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MONITORING OF CD4 IN HIV PATIENTS PRE AND POST TREATMENT WITH ANTIRETROVIRAL THERAPY (ART)

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ABSTRACT

Background: Human Immunodeficiency Virus (HIV) infection leads to a progressive reduction in the number of T cells expressing CD4. World Health Organization (WHO) recommends antiretroviral therapy (ART) for all people with HIV. Also WHO recommends to monitor the CD4 as indication of treatment failure and the need to switch from first-line to second-line drugs. **Objectives**: Therefore, the study aims to monitor the efficacy of ART in HIV patients hospitalizations based on CD4 count using protocol of National AIDS and HIV Control Program that is derived from World Health Organization (WHO) guideline. **Methods**: Based on a cross sectional study, 15 subjects were collected from adults of 27–52 years of age, suffering from diarrhea, recurrent oral ulceration, fungal infection, lymphadenopathy, herpes zoster and fever attended at the center of tropical medicine and infectious diseases (CTMID) of Authority of Public AL- Thawra Hospital in Hodeidah, Yemen. HIV was diagnosed clinically and laboratory namely HIV antigen test, then CD4 count was assayed pre – treatment. The treatment course consists of triple ART namely Tenofovir /Efavirenz / Emtricitabine. The efficacy of ART was monitored based on CD4 count post six months. **Results**: 15 patients were enrolled in unit of HIV treatment and monitored pre and post treatment. The average of CD4 count pre - treatment was 216 ± 129 cell/µL and increased post – treatment about 404 ± 236 cell/µL. The patients improved , that was significantly statistically different ($p < 0.05$) between pre and post – treatment . **Conclusion:** The finding data showed that the ART improved the immunity and the quality of life for HIV patients.

KEYWORDS: ART, HIV, Monitoring, CD4, Efficacy, Therapeutic, Yemen.

INTRODUCTION

The global Human Immunodeficiency Virus (HIV) epidemic claimed fewer lives in 2015 than at any point in almost two decades and fewer people became newly infected with HIV than in any year since 1991. The list of countries on the brink of eliminating new HIV infections among children keeps growing. A massive expansion of antiretroviral therapy (ART) has reduced the global number of people dying from HIV-related causes to about 1.1 million in 2015 – 45% fewer than in 2005. The Joint United Nations Program on HIV/AIDS (UNAIDS) / World Health Organization (WHO) estimates show that more than 18 million people were receiving ART in mid-2016.[1]

HIV infection leads to a progressive reduction in the number of T cells expressing CD4. World Health Organization (WHO) recommends antiretroviral therapy (ART) for all people with HIV. Standard ART consists of the combination of antiretroviral (ARV) drugs to maximally suppress the HIV and stop the progression of HIV disease. It also recommends offer of pre-exposure prophylaxis to people at substantial risk of HIV infection as an additional prevention choice as part of comprehensive prevention.[2,3]

On the other hand, the revised WHO clinical classification of HIV-associated disease is designed to be used in patients with confirmed HIV infection. Along with monitoring of the CD4 T lymphocytes count, where available, the staging system is used to guide decisions on when to start prophylaxis for opportunistic infections (OI) and when to start and switch ART.[4]

Our study aims to monitor the effect of ART on HIV patients hospitalizations based on CD4 using protocol of National AIDS and HIV Control Program that is derived from World Health Organization (WHO) guideline. On the other mean, the study have attempted to knowledge

of the role(s) of ART therapy to enhance the CD4 in HIV patients.

MATERILAS AND METHODS

Study design

A cross sectional study conducted by recruiting adults aged from 18 – 52 years of age. The study was conducted from January until December 2015 at National AIDS and HIV Control Program, Center of Tropical Medicine and Infectious Diseases (CTMID), Authority of Public AL-Thawra Hospital, Hodeidah city, Yemen. 15 subjects suffering from diarrhea, recurrent oral ulceration, fungal infection, lymphadenopathy, herpes zoster and fever were diagnosed clinically and laboratory namely HIV antigen test and CD4 count assay.

Ethical issue

Patients received a simple explanation of the aim of the study and asked to participate. If they agreed, the sample was collected and an interview was conducted. Confidentiality of the collected data was achieved by keeping data record in a locked room with limited access to the research team only. Clinical information was obtained from the patients. Information included the sex, age, symptoms, and accommodation.

Diagnosis of HIV

Enzyme Linked Sorbent Assay (ELISA) of Bio - Rad, Germany was used with kit of human for detection of HIV in the sera for 15 patients.[5,6]

Assay of CD4 count pre and post – treatment

CD4 count was assayed using kit of human , Germany with Immunofluroscence analysis - flow cytometry of Partic, Germany as the gold standard method for CD4 T lymphocytes measurement.[4]

Anti-retroviral therapy (ART)

The treatment course consists of ART of Mylan company namely Tenofovir 300 mg "nucleotide analog reverse-transcriptase inhibitor" (NARTI) - Efavirenz 600 mg "non-nucleoside reverse transcriptase inhibitor" (NNRTI) and Emtricitabine 200 mg " nucleoside reverse transcriptase inhibitor"(NRTI). The ART dose was taken daily by HIV patients. The efficacy of therapy was monitored after six months.[7]

Statistical methods

Demographic and laboratory results data were entered and analyzed using Excel Software 2010. Descriptive analysis and Chi-square test were used to make comparisons among categorical variables. For all statistical analyses, a p -value of less than 0.05 was considered statistically significant.

RESULTS

The background information of 15 patients with HIV were summarized in (Table 1) namely age, and sex.

The results showed that the age of the patients included in this study between 18-52 years with 4:1 male: female. 15 patients were enrolled in unit of HIV treatment of CTMID and CD4 count was monitored. The average of CD4 pre - treatment was 216 ± 129 cell/µL and increased post – treatment 404 ± 236 cell/µL. The patients were recovered and of patients was significantly statistically different ($p < 0.05$) but the CD4 post – treatment under normal range (800 – 1200 cell/µL).

Table 1 : Monitoring of CD4 pre and post treatment

Patient Number	Age	Gander	CD4 account Pre – Treatment	CD4 account Post – Treatment	
1	40	M	306	374	
2	52	M	331	351	
3	39	F	169	225	
4	40	M	151	389	
5	28	F	230	186	
6	37	M	272	459	
7	30	M	70	385	
8	23	M	253	538	
9	45	M	192	357	
10	33	M	102	196	
11	34	F	526	1163	
12	35	M	80	216	
13	34	F	303	520	
14	40	M	118	393	
15	18	M	149	314	
			216 ± 129	404 ± 236	$p < 0.05$

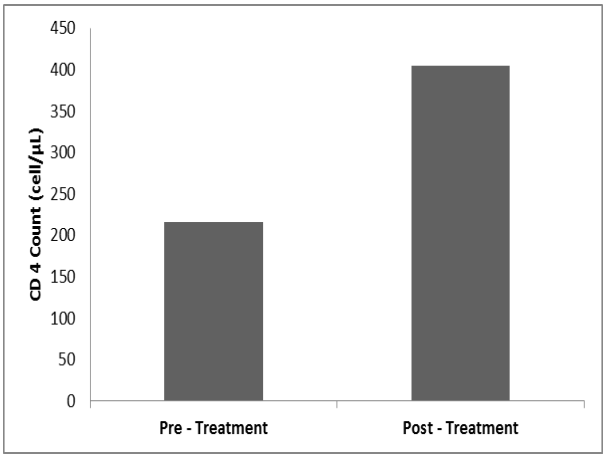

Figure 1: Monitoring of CD4 pre and post treatment.

DISCUSSION

Monitoring people on ART is important to ensure successful treatment, identify adherence problems and determine whether ART regimens should be switched in case of treatment failure. In the absence of better criteria namely viral load test to predict treatment failure, it is important to use CD4 cell count and clinical assessment to identify those at the highest risk of disease progression and mortality. On the other hand, the monitoring provides an early and more accurate indication of treatment failure and the need to switch from first-line to second-line drugs, reducing the accumulation of drug resistance mutations and improving clinical outcomes.[8,9]

The CD4 cell surface antigen belongs to the immunoglobulin superfamily and is the primary receptor for the HIV-1. The high affinity interaction between HIV-1 and CD4 is mediated by the viral envelope glycoprotein gp120.[10] In previous study described the role(s) of CD4 in human T-cell function and the consequences of interactions between CD4 molecules and the HIV. CD4 serves as a high affinity receptor for HIV, the causative agent of AIDS. Not only does interaction between the virus and CD4 initiate viral fusion to the cell membrane and HIV entry but, in addition, a similar molecular interaction initiates fusion between HIV-infected and uninfected CD4 cells, resulting in the formation of multinucleated syncytia. Since uninfected CD4 cells are, in effect, recruited into such syncytia, this mechanism may account in part for the depletion of CD4 T cells in HIV-infected patients.[11]

The finding data showed that the ART improved the immunity and the quality of life for patients. This result was supported by previous study that the combined ART (Tenofovir, Efavirenz and Emtricitabine) reduced HIV-1 plasma load and improved CD4 counts but does not interfere with ongoing lymphocyte apoptosis. On the other mean, there was a prompt reduction in plasma viremia and a secondary increase in CD4 counts, but the lack of any effect on the process of lymphocyte apoptosis.[12] On the other hand, previous study reported the change in CD4 with ART was from 159 cells/mm 3 to 317 cells/mm 3. This study supported our study. Also, the CD4 cell count thresholds were recently raised from 350 to 500 cells/mL in the United States and from 200 to 350 cells/mL in mid- and low-income countries.[13]

In addition, the efficacy of ART regimens in the treatment of patients infected with HIV has been established in several randomized clinical trials. Our data was supported by previous study in British Columbia who were treated with double- and triple-drug regimens. The population-based cohort study confirms that patients initially treated with a triple-drug antiretroviral regimen comprising two Nucleoside/Nucleotide Reverse Transcriptase Inhibitors (NRTIs) plus protease inhibitor or a NNRTI have a lower risk of morbidity and death than patients treated exclusively with 2 NRTIs.[14]

CONCLUSION

ART is now recommended for all HIV-infected patients. ART helps the people with HIV live longer, healthier lives. On the other hand, the CD4 counts should be monitored every 3 to 6 months to assess the urgency of ART initiation. Also, the study concluded that the ART improved the immunity and the quality of life for patients.

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