WORLD JOURNAL OF PHARMACEUTICAL RESEARCH
SJIF Impact Factor 7.523
Volume 6, Issue 8, 1897-1908. Research Article ISSN 2277– 7105

THE IMPACT OF VIRAL LOAD MONITORING AND CD4 IN PATIENT TAKING ANTI-RETROVIRAL TREATMENT AT KICUKIRO HEALTH CENTER

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Article Received on
10 June 2017,
Revised on 01 July 2017,
Accepted on 21 July 2017
DOI: 10.20959/wjpr20178-9114

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ABSTRACT

The viral load and CD4 count are two measures used to monitor the health status of individuals with HIV that is why the assessment on ART affects CD_4 count and viral load for the patients taking ART at Kicukiro health center has been conducted at Kicukiro Health Center. The research questions were to see if the ARTS cause the increase of CD4 and the decrease of viral load in HIV positive patients; and to see if the variation of the viral load and CD4 is the same in female and male. The main objective of this study was to assess the effect of ART on CD_4 and viral load for the patient on ART at Kicukiro Health Center. The target population was HIV positive patient taking ART at Kicukiro HC. A total sample of 100 patients has been selected and each selected patient has been tested on CD4 and viral load in three interval of time from August 2013 to September 2014. We have analyzed the impact of sex in increasing of CD4 and decreasing viral load. After analysis, we found that the number of CD4 count increase in male than in female and the number of viral load decrease in male than in female and this is due to biological differences between male and female. The comparison of the number of viral load in three different time has been done using t test paired sample. The analysis has showed that there is a significance difference between the number of viral load from August 2013 to September 2014 with, $p<0,05$. This shows the success of antiretroviral success because the number of

viral load has been reduced. Then our question on the role of ART in increasing CD4 and decreasing viral load has been achieved. The comparison of the number of CD_4 count in three different time has been done using t test paired sample. The analysis has showed that there is a significance difference between the number of CD_4 from August 2013 to September 2014 with, $p<0,05$. 2014. This shows a good immunological response of patients to ART and this will avoid the occurrence of opportunistic infection. As conclusion the main objective of our study has been achieved and our hypothesis has been verified.

KEYWORD: viral load. CD4 count, patient, Anti-retroviral Treatment, Kicukiro Health Center.

INTRODUCTION

The Human Immunodeficiency Virus, also known as HIV causes AIDS and this is a major problems of public health in the world where at the end of 2012, about 40 million of people worldwide were living with HIV / AIDS and 70 $^{0/0}$ of all infected were in Africa. (UNAIDS, 2012).

Across sub-Saharan Africa, an estimated 22.4 million people are infected with the human immunodeficiency virus (HIV) of these; approximately 5 million are currently receiving antiretroviral therapy (ART). According to Demographic health survey report of 2010, the persons living with HIV were $3^{0/0}$ in 2010 in Rwanda (DHS 2010) and 122940 patients living with HIV are under ART (RBC, 2013).

HIV is transmitted from person to person via bodily fluids; including blood, semen, vaginal discharge, and breast milk HIV can infect and kill many different types of cells in the body, but the primary targets are immune cells called CD_4 T-cells. The CD_4 T-cells are a type of T-lymphocytes which coordinate the immune system's response to infection and disease.

These cells express a molecule called CD_4 on their surfaces, which allow them to detect foreign substances, including viruses that enter the body. HIV binds to the receptors on CD_4 cells and enters the white blood cell. Once inside the cell, HIV begins replicating (Rye et al, 2012).

HIV RNA (viral load) and CD_4 T lymphocyte (CD_4) cell count are the two surrogate markers of antiretroviral treatment (ART) responses and HIV disease progression that are used for decades to manage and monitor HIV infection. Viral load is a marker of response to ART. A

patient's pre-ART viral load level and the magnitude of viral load decline after initiation of ART provide prognostic information about the probability of disease progression. The key goal of ART is to achieve and maintain durable viral suppression. Thus, the most important use of the viral load is to monitor the effectiveness of therapy after initiation of ART.

Measurement of CD_4 count is particularly useful before initiation of ART. The CD_4 cell count provides information on the overall immune function of an HIV-infected patient. The measurement is critical in establishing thresholds for the initiation and discontinuation of opportunistic infection prophylaxis and in assessing the urgency to initiate ART. (Michael sweat et al, 2012).

It is in this context that we have done the assessment for the effect of viral load monitoring and CD_4 in patient taking ART at Kicukiro Health Center from August 2013 to September 2014.

Research question

1. Are the ARTS cause the increase of CD4 and the decrease of viral load in HIV positive taking ARTS at Kicukiro HC.
2. Is there any correlation between the number of viral load, CD4 and the sex in HIV patients taking ARTS at Kicukiro HC?
3. The variation of the viral load and CD4 is the same in female and male?

Objectives of the study

Main objective

The main objective of this study was to assess the effect of ART CD_4 and viral load for the patient on ART at Kicukiro Health Center.

Specifics objectives

- To determine the number of viral load and CD4 in patient under ARVs at Kicukiro Health Center in three interval of time.
- To compare the number of CD_4 counts and viral load in males and females.
- To establish the relationship between the number of CD_4 and viral load.

METHODOLOGY

Statistical method.

The data was analyzed using SPSS version 16.

The statistical methods have been allowed us to present and to analyze the data obtained from our study. Descriptive statistic allowed us to present the results obtained and inferential statistic has allow us to analyze the data.

RESULTS

Table I: Presentation of CD4 count according to the sex.

Sex	Mean of CD4 count in August 2013	Mean of CD4 in February 2014	Mean of CD4 in September 2014
Male	524,679	619,207	744,188
Female	495,893	549,361	839,191

The analysis of CD4 count in three intervals of period in table I shows that the number of CD4 count increase in male than female.

Table II: Presentation of viral load according to the sex.

Sex	Mean of viral load in August 2013	Mean of viral load in February 2014	Mean of viral load in September 2014
Male	24,361	22,0425	18,132
Female	24,363	20,245	19,446

The analysis of viral load in three intervals of period in table II shows that the number of viral load decrease in male than female.

Table III: Presentation of CD4 according to the range age.

Range of age	Mean of CD4 in August 2013	Mean of CD4 in February	Mean of CD4 in September 2014
19−29	560,375	659,875	761,875
30−40	498,162	575,432	712
41−51	488,578	619,473	731,105
52−65	510,842	563,647	688,631

According to the age range, the patients between 19- 29 age have high number of CD4 than other range of age.

Table IV: Presentation of viral load according to the range age.

Range of age	Mean of viral load in August 2013	Mean of viral load in February	Mean of viral load in September 2014
19−29	19,458	17,541	17,625
30−40	20,540	19,729	17,810
41−51	24,0526	21,894	20,105
52−65	29,684	25,210	22,476

According to the age range, the patients between 19- 29 ages have low number of viral load than other range of age.

Table V: The analysis of correlation between sex of the patients and their CD4

		Sex of patients	CD4
Sex of patients	Pearson Correlation	1	.077
	Sig. (2-tailed)		.444
	N	100	100
CD4	Pearson Correlation	.077	1
	Sig. (2-tailed)	.444	
	N	100	100

The analysis of correlation between sex and their CD4 count by the test of correlation r showed that there is no correlation between the number of CD4 and the sex with r = 0, 077, and p> 0, 05.

Table VI: The analysis of correlation between sex of the patients and their number of viral load.

		Sex of patient taking ART	Viral load in August 2013
Sex of patients taking ART	Pearson Correlation	1	.129
	Sig. (2-tailed)		.202
	N	100	100
Viral load in August 2013	Pearson Correlation	-.129	1
	Sig. (2-tailed)	.202	
	N	100	100

The analysis of correlation between sex and their viral load measurement by the test of correlation r showed that there is no correlation between the number of viral load and the sex With r = 0, 129, and p> 0, 005.

Table VII: Comparison between the number of viral load in February 2014 and the number of viral load in September 2014.

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
Pair 1	Viral load in August 2013 - Viral load in February 2014	2.020000E0	5.083107	.508311	1.011401	3.028599	3.974	99	.000

The comparison between the number of viral load in August 2013 and in February 2014 has been done using t test paired sample .The analysis has showed that there is a significance difference between the number of viral load in August 2013 and viral load in February 2014 with t= 3, 974, p<0,05.

TABLE VIII: Comparison between the number of viral load in February 2014 and the number of viral load in September 2014.

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
Pair 1	Viral load in February 2014 - Viral load in September 2014	1.57000	4.98332	.49833	.58120	2.55880	3.151	99	.002

The comparison between the number of viral load in February 2014 and viral load in September 2014 has been done using t test paired sample. The analysis has showed that there is significance difference between the number of viral load in February 2014 and viral load in September 2014 with t=3,151, P<0, 05.

The comparison between the number of viral load in August 2013 and viral load in September 2014 has been done using t test paired sample. The analysis has showed that there is a significance difference between the number of viral load in August 2013 and viral load in September 2014 with t = 4, 950, p<0,05.

Table IX: **Comparison of the number of CD4 count in February and in September 2014**

		Paired Differences					t	Df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
Pair 1	Viral load in August2013viral load in September	3.590000Eo	7.253136	7.25314	2.150820	5.029180	4.950	99	.000

The comparison of number of CD4 count in February and the number of CD4 in September 2014 has been done using t test paired sample. The analysis has showed that there is significance difference between the number of CD4 count in February and in September 2014 with t = 4.950, p<0,05.

Table X: Comparison between the number of CD4 count in February2013 and the number of CD4 count in September 2014.

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
Pair 1	CD4 in February 2014 - CD4 IN September 2014	1.21430E2	118.30420	11.83042	144.90412	97.95588	10.264	99	.000

The comparison of number of CD4 count in February and the number of CD4 in September 2014 has been done using t test paired sample. The analysis has showed that there is a significance difference between the number of CD4 count in February and in September 2014 with t = 14, 341, p<0, 05.

Table XI: The analysis of correlation between the viral load and CD4 count.

		Viral load	CD4
Viral load	Pearson Correlation	1	-.258**
	Sig. (2-tailed)		.009
	N	100	100
CD4	Pearson Correlation	-.258**	1
	Sig. (2-tailed)	.009	
	N	100	100

**Correlation is significant at the 0.01 level (2-tailed).

The analysis of correlation between the CD4 count and viral has been done using the correlation test r. The analysis has showed that there is a negative correlation between the number of CD4 count and the viral load with r. This means that plus the CD4 increase, plus the number of viral load decrease.

Table 10: **The presentation of the patients according to the sexes.**

	Frequency	Percent	Cumulative Percent
Males	47	47.0	47.0
Females	53	53.0	100.0
Total	100	100.0	

This table shows that 47 $^{0/0}$ was the males and 53 $^{0/0}$ was the females.

OUTCOMES DISCUSSION

Viral load and CD4 count are two measures used to monitor the health status of individuals with HIV. Viral load has an impact on the CD4 count as an increase of virus in the blood leads to a reduction in CD4 T cells, meaning that there is a greater risk of developing symptomatic HIV in the following years. (NAM, 2006).

The population was all expected those who are started the ARV with lower CD4 and higher low viral load at baseline of CD4> 200 cells/ µl with Viral load ≥20 copies of viral RNA.

The CD4 and viral load were assessed based on first CD4 and viral load at August 2013, the second CD4 and viral load at February 2014, the third CD4 and viral load at September 2014.

We have analyzed the impact of sex in increasing of CD4 and decreasing viral load.

After analysis, we found that the number of CD4 count increase in male than in female and the number of viral load decrease in male than in female.

This may be to biological factors such as difference between those two sexes like hormonal differences. Those results are similar of those conducted in USA by Katzenstein on the Sex differences in HIV-1 viral load and progression to AIDS (MELLOW JW, 2012).Then our hypothesis which said that CD4 counts could increase and viral load decrease differently in males and females is verified.

According to the age range, the patients between 19- 29 ages have high number of CD4 than other range of age. This is due to physiological factor because this is the young group compared to other range of age analyzed. Those results are similar to those found in the study conducted in China on the role of age in progression of HIV. (CARPENTER CCJ, 2012).

The comparison of the number of viral load in August 2013 and the number of viral load in February 2014. This has been done using t test paired sample .The analysis has showed that there is a significance difference between the number of viral load in August 2013 and viral load in February 2014 with t= 3, 974, $p<0,05$. This shows the success of antiretroviral success because the number of viral load has been reduced. Then our first question which was that ARTS cause the increase of CD4 and the decrease of viral load in HIV positive taking ARTS at Kicukiro HC has been answered.

The comparison of the number of viral load in February and the number of viral load in September 2014 has been done using t test paired sample.

The analysis has showed also that there is a significance difference between the number of viral load in February 2014 and viral load in September 2014 with t = 3, 151, p<0, 05. This shows a good response of ART to the patients. Those results are similar to those obtained in other research conducted in Belgium on the role of ART in immunological response. (Brancato G, 2011).

The comparison of the number of CD4 count in February and the number of CD4 in September 2014. This has been done using t test paired sample. The analysis has showed that there is a significance difference between the number of CD4 count in February and in September 2014 with t = 10, 264, p<0, 05. This shows a good immunological response of patients to ART and this will avoid the occurrence of opportunistic infections. Those results The comparison between the number of CD4 count in August 2013 and the number of CD4 count in September 2014 using t test paired sample. The analysis has showed that there is a significance difference between the number of CD4 count in February and in September 2014 with t = 14, 341, p<0, 05. This means that after one year there is a significance variation between the numbers of CD4 count after one year.

The analysis of the correlation between the viral load and CD4 count. This analysis of correlation between the CD4 count and viral has been done using the correlation test r. The analysis has showed that there is a negative correlation between the number of CD4 count and the viral load with r.

CONCLUSION AND RECOMMENDATIONS

The assessment for the effect of CD4 and viral load for the patients taking ART at Kicukiro health center has been conducted from August 2013 to September 2014.

The research questions were to determinate if the ARTS cause the increase of CD4 and the decrease of viral load in HIV positive taking ARTS at Kicukiro HC; and if the variation of the viral load and CD4 is the same in female and male.

The main objective of this study was to assess the effect of ART on CD_4 and viral load for the patient on ART at Kicukiro Health Center.

The study population was the HIV positive taking ART at Kicukiro HC. After results presentation and discuss, we found that the number of CD4 increase while the number of viral load decrease.

We have analyzed also the impact of sex in increasing of CD4 and decreasing viral load. After analysis, we found that the number of CD4 count increase in male than in female. This may be to biological factors such as difference between those two sex like hormonal differences. Then our hypothesis which said that CD4 counts could increase and viral load decrease differently in males and females is verified.

And we conclude more the CD4 increase, more the number of viral load decrease. This show that as HIV reproduces within the body, the viral load increases and HIV destroys the CD4+ T-cells and thus lowers the amount of cells present. Generally, the higher the HIV viral load, the more CD4+ T-cells are being destroyed. The goals are to keep CD4+ T-cell count high and viral load low. In this situation the numbers of CD4 has increased and the numbers of viral load has decreased this shows a good immunological response to ART for the patients at Kicukiro health center.

RECOMMENDATIONS

To Kicukiro health center

To continue to do assessment on the patient taking ART in order to determinate if the ART is successful or not.

To other researchers

To extend this research to other health facilities in order to evaluate the ART.

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