



ISSN: 2230-9926

Available online at <http://www.journalijdr.com>

# IJDR

International Journal of Development Research

Vol. 11, Issue, 04, pp. 45903-45907, April, 2021

<https://doi.org/10.37118/ijdr.21455.04.2021>



RESEARCH ARTICLE

OPEN ACCESS

## FACTORS BLOCKING THE GOOD CARE OF PEOPLE LIVING WITH HIV IN MADAGASCAR

Niaina Zakaria Rodolphe Andriamifidison<sup>1</sup>, Alfakihi Ahmed Said Ismail<sup>2</sup>, Fidiniaina Mamy Randriatsarafara<sup>3</sup>, Zafindrasoa Domoina Rakotovaov-Ravahatra<sup>4</sup>, Léa Raobela<sup>5</sup>, El-C. Julio Rakotonirina<sup>1</sup> and Rivo Andry Rakotoarivelo<sup>6</sup>

<sup>1</sup>Analakely University Hospital Center for Care and Public Health. Faculty of Medicine, University of Antananarivo, Madagascar; <sup>2</sup>Faculty of Medicine, University of Antananarivo, Madagascar; <sup>3</sup>National Institute of Public and Community Health Mahamasina, Faculty of Medicine, University of Antananarivo, Madagascar; <sup>4</sup>University Hospital of Joseph Raseta Befelatanana. Faculty of Medicine, University of Antananarivo, Madagascar; <sup>5</sup>University Hospital of Ravoahangy Andrianavalona. Faculty of Medicine, University of Antananarivo, Madagascar; <sup>6</sup>Faculty of Medicine, University of Fianarantsoa, Madagascar

### ARTICLE INFO

#### Article History:

Received 20<sup>th</sup> January, 2021

Received in revised form

14<sup>th</sup> February, 2021

Accepted 06<sup>th</sup> March, 2021

Published online 13<sup>th</sup> April, 2021

#### Key Words:

Opportunistic infections,  
Physicians, HIV, Madagascar.

#### \*Corresponding author:

Niaina Zakaria Rodolphe Andriamifidison

### ABSTRACT

This study consists of identifying the problems of care for people living with HIV (PLHIV). This is a cross-sectional, descriptive and retrospective study including all referring doctors. The median age was 51 years with a sex ratio of 1. The median year of specific HIV training was 10 years. Each doctor takes care of an average of 34.7 PLHIV [range: 0-320], 94% of the 903 PLHIV followed were on first-line treatment. Stock-outs of first-line molecules were the most frequent cause of change in treatment regimen by 50% of physicians. The other causes were the occurrence of side effects (42%), confirmed (30.8%) or suspected (23%) resistance. The lack of means of virological and immune monitoring was found in 84.5% of physicians. The problems in the management of the main opportunistic infections apart from tuberculosis were the lack of means of biological diagnostics (84.5%), the difficulties of access to imaging (57.5%) and the absence of reference drugs in more than 70% of cases. The training of referring physicians is not regular. They encounter a lot of difficulties and their training by experts and the sharing of experiences between them would be a solution to help them improve the care of PLHIV.

Copyright © 2021, Niaina Zakaria Rodolphe Andriamifidison et al. This is an open access article distributed under the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

Citation: Niaina Zakaria Rodolphe Andriamifidison, Alfakihi Ahmed Said Ismail, Fidiniaina Mamy Randriatsarafara, Zafindrasoa Domoina Rakotovaov-Ravahatra, Léa Raobela, El-C. Julio Rakotonirina and Rivo Andry Rakotoarivelo, 2021. "Factors blocking the good care of people living with hiv in madagascar", *International Journal of Development Research*, 11, (04), 45903-45907.

## INTRODUCTION

HIV infection is a slowly progressive, chronic viral disease with varying symptoms depending on the depth of immunosuppression and the stage of the disease. The introduction of triple therapy or highly active antiretroviral therapy constitutes a therapeutic arsenal marking a decisive turning point in the course of the disease. Triple therapy has made significant progress in the management of people infected with HIV by slowing immune deterioration, reducing HIV-related mortality and decreasing the frequency of opportunistic infections. Despite these advances, AIDS-related illnesses remain the leading cause of death among people living with HIV (PLHIV). Globally, UNAIDS 2016 estimates reported 36.7 million people living with HIV, 70% of who already know their status and only 53% are on antiretroviral therapy. An estimated 1.8 million people are newly infected and 1 million people have died from one or more AIDS-related causes, particularly opportunistic diseases (UNAIDS, 2014). On the African continent, sub-Saharan Africa is paying a heavy price with 19.4 million PLHIV in 2016, 59% of whom are women and girls.

However, the number of AIDS-related deaths has fallen by 42% (UNAIDS, 2014). In the Indian Ocean region, the prevalence of HIV infection is still relatively low with a prevalence of 0.92% in Mauritius and less than 0.05% in the Comoros in 2015 (Ministry of Public Health in Madagascar, 2016; Ministry of Health in Comoros, 2015). In Madagascar, estimates from the Ministry of Health show an estimated prevalence of 0.4% in the adult population infected with HIV (SE-CNLS, 2014). The number of people living with HIV is estimated at 39,000 in 2015, and 3,000, the number of new cases per year, of which just over 1,000 people are monitored (UNAIDS, 2013; African Health Observatory, 2014). The country is therefore not immune to an explosion of the epidemic, hence the importance of evaluating and strengthening national strategies to fight the epidemic and provide comprehensive care. Thus, an analytical study concerning the daily work of qualified referring physicians on the care of people living with HIV throughout Madagascar was carried out. The main objective of this study is to identify the obstacles related to the management and delivery of care, encountered by physicians and hindering the proper medical care of patients. The

specific objectives were to identifying both the problems linked to the socio-professional profile of doctors and the problems linked to the organization of the service.

## MATERIALS AND METHODS

This study concerns the entire territory of the Island of Madagascar. The island of Madagascar is bathed in the Indian Ocean. It is separated from eastern Africa by the Mozambique Channel. Madagascar has 4,828 km of coastline for an area of 587,040 km<sup>2</sup>. From an administrative point of view, the island is divided into 6 provinces named after their capitals: Antananarivo, Fianarantsoa, Toamasina, Mahajanga, Toliara and Antsiranana. However, since 2004, the state has divided the country into 22 regions in order to decentralize the country and allow each region to acquire some autonomy. This is a cross-sectional, retrospective and descriptive study. The period studied concerns a period of 6 months before the survey. The study was carried out during a year and ten months from August 2017 to May 2019. The study concerns all the referring doctors of Madagascar distributed in the different district capitals and the six former provinces and which were answer our questionnaires from their e-mail address or even by phone call. Access to their identities, e-mail addresses and telephone numbers has been granted by the Directorate for the Fight against Sexually Transmitted Infections and AIDS of the Ministry of Public Health (DLIS). This is an exhaustive sampling of all referring physicians qualified in the care of PLHIV listed in the data from the DLIS of the Ministry of Public Health during the period studied. The sample size is set at 26 physicians including 8 referring physicians for the province of Antananarivo, 9 physicians for the province of Fianarantsoa, 4 physicians for the province of Toliara, 2 physicians for the province of Mahajanga, 1 physician for the province of Antsiranana, 2 doctors for the province of Toamasina. The following parameters were studied: age, gender, place of exercise, specific training on the management of PLHIV, updating of knowledge, management of HIV infection, management of the main opportunistic infections. The data was collected on a pre-established and pre-tested questionnaire form. The cards were given to the doctors and then retrieved via their e-mail addresses. The data collected was entered, processed and analyzed on a computer. Qualitative variables were represented by proportions. The quantitative variables were represented as the median. Statistical analysis was performed using Epi Info 7.1.5.0 software (CDC USA). Chi<sup>2</sup> test and Fisher test were used to compare proportions. The significance level retained was  $p < 0.05$ .

## RESULTS

During the study period, 35 referring physicians were active all over Madagascar. 26 doctors from 18 different cities answered the questionnaires representing a respondent rate of 74.28%. Subjects aged 50 and over were the most common and represented 69.23%. The median age is estimated at 51 with a minimum of 30 and a maximum of 59. The gender division is equitable with a sex ratio of 1. The geographic distribution of referring physicians varies from region to region and from city to city. But on average, 4.3 doctors take care of a province. The provinces of Antananarivo and Fianarantsoa have the most referral physicians in Madagascar with 30.8% and 34.6% respectively. 903 PLHIV were monitored, which constitutes 2.3% of the total number (39,000 PLHIV) estimated by WHO in Madagascar. Two thirds of PLHIV are monitored in Antsiranana and Toliara. PLHIV are numerous in regions where the number of referring physicians is very small. This finding was statistically significant ( $p < 0.001$ ). The first-line treatment in Madagascar is triple therapy. The majority of PLHIV are on first-line treatment. However, certain situations (out of stock, side effects, resistance) prompted the doctor to prescribe another treatment. In this study, 30.8% of cases received second-line treatment due to confirmed virological resistance. The lack of technical platform necessary for the management of opportunistic infections such as toxoplasmosis, cryptococcosis and pneumocystosis was found by

80.8% of all referring physicians. This technical platform has not yet been set up implemented in the provinces of Toamasina and Antsiranana. The lack of financial means (96.2%) is a major factor blocking better care for patients with opportunistic diseases (advanced AIDS). This lack of financial means is significant in all provinces. The lack of equipments and specific laboratory tests for follow-up and the diagnosis of opportunistic infections such as pneumocystosis, cryptococcosis, toxoplasmosis was reported by 84.5% of physicians. These diagnostic and follow-up biological examinations have not yet been set up in the provinces of Toamasina, Mahajanga and Antsiranana. The scanner was inaccessible in 57.7% of cases, especially in the provinces of Mahajanga and Toamasina. The standard chest x-ray was inaccessible by three doctors coming from three different towns in the province of Antananarivo, Toliara and Toamasina. There are no free medicines to treat opportunistic infections such as toxoplasmosis, cryptococcosis, and pneumocystosis. Regarding drugs to treat opportunistic infections, pyrimethamine + sulfadiazine was not found according to 73.1% of physicians. The provinces of Toamasina, Mahajanga and Antsiranana were the most affected by this shortage. The reference medicine for cryptococcosis, Amphotericin B injection or fluconazole was not found according to 84.6% of physicians. The provinces of Toliara, Mahajanga, Toamasina and Antsiranana were the most affected by this shortage. Injectable IV cotrimoxazole or Atovaquone were not found in 69.2% of cases, especially in Toamasina, Mahajanga and Fianarantsoa. In the event of care problems for PLHIV, doctors want the help of a referring doctor in 88.5% of cases or an infectious disease specialist in 69.2% of cases. Difficulties in accessing specialist advice are predominantly due to the lack of means of communication in 57.7% of cases. For specific training on the care of PLHIV, the median age of training on HIV is estimated at 10 years with a minimum of 6 years and a maximum of 14 years. For 19 doctors, the median year of first taking care of for PLHIV was 4 years with a minimum of 1 year and a maximum of 11 years. And 7 doctors have already taken care of a PLHIV before receiving specific training. The majority of referring physicians (81%) received only one training, 2 training for 15% and 8 training for 4%. Several means are used voluntarily by doctors to strengthen knowledge in the management and follow-up of PLHIV. 30.8% of respondents do not update their knowledge. On the other hand, the others obtain information from books or the Internet (30.8%), from conferences (34.6%), or from continuing medical training (11.5%).

## DISCUSSION

**Age:** In this study, the median age is 51 with a minimum of 30 and maximum of 59. Thus, the majority of doctors are old because of the lack of recruitment of new referring doctors. Similar results were found according to a study published in 2017, with respectively a median age of 54, 53 and 54.5 years in Algeria, Syria and Morocco (Bouet et al, 2017). According to the study by Kiriazova et al in Ukraine, published in January 2018, the median age of referring physicians who participated in the study was 45.5 years old (Kiriazova et al, 2018). The mean age was influenced by the inclusion criteria. The selection was made only in one region of the country. According to another study carried out by Arditì et al in 2014 in Geneva, the study population in Switzerland was also old with an average age of 53 years (Arditì et al, 2014). However, these results are different in Australia, Bangladesh, and Benin where the most represented age group was 30 to 49 years. Indeed, this age group concerned 47.88% of doctors for Australia, 38.49% for Bangladesh and 66.24% for Benin. Likewise, according to the study by Gelaude et al in the United States, more than 50% of referring physicians were under the age of 44 Gelaude et al, 2017).

**Gender:** This study recorded as many women as men. In Madagascar, gender equality is increasingly respected within the framework of the good emancipation of women on the right to education and work. There is also a feminization of the medical profession. The study by Kiriazova et al in Ukraine, concerning the improvement of links between providers of care for PLHIV, observed

a strong female predominance in the medical profession with 12 women (85.7%) and 2 men (14, 3%) (Kirozova et al, 2018). Another study carried out in the United States by Gelaude et al, on the experience of providers trained in the care of PLHIV showed gender equality (Gelaude et al, 2017). On the other hand, a study carried out in 2017 on doctors in Arabic-speaking countries showed a strong male predominance with 80% of men against 20% of women. These results were similar for Syrian, Algerian and Tunisian doctors (Bouet et al, 2017). This discrepancy can be explained by religious or cultural phenomena in some countries with a Muslim or Arabic speaking majority. The emancipation of women is still a taboo subject. However, all the studies done in different countries were like ours. Indeed, a feminization of the medical profession has been noted.

**Distribution of referring physicians in Madagascar:** The management of human resources and their distribution in the respective regions are important for better care of PLHIV. This study showed that there is an average of 1.4 referring physicians per city among the 18 cities studied in Madagascar, i.e. 4.3 physicians per province. Then, it was observed a very large gap of the number of doctors between the provinces of high plateaus and coastal regions. In fact, the high plateau regions have 9 (30.8%) and 8 (34.6%) doctors respectively in the provinces of Fianarantsoa and Antananarivo. While in coastal areas there is on average only 1 (3.8%) doctor. This result is low compared to other studies. A Congolese study in Kinshasa in 2016 found an average of 2.8 doctors in 33 areas (médecins sans frontières, 2016). We suggest that the directorate of the ministry of public health in charge of human resources management and the directorate for the fight against AIDS allow new recruitments of doctors trained in the care of PLHIV in order to be able to fill this lack of personnel and facilitate access to patient care.

**Management of HIV infection:** This study showed that only 2.3% (903) of PLHIV in Madagascar are cared for by qualified doctors. This rate is extremely low compared to other countries. Indeed, an American study published in 2016 showed that 75% of PLHIV are already monitored and under treatment (Gelaude et al, 2017). Likewise, according to a study in Kinshasa, 69,587 PLHIV (60%) were taken care of in a health structure (médecins sans frontières, 2016). Thus, the Minister of Public Health in collaboration with the organizations involved in the fight against HIV / AIDS must implement an effective emergency plan to strengthen the awareness of the population through the media on the importance of screening, on the risk of an imminent epidemic explosion of infection. During this study, the distribution of PLHIV monitored differed greatly from one province to another. Indeed, a large proportion of PLHIV are found in coastal regions, more precisely in Diego and Toliara. However, attending physicians are insufficient in these provinces. The distribution of physicians in the provinces is inequitable and the proportion of physicians in each province was significantly related to the rate of PLHIV ( $p < 0.001$ ). This association may explain the effective role of referring physicians in reducing PLHIV in the country. Also tourism could be one more reason to explain this high rate of PLHIV in these regions. To reduce the prevalence of HIV infection, we suggest to the director of human resources in the ministry of public health to increase the number of treating physicians in the most affected provinces, particularly in the regions of Antsiranana, Toliara and Toamasina.

Regarding antiretroviral treatment, 845 (94%) of PLHIV received this first-line treatment. However, some irregularities such as stock shortage, side effects, resistance to the first-line regimen prompted doctors to switch to second-line treatment with 58 (6%) of PLHIV. These results show an increase in the use of first-line treatment. Indeed, in 2008 in Antananarivo, Lamontagne et al observed 70% of subjects receiving first-line treatment (Lamontagne et al, 2008). This increase is due to the free use of triple therapy. These results were different those found in Burkina Faso by Raoul et al in 2018 with 75.5% of first-line treatment and 14.9% of the second-line (Karfo et al, 2018). Similarly, Panda et al in Cameroon showed 86.5% of PLHIV on first-line treatment against 12.8% of second-line treatment in 2013 (Penda et al, 2013). Second-line treatment has been

increasingly prescribed in Guinea and Côte-d'Ivoire. Indeed, Traore et al in Conakry found 59.9% of PLHIV in the first-line treatment against 28.2% (Traore et al, 2016). Similarly, Kouadio et al in Côte d'Ivoire observed that 70% of patients under antiretroviral drugs received first-line treatment in 2011 (Yao et al, 2016). Six years later (2017) in Abidjan, Dainguy et al found similar results with 77.6% of first-line treatment against 22.6% (Dainguy et al, 2017).

In this study, several difficulties were reported with the use of antiretroviral drugs. The most important are stockouts, resistance to antiretroviral drugs and even side effects. Because of these issues, prescribers are shifting from first-line treatment to second-line treatment. A study done in Ivory Coast by Kouadio et al revealed more severe results than ours. In fact, on 20 sites, 80% had stock-outs ranging from 1 to 9 months (Yao et al, 2016). Essomba et al in Cameroon obtained better results compared to ours with a stock-out of 14% (Essomba et al, 2015). The shortage of stocks of antiretroviral drugs is a major cause of treatment failures, leading to the development of drug resistance. We suggest that treating physicians can benefit from training on drug stock management to improve patient care. In this study, 30.8% of cases received second-line treatment because of confirmed virologic resistance. A Malagasy study conducted by Solthis in 2013 showed 25% resistance of the HIV to antiretroviral drugs (Solthis, 2013). Savadogo et al in Burkina-Faso observed similar results in 2017 with 30% of treatment failures due to ARV resistance (Savadogo et al, 2017). In addition, our results are similar to those published in 2017 by Adawaye et al in Chad with 43% of resistances (Adawaye et al, 2017). In 2017, Kpindeet al found severe results with 60% of treatment failures due to resistance to first-line treatments (Mossoro-Kpinde et al, 2017). We suggest that the team from the Department of AIDS Control of the Ministry of Public Health work with virological laboratories with a sequencer to perform genotyping and change treatments in case of failure. In this study, side effects from ARVs caused a switch to second-line treatment. In fact, 42% of referring physicians had changed molecules responsible for major side effects in the body. Similar results were found in different countries. In the Caribbean, the study by Marcelo et al found that 39% of causes of transition to second-line treatment were attributed to drug side effects (Wolff et al, 2016). Samuel et al in London observed the same scenario with 45% of side effects (Samuel et al, 2015).

**Opportunistic infections:** In this study, more than 2/3 of the referring physicians need a technical platform to improve the quality of the management of opportunistic infections such as cryptococcosis, pneumocystosis and toxoplasmosis. This result is similar to that of Senegal, showing 70% of sites needing a technical platform to take care of PLHIV (Gelaude et al, 2017). In addition, financial means for additional examinations, medication and travel costs are insufficient. The association of the two problems (insufficient financial resources and poor care) was statistically significant with  $p < 0.001$ . In Libreville, Okomé et al showed 63.2% of financial problems of PLHIV (Okome Nkoumou et al, 2007). We suggest physicians to strengthen preventive treatment in order to significantly reduce hospital costs and mortality in the event of an opportunistic infection. In addition, 11.5% of cities do not have a chest x-ray and 57.7% do not have a CT scan. And only the city of Antananarivo has Magnetic Resonance Imaging. These results are similar to studies carried out in Africa where the scanner is still inaccessible. Thus, according to a study carried out in Ivory Coast, N'goan-Domoua et al in 2003 published the existence of only one CT scan for a population of 1.5 million inhabitants (N'goan-Damoua et al, 2003). In addition, the absence of specific laboratory tests for the diagnosis of opportunistic infections concerned 89% of cities, or 84.5% of doctors. The cities of Antananarivo and Fianarantsoa are the only ones to do these biological examinations. Indeed, these 2 cities have two large reference centers for the care of PLWHA with a specialized team managing to collaborate with local or remote laboratories. However, for tuberculosis, 16 cities of the 18 cities studied corresponding to 84.6% of cases did not have problems performing laboratory tests. This is due to the success of the national tuberculosis control plan and the free examinations. As for the drugs

needed to treat opportunistic infections, obtaining these drugs has been difficult. Medicines were not found in the majority of cities. No drug was free for the treatment of toxoplasmosis, cryptococcosis and pneumocystosis. We suggest that the Drug Management and Distribution Directorate team order more drugs for the treatment of opportunistic infections. We also suggest that the Ministry of Health team deliver the drugs for opportunistic infections free of charge.

**Specific training for doctors and updating doctors' knowledge:** In this study, the majority of physicians 21/26 (81%) had received training about the management of people living with HIV. And 7 doctors had already taken care of a PLHIV before receiving specific training. Our results are better than those of Souville et al in Côte d'Ivoire where 56.1% of physicians treating PLHIV received specific training (Msellati et al, 2001). However, only 18 (69.2%) of physicians received updates of their knowledge about the care of PLHIV. Documentation through books or the Internet, participation in medical congresses, continuing medical education were the main means. In the majority of cases, the training was biannual. Referral physicians were trained a long time ago, with a rare opportunity to update their knowledge. We suggest that the team from the Directorate of HIV / AIDS control of the Ministry of Public Health, the WHO management team in Madagascar and non-governmental organizations set up a continuing medical training program to improve the quality of the doctors' daily work.

## CONCLUSION

HIV infection remains a major public health problem in Madagascar. The number of people infected and monitored by referring physicians is very low (2.2%) compared to the estimated prevalence in Madagascar. Improving screening strategies and the regular following-up the patients are essentials. In view of the results of this study, the unavailability of diagnostic and therapeutic means for opportunistic infections, the absence of virological monitoring means, resistance to treatment and the frequent shortage of antiretroviral drug stock constitute predictive factors of poor care for PLHIV. Thus, the improvement of laboratory tests for the biological monitoring of HIV infection and opportunistic infections is necessary. Similarly, the drugs must be always available. Likewise, coaching of referring physicians by experts and sharing experiences between physicians would also be a solution to help them to improve the care of PLHIV.

### Acknowledgements

We express our gratitude to all the referring physicians who agreed to participate in the survey.

## REFERENCES

Adawaye, C., Fokam, J., Kamangu, E. Alio, H.M., Chadad, A.M., Susin, F, Moussa, A.M., Bertin, T.H-Z., Tidjani, A., Vaira, D., and Moutschen, M. (2017) Virological response, HIV-1 drug resistance mutations and genetic diversity among patients on first-line antiretroviral therapy in N'Djamena, Chad: findings from a cross-sectional study. *BMC Res Notes*. 10, pp. 589.

African Health Observatory. MDG Goal: Combat HIV/AIDS, TB, Malaria and other diseases. Madagascar: Afri Health Observatory; 2014.

Arditi, C., and Burnand, B. (2014) Global Medical Demography: Indicators and Observatories. *RDS*. 236, pp 1660-7104.

Bouet, P., and Rasse, S. (2017) longitudinal studies 2007-2017 of doctors born outside France and doctors graduated outside France: prospects for migratory flows and trajectories. Paris : Conseil National de l'Ordre des Médecins, 166p.

Dainguy, M.E., Kouadio, E.A., Kouakou, C., Tematio-Ble, M., Kokora, M.B., Djivohehoun, A., Gro Bi, A., Djoman-Oussou, I., Angan, G.A., and Folquet-Amorissani, A.M. (2017) Contributing factors to non-compliance to antiretroviral therapy among adolescents in Abidjan. *Med Afr Noire*. 6402, pp. 69-78.

Essomba, E.N., Adiogo, D., Kedy Koum, .DC., Amang, B., Lehman, L.G., and Coppitiers, Y. (2015) Factors associated with nonadherence to therapy in adult subjects infected with HIV on antiretrovirals in a referral hospital in Douala. *Pan Afr Med J*. 20, pp. 412.

Gelaude, D.J., Hart, J., Carey, J.W., Denson, D., Erickson, C., Klein, C., Mijares, A., Pitts, N.L., and Spitzer, T. (2017). HIV Provider Experiences Engaging and Retaining Patients in HIV Care and Treatment: "A Soft Place to Fall". *JANAC*. 28, pp. 491-503.

Karfo, R., Kabré, E., Coulibaly, L., Diatto, G., Sakandé, J., and Sangaré, L. (2018) Evolution of biochemical and hematological parameters in patients living with HIV/AIDS treated with antiretroviral therapy at the Aboubacar Sangoulé Lamizana General Camp Medical Center. *Pan Afr Med J*. 29, pp. 159-66.

Kiriazova, T., Postnov, O., Bingham, T., Myers, J., Flanigan, T., Vitek, C., and Neduzhko, O. (2018) Patient and provider perspectives inform and intervention to improve linkage to care for HIV patients in Ukraine. *BMC*. 18, pp. 58-72.

Lamontagne F, Andriantsimietry S, Chaix ML, Viard JP, Randria M, Nely J Randriamampionona, S., Aguilar, C., Royer, S., Pizzocolo, C., Razanakolona, L.R. , and Rouzioux, C. (2008) Virological study in HIV-1 subjects monitored in Madagascar. *Solthis*. 2008; 12 :49-58. Available online at <http://www.solthis.org>.

Médecins Sans Frontières. State of play on the availability of essential inputs for the fight against AIDS in Kinshasa. *MSF*. 2016. Available online at <http://www.msf.org.za>.

Ministry of Health in the Comoros. National AIDS Activity Report. GARPR. 2015. Available online at <http://www.unaids.org/country/documents>.

Ministry of Public Health in Madagascar. XVth HIV and Hepatitis Symposium in the Indian Ocean. *MISAN*. 2016.

Mossoro-Kpinde, C.D., Gody, J.C., Mboumba Bouassa, R.S., Mbitikon, O., Jenabian, M.A., Robin, L., Matta, M., Zeitouni, K., Longo, J.D., Costiniuk, C., Grésenguet, G., Touré Kane, N.C., and Bélec, L. (2017) High levels of virological failure with major genotypic resistance mutations in HIV-1-infected children after 5 years of care according to WHO-recommended 1st-line and 2nd-line antiretroviral regimens in the Central African Republic: A cross-sectional study. *Medicine (Baltimore)*. 96, e6282.

Msellati, P., Vidal, L., and Moatti, J.-P. (2001) Access to treatment of HIV / AIDS in Côte d'Ivoire. Evaluation of the UNAIDS Initiative /Ivorian ministry of public health: Economic aspects, social and behavioral. Paris: ANRS, Social sciences and AIDS collection, 327p.

N'goam-Damoua, A.M., N'gbesso, R.D., Coulibaly, Y., and Keita, A.K. (2003) State of play of pediatric imaging in Abidjan (Ivory Coast). *SANTE*. 2003 13, pp 85-87.

Okome Nkoumou, M.M.L., Okome Essima, R. , Obiang Ndong, G.P., and Okome Miami, F. (2007) Clinical and laboratory findings in HIV-infected patients at the Jeanne Ebori foundation in Libreville, Gabon (2002-2005). *Med Trop*. 67, pp 357-362.

Penda, C.I., Bebey, F.S., Mangamba, D.K., Moukoko, E.C., Ngwa, V., Makouet, N., Bissek, A.C., Minkemdefo, B.D., Tetanye, E., and Ndombo, P.K. (2013) Treatment failure in children infected with HIV in routine follow-up in a resource-limited setting in Cameroon. *Pan Afr Med J*. 30, pp. 15:80.

Samuel, M., Winston, A., and Peters, B. (2015) Drug treatment for adults with HIV infection. *BMJ*. 23, h1555.

Savadogo, M., Sako, F.B., Sondo, K.A., and Kyeleme, N. (2017) Clinical signs of patients living with HIV hospitalized in the Infectious Disease Unit, Yalgado Ouedraogo Teaching Hospital (CHU YO) Burkina Faso, in highly active antiretroviral therapy era. *Med Afr Noire*. 6403, pp. 153-158.

SE / CNLS. Report on the response to HIV and AIDS in Madagascar 2014. SE / CNLS.2014. Available online at URL: [http // www.aidsmada.mg](http://www.aidsmada.mg).

Solthis. Study on resistance transmitted to ARVs and technical assistance for the management of treatment failures in Madagascar. *Solthis*. 2013. Available online at [http // www.solthis.org](http://www.solthis.org).

- Traore, F.A., Sako, F.B., Keita, M., Tounkara, T.M., Soumah, M.M., Sylla, D., Bangoura, M., Traore, M., Keita, A., Sidibe, A., and Barry, M. (2016) Cisse Tolerance and compliance to ART in people living with HIV/AIDS followed in the infectious diseases unit of Donka National Hospital in Conakry. *Med Afr Noire.* 6306, pp. 333-337.
- UNAIDS Report on the Global AIDS Epidemic. (2013) Joint United Nations Program on HIV / AIDS (UNAIDS). UNAIDS.
- UNAIDS. Information sheet. UNAIDS. 2014. Available online at <http://www.unaids.org/fr/ressources/campaigns/2014/2014gapreport>.
- Wolff, M., Shepherd, B.E., Cortés, C., Rebeiro, P., Cesar, C., Wagner Cardoso, S., Pape, J.W., Padgett, D., Sierra-Madero, J., Echevarria, J., McGowan, C.C. (2016) Clinical and Virologic Outcomes After Changes in First Antiretroviral Regimen at 7 Sites in the Caribbean, Central and South America Network. *J Acquir Immune Defic Syndr.* 71, pp.102-110.
- Yao, K.J., Damey, N.F., Konan, D.J., Aka, J., Aka-Konan, S., Ani, A., Bonle, M.T., and Kouassi, D. (2016) Evaluation of early warning indicators of HIV resistance to antiretroviral (ARV) drugs in Ivory Coast in 2011. *Pan Afr Med J.* 25, pp. 52.

\*\*\*\*\*