CD4+ T-cell count, HIV viral load, and Toxoplasma gondii serological status.

1.7. Biological sample collection

Venous blood samples were collected from each participant using sterile techniques. Approximately 5 mL of blood was drawn and placed into EDTA tubes for immunological and virological analyses, allowing for repeat testing if necessary.

1.8. Determination of HIV viral load

HIV-1 viral load was determined by detection and quantification of HIV-1 RNA in plasma using the GeneXpert® HIV-1 Viral Load assay (MSF/B reference). This assay is based on reverse transcription polymerase chain reaction (RT-PCR) technology and was performed according to the manufacturer's instructions.

CD4+ T-cell count

CD4+ T-lymphocyte counts were measured using standard immunological techniques routinely employed at the Matam CMC laboratory.

1.8.1. Detection of Toxoplasma gondii

Serological detection of Toxoplasma gondii infection was performed using enzyme immunoassay techniques. Anti-Toxoplasma gondii IgG and IgM antibodies were detected using ImmunoComb® Toxo IgG and IgM kits (Orgenics Ltd., Yavne, Israel) and confirmed by enzyme-linked immunosorbent assay (ELISA) using the Mini-Vidas analyzer (bioMérieux, Marcy-l'Étoile, France), in accordance with the manufacturers' recommendations.

1.8.2. Ethical considerations

The study was conducted in accordance with ethical standards for research involving human participants. Prior to enrollment, informed consent was obtained from all participants. Confidentiality and anonymity of patient data were strictly maintained throughout the study.

2. Results

The application of the research methodology resulted in the following results presented in the form of tables, figures and graphs which were interpreted, commented and discussed according to the data from the available literature.

2.1. Distribution of PLHIV on ARV treatment according to epidemiological parameters

Table 1 Socio-demographic characteristics of PLHIV

Communes	**Number**	**Percentages**
Matoto	38	18.71
Matam	36	17.73
Dixinn	12	5.91
Kaloum	11	5.41
Outside Conakry	72	35.46
Total	203	100
Socio-professional characteristics	**Number**	**Percentage (%)**

Housewives	68	33.49
Workers	61	30.04
Commercial agents	48	23.64
Administration agents	2	0.98
Security guards	8	3.94
Health workers	2	0.98
Teachers	2	0.98
Students/Pupils	6	2.95
Unemployed	6	2.95
Total	203	100
Age groups (years)	**Number**	**Percentage**
≤ 20	16	7.88
21-40	91	44.82
41-60	81	39.90
≥ 61	15	7.39
Total	203	100
Marital status	**Number**	**Percentage**
Singles	132	65.02
Divorced	39	19.21
Married	31	15.27
Widow	1	0.50
Total	203	100
Sexe	Number	Percentages
Female	137	67.49
Male	66	32.51
Total	203	100

Average age=39 years, extremes: 18 and 76 years; Sex-ratio (F/M) =2.07

2.2. Determination Of Biological Parameters In Hiv/Aids Patients Receiving Arv Treatment

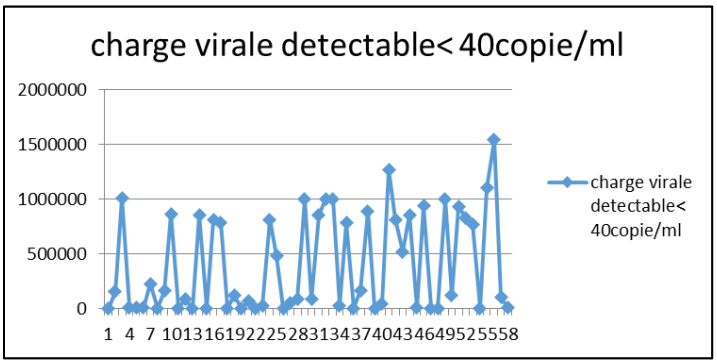

Figure 1 Determination of HIV/AIDS viral load and CD4 in patients on ARV treatment

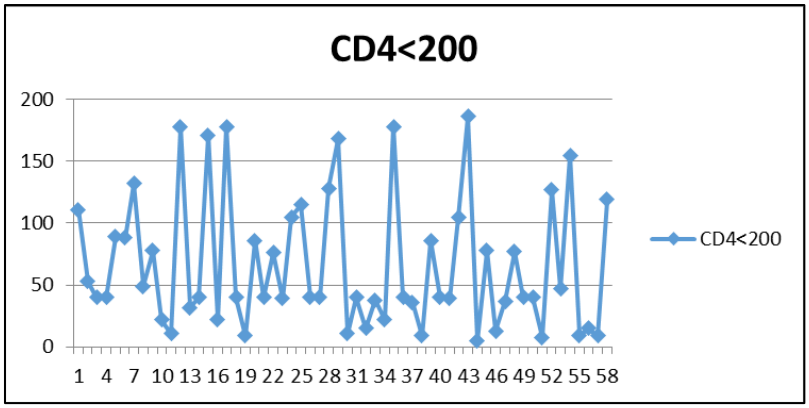

Figure 2 Distribution of HIV/AIDS patients with detectable viral load according to the LTCD4+ rate

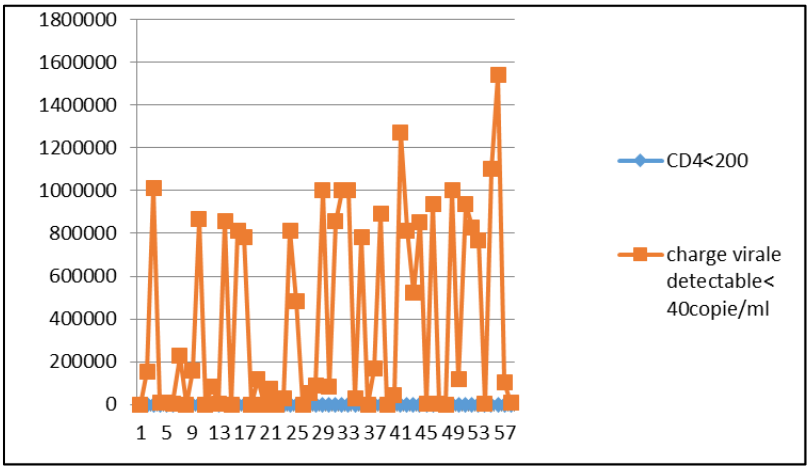

Figure 3 Variation in CD4 count and viral load in PLHIV

Table 2 Distribution of HIV/AIDS and toxoplasmosis co-infected individuals by age group (n=28)

Age group (years)	Number	Percentages
≤ 20	0	0
21-40	15	53.57
41-60	11	39.28
≥61	2	7.14
Total	28	100

Table 3 HIV/AIDS and Toxoplasma gondii co-infection according to marital status (n=28=)

Marital status	Number	Percentage
Singles	15	53.57
Married	4	14.28
Divorced	8	28.57
Widow	1	3.57
Total	28	100

3. Discussion

The objective of the present study was to determine the seroprevalence of Toxoplasma gondii in people living with HIV/AIDS receiving antiretroviral therapy at the Matam Community Medical Center.

In this present work, we discussed the demographic characteristics of all patients initially included in the study before addressing the study of the seroprevalence of toxoplasmosis in the 81 patients for whom the viral load was detected.

3.1. Demographic characteristics of PLHIV under ARV treatment Matam Communal Medical Center in Conakry

Table 1 shows that most of the patients come from other municipalities outside the Conakry and Matoto areas, i.e. 35.46% and 17.73% respectively. These results could be justified by the accessibility to health facilities and non-acceptance of test results followed by doctors' instructions. Which explains a high rate of patients at the Reference and Diagnostic Hospitalization Center at the CMC of Matam. In addition, the demographic concentration and the (precarious) living conditions in the study area also reflect this high proportion in two municipalities compared to those of Kaloum. These rates were 5.41% for Kaloum, 17.73% for Matam, 5.91% for Dixinn. The majority of studies carried out in Africa show that HIV infection affects the most disadvantaged populations. These populations, with little or no education, are less affected by awareness messages. The vulnerability to HIV of this segment of the population could also be explained by poverty and insufficient socio-economic infrastructure. This same trend was reportedin 2017 by Niang I., with 69.52% living in rural areas and 60% unemployed in the department of Oussouye , by Kamala A, in 2016 who found 63.29% patients living in rural areas and 87.92% unemployed in the department of Sédhiou and by Tamba T., who reported that 80.30% lived in rural areas and 82% were unemployed in the department of Bignona in Senegal in 2013 [15-17]. This rural predominance underlines the importance of decentralizing the monitoring of PLHIV, with delegation of tasks to local structures such as health posts. Table 2 shows that of the 203 positive patients, 67.49% were female versus 32.59% male with a sex ratio of 2.07. Identical results were found in several African countries. Thus, Saka B in Togo, found in his study a female predominance with 72.9% and a sex ratio (F/M) of 2.5 [18]. These data suggest that African women would be at least 2.5 times more exposed to contracting HIV than their male counterparts. Furthermore, through Table 1, we observe that Housewives were the most affected, i.e. 33% followed by workers (30%). The same observation was made by Abay et al, (2018), in Ethiopia, who reported a predominance of Workers with 32%, followed by Housewives (19%) [19]. Through the two studies, we can affirm that Housewives and Workers belong to a vulnerable group less affected by the awareness methods applied in Africa [20]. In our study population, the majority of the cohort (126 patients) or 62% (n=203) of cases were female with a sex ratio (F/M) of 2.07. The feminization of the epidemic could be explained by the fact that transmission is essentially heterosexual in Africa with a vulnerability of the female gender on several levels

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3.2. Toxoplasma gondii carriage by patients

Of the 203 people living with HIV (PLHIV) included in the study, only 81 patients had been tested for toxoplasmosis, as viral load was only determined in these individuals. Therefore, the statistical analysis focused on a sample of 81 patients enrolled in the support program for individuals with an undetectable (non-transmissible) viral load. Of these, 70% had a detectable viral load (CV ≤ 40 copies/ml) with a mean of 59,277 copies/ml, while 30% had an undetectable viral load. No difference was observed between the 116 patients on treatment and the 81 patients with a detectable viral load measurements while on antiretroviral therapy. This study was part of a follow-up program for people living with HIV (PLHIV); therefore, biological data were analyzed after several months of antiretroviral treatment, in accordance with National Policies, Standards, and Procedures for the Management of Sexually Transmitted Infections (STIs). Two tests were required for follow-up: CD4 lymphocyte count and viral load measurement. The study found that when the CD4 lymphocyte count increases, the viral load decreases (becoming undetectable), and when the CD4 lymphocyte count decreases, the viral load increases (becoming detectable).

Figure 3 shows the relationship between CD4 count and viral load, analyzed using correlation tests. These tests were applied after selecting patients who had both CD4 count and viral load results while on antiretroviral therapy. This study was part of a follow-up program for people living with HIV (PLHIV); therefore, biological data were analyzed after several months of antiretroviral treatment, in accordance with National Policies, Standards, and Procedures for the Management of Sexually Transmitted Infections (STIs). Two tests were required for follow-up: CD4 lymphocyte count and viral load measurement. The study found that when the CD4 lymphocyte count increases, the viral load decreases

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The prevalence of toxoplasmosis in 81 of the 203 people living with HIV/AIDS (PLHIV/AIDS) receiving antiretroviral therapy at the Matam Community Medical Center in Conakry for whom viral load was high. The frequency of toxoplasmosis in this patient group was 49% (=28/57). This frequency is significantly lower than that reported in 2024 by Makanera et al, in a study conducted at China-Guinea friendship hospital. Indeed, in 2024, Makanéra et al. reported in one of their studies that the prevalence of toxoplasmosis/HIV coinfection was high, significantly higher than that detected in the present study [2]. Indeed, these authors reported that their study revealed that 83.3% of patients who tested positive for HIV were also positive for toxoplasmosis.

3.3. According to marital status, singles were more infected by Toxoplasma gondii

Toxoplasmosis was more frequently associated with patients whose CD4 count decreased significantly. This is consistent with data from the literature, since it is an opportunistic infection in immunocompromised individuals [2]. Cerebral toxoplasmosis is one of the main opportunistic infections of the central nervous system in AIDS. It most often occurs in the context of severe immunosuppression [22]. Toxoplasma gondii infection rates vary between countries and also between study authors [2,21-23].

In Zambia, Kapembwa et al., [7] was significantly lower than those found in 2009 by Shimelis et al., which were 93.3% and 86.7% in HIV-positive and HIV-negative patients, respectively [8]. Toxoplasma gondii, a parasite belonging to the phylum Apicomplexa. Infection in pregnant women may lead to abortion, stillbirth or other serious consequences in newborns [8]. Infection in immunocompromised patients can be fatal if not treated. This data thus requires close monitoring of all patients included in this study.

4. Conclusion

These results show a high prevalence of toxoplasmosis among people living with HIV who underwent viral load testing. Therefore, the overall result shows that the early initiation of integrated and appropriate antiretroviral therapy in people living with HIV/AIDS, including biological monitoring, ensures the protection of patients against advanced immunosuppression, thus preventing opportunistic infections such as toxoplasmosis, which can worsen the disease, particularly in the case of cerebral toxoplasmosis.

Compliance with ethical standards

Acknowledgments

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Disclosure of conflict of interest

The authors declare no conflicts of interest.

Author Contributions

All authors contributed to this work.

Statement of informed consent

Informed consent was obtained from all individual participants included in the study.

References

[1] Dramou I, Makanéra A, Camara TD, Délamou AB, Traoré S.Evaluation of the care of patients living with HIV/AIDS under antiretroviral treatment at the Matam Communal Medical Center in Conakry (2021-2023).World Journal of Advanced Research and Reviews, 2025, 25(01), 1058-1071

[2] Makanéra A, Sidibé S, Camara T, Condé M , Barry AO , Diallo MA, et al. Seroprevalence of the triple infection by Hepatitis B virus, HIV and Toxoplasma gondii at the China-Guinea Friendship Hospital of Kipé in Conakry. Rev Mali Infect Microbiol 2024, 19 (1): 1-7.https://doi.org/10.30574/wjarr.2025.25.1.0109

[3] WHO. HIV and AIDS. July 13, 2023. https://www.who.int/en/news-room/fact-sheets/detail/hiv-aids.

[4] Okwuzu JO, Odunukwe NN, Ezechi OC, Gbajabiamila TA, Musa AZ, Ezeobi PM, et al., Toxoplasma gondii infection in HIV/AIDS: prevalence and risk factors. Afr. J. Clin. Exper. Microbiol. 2014. 15(2): 97-102

[5] Ojide CK, Kalu EI, Ogbaini-Emevon E, Nwadike VU. Co-infections of hepatitis B and C with human immunodeficiency virus among adult patients attending human immunodeficiency virus outpatients clinic in Benin City, Nigeria. Niger J Clin Pract. 2015;18(4):516-21. doi: 10.4103/1119-3077.151790. PMID: 25966725

[6] UNAIDS. Global HIV Statistics. FactSheet July 2017. www.unaids.org/sites/default/files/media_asset/UNAIDS_FactSheet_en.pdf

[7] Kapembwa KC, Goldman JD, Lakhi S, Banda Y, Bowa K, Vermund SH et al. HIV, Hepatitis B, and Hepatitis C in Zambia. J Glob Infect Dis., 2011; 3: 269- 274.

[8] Shimelis T, Tebeje M, Tadesse E, Tegbaru B, Terefe A. Sero-prevalence of latent Toxoplasma gondii infection among HIV-infected and HIV-uninfected people in Addis Ababa, Ethiopia: A comparative crosssectional study. BMC Research Notes, 2009; 2: 213. http://www.biomedcentral.com/1756-0500/2/213

[9] Kadjo K, Ouattara B, Kra O, Sanogo S, Yao H, Niamkey EK. Toxoplasmose cérébrale chez le sidéen dans le service de médecine interne du CHU de Treichville. Med. Afr Noire, 2007 ; 54 (1) : 13-16

[10] Oumar AA, Dao S, Diallo S, Kaba ML. Cisse LA, Tounkara. Prévalence des infections opportunistes au cours du sida en hospitalier de bamako,Mali. Louvain Medical 2008; 127(1)12-17

[11] George SM, Kumar Malik AK, Al Hilli F. Cerebral Toxoplasmosis in an HIV Positive Patient: A Case Report and Review of Pathogenesis and Laboratory Diagnosis. Bahrain Medical Bulletin, 2009; 31(2), June 2009

[12] Emeka EU, Ogunrin AO, Olubunmi A. Cerebellar toxoplasmosis in HIV/AIDS: a case report. West Afr J Med., 2010; 29(2):123-126.

[13] Zhou P, Chen Z, Li HL, Zheng H, He S, Lin RQ et al. Toxoplasma gondii infection in humans in China. Parasite & Vectors, 2011; 165 (4): 2-9

[14] Camara LB, Makanéra A, Camara A, Magassouba FB, Abba BA, Dimai OK, et al. Co-infection of cerebral toxoplasmosis and HIV/AIDS at the Infectious and Tropical Diseases Department of the Donka National Hospital, University Hospital Center of Conakry, Guinea. Annals of IRBAG, 2017; 11: 27-33

[15] Niang I. Failure of antiretroviral treatment in patients from the Oussouye health district cohort. Prevalence and associated factors about 105 cases. Doctoral thesis in Medicine (2017), Dakar, Senegal. n°97.

[16] Kamal AA. Decentralization of care for people living with HIV in Senegal: Experience of the Sédhiou Health District (About 207 cases). Doctoral thesis in Medicine (2016), Cheikh Anta Diop University, Dakar, Senegal.

[17] Tamba T. Management of patients living with HIV/AIDS under triple therapy: About 203 cases monitored in the

[18] Bignona health district. Doctoral thesis in Medicine (2013; No. 77), Cheikh Anta Diop University of Dakar, Senegal.

[19] Saka SK, Wang Y, Kishi JY, Zhu A, Zeng Y, Xie W, et al. Immuno-SABER enables highly multiplexed and amplified

[20] protein imaging in tissues. Nat Biotechnol. 2019 Sep;37(9):1080-1090. doi: 10.1038/s41587-019-0207-y. Epub

[21] 2019 Aug 19. PMID: 31427819; PMCID: PMC6728175.

[22] Abay et al,en 2018, en Ethiopie.Worku ED, Asemahagn MA, Endalifer ML. Epidemiology of HIV Infection in the Amhara Region of Ethiopia, 2015 to 2018 Surveillance Data Analysis. HIV AIDS (Auckl). 2020 Jul 30;12:307-314. doi: 10.2147/HIV.S253194. PMID: 32801929; PMCID: PMC7398753.

[23] Tchounga BK, Inwoley A, Coffie PA, Minta D, Messou E, Bado G, et al. Re-testing and misclassification of HIV-2 and HIV-1&2 dually reactive patients among the HIV-2 cohort of the West African Database to evaluate AIDS collaboration. J Int AIDS Soc. 2014 Aug 11;17(1):19064. doi: 10.7448/IAS.17.1.19064. PMID: 25128907; PMCID: PMC4134669.

[24] UNAIDS 2024. Global HIV AND AIDS statistics -Fact sheet. https://www.unaids.org › resources Download spreadsheet (updated 2 August 2024). Consulted on 12/12/2024.

[25] Goita D, Karambe M, Dembele J.P, Sogoba D, Sidibe AF, Diaby S, et al. Toxoplasmose cerebrale au cours du Sida dans le service des maladies infectieuses du CHU du Point-G, Bamako-Mali. Mali médical 2012 ; tome XXVII , 47-50

[26] WHO, 22 July 2024. HIV and AIDS. Fact Sheet WHO fact sheet on HIV and AIDS with key facts and information on signs and symptoms, transmission, risk factors, testing and counselling. https://www.who.int/en/news room/fact-sheets/detail/hiv-aids. Consulted on 12/ 12/2024.