ACTA SCIENTIFIC MICROBIOLOGY (ISSN: 2581-3226)

Volume 3 Issue 1 January 2020

Research Article

Immunological Profile of TB/HIV Co-Infected Patients Attending ADEPR Nyamata Hospital in Rwanda

Gisele Nyambere and Francois Niyongabo Niyonzima*

Department of Department of Biomedical Laboratory Sciences, Faculty of Applied Fundamental Sciences, INES-Ruhengeri, Rwandaa

***Corresponding Author:** Francois Niyongabo Niyonzima, Department of Department of Biomedical Laboratory Sciences, Faculty of Applied Fundamental Sciences, INES-Ruhengeri, Rwanda.

Received: October 17, 2019; **Published:** December 03, 2019

DOI: 10.31080/ASMI.2020.03.0444

Abstract

Tuberculosis is an important disease that attacks mainly people from low income countries. One third of the population having HIV in Sub-Saharan African countries are also having TB. Investigating the prevalence and immunological profile of TB in patients having HIV is important step in discovering drugs and setting preventive measures. The present study aimed to estimate the CD4 cell levels and viral load in TB and HIV co-infected patients and to identify the prevalence of tuberculosis and HIV co-infected patients attending ADEPR Nyamata Hospital: It was a cross sectional study and was carried out on 85 HIV positive patients where18 patients were TB/HIV co-infected. Study participants were followed during 4 months of HAART initiation. This was based on the laboratory results of CD4 count from FACS count machine, and viral load results from AmpliPrep/COBAS® TaqMan® machine. Data were analysed with SPSS and significance was considered when $P < 0.05$. Among the 18 TB/HIV co-infected patients, compared to the CD4 levels before the initiation of treatment, there was a decrease in CD4 cells count at the level of 50.0% with CD4 cells less than 175 cells/mm3 and those patients had a viral load level above 1000 copies/ml. Patients between 36 and 54 years showed a high frequency of co-infection at the level of 44.4%. After 4 months treatment, only 11.1% of co-infected patients achieved an undetectable viral load means less than 20 copies/ml and 55.6% of co-infected patients their CD4+ T cells were recovered up to 350 cells/mm3 after taking treatment. In all co-infected patients, CD4 cells augmentation and viral load decline were observed after 4 months on treatment. It is recommended to take care of co-infected patients. CD4 count and viral load have to be regularly checked among HAART patients at least for a period of less than 90 days.

Keywords: Tb/Hiv Co-Infected Patients; Nyamata Hospital; Immunological Profile; Highly Active Antiretroviral Treatment, Tuberculosis

Abbreviations

ADEPR: Association Des Eglises De Pentecôte Au Rwanda; AIDS: Acquired Immune Deficiency Syndrome; CD4: Cluster of Differentiation Four; COBAS: Complete Bioanalytical System; EDTA: Ethylene Diamine Tetra Acetic; HAART: Highly Active Antiretroviral Treatment; HIV: Human Immunodeficiency Virus; MDR-TB: Multi-Drug-Resistant Tuberculosis; SPSS: Statistical Package For Social Sciences; TB: Tuberculosis; VL: Viral Load; WHO: World Health Organization.

Introduction

Tuberculosis and HIV/AIDS are among the deadly diseases in the countries under development.

Almost 1.8 and 2 million people are died owing to AIDS and TB, respectively as reported by WHO [1]. China is the first country to have many people suffering from TB. It is followed by India [2]. TB/HIV co-infections are principally observed in African and Asian countries. The co-infection rate in the countries of Sub-Saharan Africa is 33% [3]. The causative agents of these 2 diseases speed up immunological function deterioration, and thus accelerating death [1]. Mycobacterium tuberculosis of Mycobactericidal family was reported to be the frequent bacterium causing human TB. This rod-shaped, aerobic, acid-fast, and non-spore forming bacterium does not undergo Gram staining [4]. TB occurs in human being through bacilli inhalation. It can be controlled by monitoring cell immunity. CD4+T and CD8+T cells were seen activated in humans suffering with TB [1].

HIV-1 and -2 are responsible to AIDS in human beings. If any patient is having HIV, it can transmit it through blood transfusion, unprotected sexual intercourse or injection. Sometimes, the mother can transmit it to her/his child at birth, during breastfeeding, or pregnancy [4]. The virus causes chronic infection by inhibiting hu-

man immunity. This is shown by CD4+T lymphocyte reduction, resulting in immune defense mechanisms blockage. The present blockage allows the TB bacilli to grow and multiply easily in the case of co-infection [5]. Salim., et al. [6] reported resistance on TB in presence of its drugs.

Few studies about TB/HIV co-infection was carried out in Rwanda. For instance, a significant TB/HIV co-infection in patients of Ruhengeri hospital (Northern Province in Rwanda) was reported by Kangabo [7]. The prevalence of co-infection of tuberculosis and HIV from 2012 to 2016 was 21.0% among screened HIV patients at Nemba hospital, Gakenke district in Rwanda [8]. Understanding the prevalence and immunological profile of TB in patients with HIV is crucial for the design of effective preventive strategies. Data on the prevalence of TB/HIV co-infection in Rwanda are still limited. The assessment of immunological profile of TB and HIV co-infected patients in Rwandan population is thus necessary. The quantification of the levels of CD4+ T cells and viral load in TB and HIV co-infected patients, and the determination of the co-infection prevalence at ADEPR Nyamata hospital were the present study objectives.

Materials and Methods

Study area and population

This study was carried out in Eastern province, Bugesera district at ADEPR Nyamata hospital laboratory. The population considered was all patients with TB/HIV co-infection. The patients without HIV were excluded. Viral load and cluster of differentiation 4 (CD4) were analysed in both males and females. A total sample of 85 participants was recorded during the study period (from June to September 2017).

Study design and ethical consideration

In this study, CD4 count and viral load levels were estimated among the TB/HIV co-infected patients. An authorization letter to request for data collection was obtained from INES administration. An application letter along with research proposal was addressed to ADEPR Nyamata hospital administration to request for data collection on TB/HIV co-infected patients. The collected data were granted by hospital ethical department.

Sample collection and analysis

CD4 levels were estimated using whole blood, whereas viral load was determined using blood plasma. EDTA tubes were utilized for blood collection among TB/HIV co-infected patients. After samples collection, they were transported in biochemistry and molecular biology laboratories of ADEPR Nyamata hospital for analysis. Centrifugation was employed to get plasma. CD4 level was estimated with CD4 count machine. The viral load levels were quantified with AmpliPrep/COBAS TaqMan machine. The obtained results were noted down.

Statistical analysis

The data were recorded in SPSS machine and statistically analysed. Significance was considered when $p < 0.05$.

Results and Discussion

Repartition of all TB/HIV co-infected patients based on their gender

Tuberculosis is a highly contagious disease among males and females mainly in patient with HIV [9]. The frequency of TB/HIV co-infected male and female patients at ADEPR Nyamata hospital was investigated. The results imply that females present high frequency among all TB/HIV confected patients and females also show high frequency in HIV patients without TB (Table 1). Similar results where females present high prevalence in the TB/HIV co-infected patients than in males were reported in Mombosa (Kenya) [9]. The study carried out on immunological profile of TB/HIV co-infected patients at Ruhengeri referral hospital (Musanze district, Rwanda) by Kangabo [7] showed also similar results where there is a high frequency in female (63.09%) than in males. The contrary results where males present high prevalence in the TB/HIV co-infected patients than in males was found in Finland at the level of 64% [10].

	TB/HIV co-infected patients		HIV patients without TB				
Gender	**Frequency**	**%**	**Frequency**	**%**	**Chi-square**	**df**	**P-value**
Males	8	44.4	32	47.7	0.004	1	0.9
Females	10	55.6	35	52.3			
Total	18	100	67	100.0			

Table 1: TB/HIV confection among study participants.

Prevalence of TB/HIV co-infection among study participants based on age groups

The people of all ages living with HIV are most often co-infected with TB, especially in Sub-Saharan African countries [3]. Table 2 shows that the prevalence of TB among HIV patients. It was high in patients between 36 and 54 years old than other age groups. Similarly, in Malawi, the age group most affected was 30 - 44 years and there was a decrease of female to male ratio from 1.3 to 0.8 [10]. Similar range of 40 - 49 years was also reported by Ligidi [4] in a study carried out in Ethiopia at Adama hospital. In contrast, Mukasano [8] found high frequency for patients above 50 years old in study carried out in Gakenke district (Rwanda) on trend of tuberculosis from 2012-2016 at Nemba hospital. The co-infection can therefore occur at any age with high frequency for older ages as the immunity is decreasing.

	TB/VIH co-infected patients		HIV patients without TB				
Age groups	**Frequency**	**%**	**Frequency**	**%**	**Chi-square**	**df**	**P-value**
Under 18 years	2	11.1	12	17.9	10.8	3	0.013*
[18-36 years]	3	16.7	15	22.4			
[36-54 years]	8	44.4	23	34.3			
Above 54 years	5	27.8	17	25.4			
Total	18	100.0	67	100.0			

Table 2: TB/HIV co-infected patients and HIV patients without TB based on age groups.

CD4 cells of TB/HIV co-infected patients before and after 4 months of follow up

CD4 cell count quantification is a vital indicator of AIDS disease status in human being living with HIV [11]. The CD4+ T cells of all TB/HIV co-infected patients are represented in cells/mm^3 in the table 3 before and after 4 months of follow up. At the beginning, a half of all TB/HIV co-infected patients have CD4 cells less than 175 cells/mm^3. However after 4 months of follow up, most of them (94.4%) have CD4 cells above 175 cells/mm^3 (with 55.6% above 350 cells/mm^3). Therefore, the patients showed recovery of CD4 cells after 4 months of follow up and treatment. Another study conducted by Jourdain., *et al.* [12] reported similar results in an investigation done in Thailand. Similar results were also reported by Nyirihirwe [13] in a study called assessment of immune status and viral load levels among HIV patients attending Ruhengeri referral hospital where an increase in CD4 cells at 40% after six on antiretroviral therapy was observed.

	At the beginning					After 4 months				
CD4 cells/mm^3	**Fr**	**%**	**Chi-square**	**df**	**p-value**	**Fr**	**%**	**Chi-square**	**df**	**p-value**
Less than 175 cells/mm^3	9	50.0	83	3	0.001*	1	5.6	86.8	3	0.002*
[175-350 cells/mm^3]	6	33.3				7	38.8			
Above 350 cells/mm^3	3	16.7				10	55.6			
Total	18	100.0				18	100.0			

Table 3: CD4 cells of TB/HIV co-infected patients at the beginning and after 4 months of follow up.

Viral load levels of TB/HIV co-infected patients before and after 4 months of follow up

The viral load in plasma is estimated in order to know appropriate antiretroviral regimens of HIV patients [14]. Table 4 highlights the viral load levels of all TB/HIV co-infected patients before and after 4 months of follow up. Most of the TB/HIV co-infected patients have viral load above 1000 copies/ml at the beginning. However, a decline in viral load was noticed after 4 months of follow up and treatment. The study carried out in eastern Ethiopia on the prevalence of *M. tuberculosis* and HIV infections among patients visiting Dicloran referral hospital show a decreasing in viral load level among TB/HIV co-infected patients after follow up and treatment [15]. Nyirihirwe [13] described similar trend in the study called assessment of immune status and viral load levels among HIV patients attending Ruhengeri referral hospital. Indeed, a decrease in viral load levels at 56% after 6 months on antiretroviral therapy was recorded. The co-infected patients have to respect the given advice about medication in order to sustain the decrease in viral load.

	At the beginning		After 4 months				
Viral load	**Frequency**	**%**	**Frequency**	**%**	**Chi-square**	**df**	**p-value**
Less than 20 copies/ml	1	5.6	2	11.1%	82.09	3	0.003*
[20-1000 copies/ml]	4	22.2	9	50.0%			
Above 1000 copies/ml	13	72.2	7	38.9%			
Total	18	100.0	18	100.0			

Table 4: VL of TB/HIV co-infected patients at the beginning and after 4 months of follow up.

Conclusion

The present study was carried out to assess the CD4 cells and viral load levels in TB/HIV co-infected patients attending ADEPR Nyamata Hospital. The high frequency of TB/HIV co-infection was seen for the patients between 36 and 54 years old. After 4 months, there was an important augmentation of CD4 cells and a viral load decline. Therefore, the treatment allows CD4 cells to recover and diminishes viral load levels in a significant number of patients. The different stakeholders have to enhance the clinical care of TB/HIV co-infected patients. The CD4 count and viral load have to be checked within a period of less than 3 months, especially among patients under HAART medication. TB/HIV co-infected patients have to obey to the medical instructions given and they must not take alcoholic drinks during ARVs therapy in order to survive and live longer. Further researchers have to be carried out in other Rwandan hospitals to estimate CD4 cells and viral load levels in the TB/HIV co-infected patients in order to have a country picture.

Conflicts of Interest

The author declares no financial conflicts of interest.

Acknowledgments

The INES Ruhengeri management and Nyamata hospital were acknowledged for financial support.

Bibliography

1. Pawlowski ME., *et al*. "Tuberculosis and human immunodeficiency virus co-infection". *PLOS Pathogens* 8 (2012): e1002464.

2. Giorgia S., *et al*. "Tuberculosis: Epidemiology and control". *Mediterranean Journal of Hematology and Infectious Diseases* 6 (2014): e2014070.

3. Mitku AA., *et al*. "Prevalence and associated factors of TB/HIV co-infection among HIV infected patients in Ethiopia". *African Journal of Health Sciences* 16 (2016): 588-595.

4. Ligidi T. Prevalence of Human Immunodeficiency Virus Infection and Immune Status in Newly Diagnosed Adult Tuberculosis Patients in Adama Hospital (2008).

5. Ayieko SY. Epidemiology of Tuberculosis and Human Immunodeficiency Virus Co-Infection, Clinical Presentations and Impact on Immune - Haematological Parameters in Mombasa (2015).

6. Salim SSA., *et al*. "HIV infection and tuberculosis in South Africa: an urgent need to escalate the public health response". *Lancet* 374 (2009): 921-933.

7. Kangabo L. Immunological Profile of Tuberculosis and HIV Co-Infected Patients Attending Ruhengeri Referal Hospital (2017).

8. Mukasano MV. "Trend of Tuberculosis from 2012-2016 at Nemba Hospital". INES Ruhengeri, dissertation (2017).

9. Yonge SA., *et al*. "Human Immunodeficiency virus and immunological profiles among suspected tuberculosis cases in Mombasa County, Kenya". *Journal of Tuberculosis Research* 4 (2016): 34-45.

10. Askar AHO. Tuberculosis and HIV Co-infection in Two District of Somaliland (2008).

11. Asfaw A., *et al*. "CD4 Cell count trends after commencement of antiretroviral therapy among HIV infected patients in Tigray, Northern Ethiopia. A retrospective cross sectional study". *Plos One* 10 (2015): e0122583.

12. Jourdain G., *et al*. "Switching HIV treatment in adults based on CD4 count versus viral load monitoring: A randomized, non- inferiority trial in Thailand". *PLoS Medicine* 10 (2013): e1001494.

13. Nyirihirwe OBS. Assessment of Immune Status and Viral Load Levels Among HIV Positive Patients Attending Ruhengeri Referral Hospital (2017).

14. Mermin J., *et al*. "Utility of routine viral load, CD4 cell count, and clinical monitoring among adults with HIV receiving antiretroviral therapy in Uganda: Randomised trial". *Biomedical Journal* 343 (2011): d6792.

15. Teshome A., *et al*. Prevalence of Mycobacterium Tuberculosis and HIV Infections Among Patients Visiting Dil-Chora Referral Hospital, Dire Dawa Administrative Council, Eastern Ethiopia (2014).

Volume 3 Issue 1 January 2020