Proportion of CD4 cells before and after antiretroviral therapy (ART) in people living with HIV/AIDS visiting ART center in Sukraraj Tropical and Infectious Disease Hospital, Teku, Kathmandu, Nepal

S Neupane*, R Gupta* and **SB Pun****

** Central Department of Zoology, Tribhuvan University, Kirtipur, Nepal*

*** Sukraraj Tropical and Infectious Disease Hospital*

Abstract

The present study deals with effect of antiretroviral treatment (ART) and effect of antiretroviral drugs (ARV) on clients attending the ART and Voluntary counseling and testing center (VCT). It is a prospective cross-sectional record-based study. According to the present study, 78 clients have taken ART age up to 54 years. Out of 78 positives, 45 (57.69%) were males and 33 (42.30%) were females. The result showed no significant relationship between age and gender (χ^2=4.196, P>0.05) of HIV positives taking ART. Majority of the positives taking ART have CD4 count less than 350 cells/mm^3 of blood and no significant relation was found between the number of positives taking ART and the CD4 cell count (χ^2=40, P>0.05). Majority of the positives i.e. 38 (48.7%) were on the WHO stage II. Majority of the positives i.e. 55 (70.5%) were given ART regimen containing Zidovudine (ZDV), Lamivudine (3TC) and Nevirapine (NVP).

The mean rise of CD4 cells i.e. 368.79 cells/µl of blood after 6 months of ART was found significant to initial CD4 count (P<0.05). Hence significant relationship was established between the ART and the increase in CD4 count (V= 8.046 P<0.05). It is also found that there is a significant increase in CD4 counts in both NVP and EFV group in unit increase of time (i.e. 6 months) (p<0.05). Also there was a significant increase (P<0.05) in weight of the positives after 6 months of ART.

***Key words**: VCT, ARV drugs, CD4 count*

Introduction

According to the report on acquired immunodeficiency syndrome (AIDS) released by the UNAIDS and World Health Organization (WHO), approximately 34 million people are living with HIV/AIDS worldwide (WHO/UNAIDS Epidemic Update 2011). The reported HIV cases in Nepal are 20,583. Out of these cases 13,157 are males while 7,417 are females and 9 are third genders. The age group between 30-39 has the highest prevalence of HIV/AIDS with 7,963 cases. Out of the total sub groups, clients of sex workers have the highest prevalence of HIV/AIDS with 8,772 cases (NCASC 2012).

Anti-retroviral therapy (ART) started in Nepal from February 2004 from Teku Hospital. Government is providing free of cost ART service to all those in need. There are National ART Guidelines and standard operating procedures for the clinical management of ART. Currently there are 39 ART centers in 33 districts in Nepal. CD4 count service is available at 16 sites, while 4 sites have CD4 caliber (NCASC 2012).

Counseling for HIV and AIDS has become a core element of a holistic model of health care; in this model, psychological issues are recognized as integral to positive management. Both pre and post counseling have become standard components of prevention-oriented HIV antibody testing programs (Valdiserri et al. 1993). The Voluntary Counseling and Testing Center (VCTC) provide a key entry point for the continuum of care in HIV/AIDS for all segments of the population.

The data collected in the present study is from ART center of Sukraraj Tropical and Infectious Disease Hospital, Teku, Kathmandu, Nepal, may provide important clues regarding the effect of HIV positive individuals. Hence the present work is taken up to study the proportion of CD4 cells on the general public visiting ART center of Sukraraj Tropical and Infectious Disease Hospital.

Materials and Methods

The present study was conducted at the ART center of the Sukraraj Tropical and Infectious Disease Hospital, Teku, Kathmandu, Nepal. It is a separate department of the hospital which is funded by National Center for AIDS and STD Control (NCASC) and The Global Fund under health ministry.

To investigate this study, permission from Sukraraj Tropical and Infectious Disease Hospital (STIDH), Teku, Kathmandu, authorities of Voluntary Counseling and Testing Center (VCTC) and ART center was obtained. The collected data was provided by ART center of STIDH so the reliability of the data is very high.

In the present study, only the data of positives who tested positive for HIV at the VCTC was included. This information was recorded when the positive visited the VCTC for the first time and the positives with low CD4 counts were sent to ART center for treatment. Data was collected and analyzed using the statistical package Microsoft Excel, SPSS 16 and R(R console 2.15.2). Questionnaire survey was done to know the social status of HIV positives.

Results

Demographic profile of PLHIV who are under ART

A cross-sectional study was carried out in 78 positives, undergoing ART in ART center, Sukraraj Tropical and Infectious Disease Hospital, Teku, Kathmandu, Nepal between February 2012 to August 2012. The present study enrolled 78 PLHIV.

Out of 78 respondents, 45 (57.69%) were male while 33 (42.30%) were female. Respondent's age ranged from 4-60 years. Majority of positives were in the age group of 21-40 years (78.2%) (Table 1). No significant relationship between age and gender (χ^2=4.196, P>0.05) of HIV positives taking ART was found.

Table 1. Distribution of PLHIV taking ART according to Age and Gender

Age group	Male		Female		Total	
	No.	%	No.	%	No.	%
0-20	2	4.4	3	9.1	5	6.4
21-40	33	73.4	28	84.8	61	78.2
41-60	10	22.2	2	6.1	12	15.4
Total	45	100	33	100	78	100

(χ^2=4.196, P>0.05)

Distribution of PLHIV by Baseline CD4 count

After the positives have been counseled for ART, their social and support structure were assessed. Positives were referred to do CD4 count at every six months and monitoring of the progress was done. Follow up was maintained as: every two weeks in the first month, monthly up to the third month after the start of ART, then once in every three months and as necessary of the positives. As shown in the Table 2, about 13 of the positives (16.7%) had CD4 count<50 cells/mm^3 of blood. 9 positives (11.5%) had CD4 count between 51 to 100 cells/mm^3, 11 positives (14.1%) had CD4 count between 101 to 150 cells/mm^3, 13 positives (16.7%) had CD4 count between 151 to 200 cells/mm^3, 8 positives (10.3%) had CD4 count between 201 to 250 cells/mm^3, 8 positives (10.3%) had CD4 count between 251 to 300 cells/mm^3 , 10 positives (12.8%) had CD4 count between 300-350 cells/mm^3 and 6 positives (7.7%) had CD4 count more than 350 cells/mm^3.

Table 2. Distribution of PLHIV by Baseline CD4 count

CD4 range/cu mm blood	Male	Female	Total	%
0-50	9	4	13	16.7
51-100	4	5	9	11.5
101-150	9	2	11	14.1
151-200	7	6	13	16.7
201-250	6	2	8	10.25
251-300	2	6	8	10.25
300-350	7	3	10	12.8
350+	1	5	6	7.7
Total	45	33	78	100.0

Out of 78 positives taking ART 72 positives (92.31%) have CD4 cell count less than 350 cells/mm^3 of blood. Statistically no significant relation between the number of positives taking ART and the CD4 cell count was found (χ^2=40, P>0.05).

Distribution of the positives on the basis of WHO staging

Out of 78 positives, 10 positives (12.8%) were on WHO clinical stage I, 38 positives (48.7%) were on WHO clinical stage II, 21 positives (26.9%) were on WHO clinical stage III and 8 positives (11.5%) were on WHO clinical stage IV (Table 3).

Table 3. Distribution of PLHIV on the basis of WHO staging

WHO staging	number of positives	%
I	10	12.8
II	38	48.7
III	21	26.9
IV	9	11.5
Total	78	100

Effect of ARV drugs in PLHIV who are under ART

Antiretroviral therapy was started in all 78 positives. 56 (71.8%) positives were on the first line Nevirapine (NVP) containing regimen and 22 (28.2%) positives were on the Efavirenz (EFV) containing regimen. 55 positives (70.5%) were given ART regimen containing Zidovudine (ZDV), Lamivudine (3TC), Nevirapine (NVP); 22 positives (28.2%) were given ART regimen containing Zidovudine (ZDV), Lamivudine (3TC), Efavirenz (EFV); and 1 positive (1.3%) was given ART regimen containing Stavudine (d4T), Lamivudine (3TC), Nevirapine (NVP) (Table 4).

Table 4: ART regimen prescribed

Regimen	Frequency (number of positives)	Percentage (%)
Zidovudine+Lamivudine+Nevirapine	55	70.5
Zidovudine+Lamivudine+Efavirenz	22	28.2
Stavudine+Lamivudine+Nevirapine	1	1.3
Total	78	100.0

As shown in the Figure 1, there is a significant increase in CD4 counts in both NVP and EFV group in unit increase of time (i.e. 6 months) ($p<0.05$).

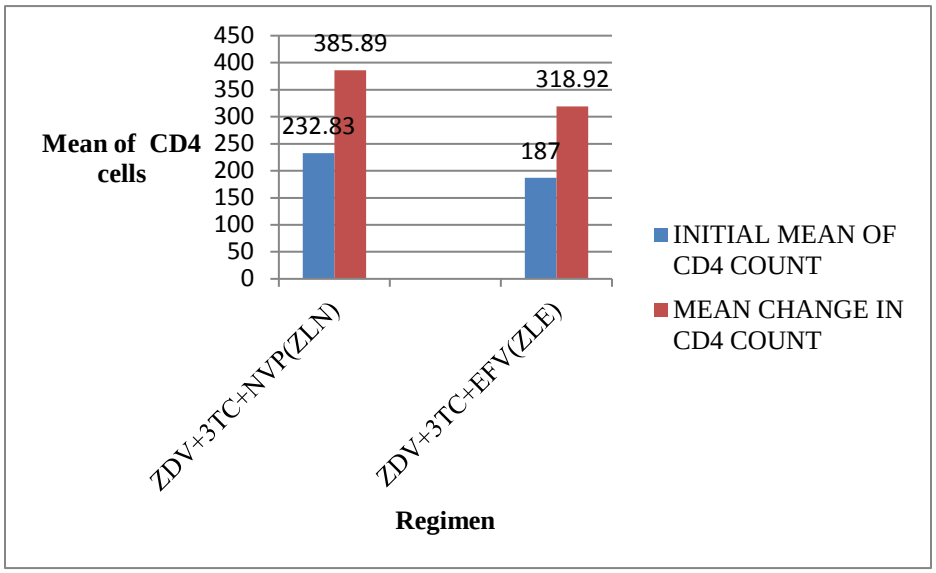


Figure 1: Initial and follow up CD4 counts

Out of the total 78 positives taken under study 47 (60.26%) were undergoing active ART. During the study period 6 positives (7.69%) lost follow up (LFU), 20 positives (25.64%) were transferred to other ART centers and 5 positives (6.41%) died.

Among 47 positives who were undergoing active ART, 43 positives (91.49%) showed normal activity throughout the study period with increase in the CD4 cells (they belong to the group with CD4 count improvement), while 4 positives (8.51%) showed decrease in CD4 count (Table 5).

Table 5. Performance of the PLHIV under ART

Features	Number (%)	Features	Number (%)
Active cases	47(60.26)	Increase in CD4 count after start of ART	43(91.49)
Lost follow up	6(7.69)	Decrease in CD4 count	4(8.51)
Transferred out	20(25.64)	No change of CD4 (stable)	0(0)
Death	5(6.41)		
Total	78(100)	Total	47(100)

Profile of CD4 counts in PLHIV who are under ART

Among 78 positives, all the positives had done CD4 count at the start but out of total samples to be studied 6 positives (7.69%) lost follow up (LFU), 20 positives (25.64%) were transferred to other ART centers and 5 positives (6.41%) died. So that only the brief ART profile of 47 active samples was available. Among the positives who had done CD4 count after six months of the start of the ART, significant relationship was found to be established between the ART and the increase in CD4 count ($V= 8.046$, $P<0.05$).

As shown in the Table 6, the mean CD4 before the start of ART is 223.21 cells/µl of blood while the mean CD4 cells after the start of ART increased to 368.79 cells/µl of blood. The minimum cell before the start of ART is 12 cells/µl of blood and the maximum cell before the start of ART is 1134 cells/µl of blood (median cells is 197 cells/µl of blood) while the minimum cell after the start of ART is 102 cells/µl of blood and the maximum cell after the start of ART is 1159 cells/µl of blood (cells/µl of blood).

Table 6. Status of CD4 counts in PLHIV

CD4 count	Frequency (no. of positives)	Mean CD4 (cells/µl)	SD	SEM	Minimum (cells/µl of blood)	Maximum (cells/µl of blood)	Median (cells/µl of blood)
Initial	47	223.21	185.98	27.1	12	1134	197
6 months	47	368.79	227.39	33.2	102	1159	370

Antiretroviral therapy and its effect on CD4 count and weight

In the study, out of 78 cases, antiretroviral therapy (ART) was given to all positives but only 47 active samples (6 lost follow up, 20 transferred out and 5 died) have active ART with prophylaxis for opportunistic infections. On comparison of pre and post ART data for CD4 count and initial and follow-up weight, there was a significant improvement in the two parameters (Table 7, Figure 2 and 3). In many cases quality of life had been improved after taking ART for six months on revealed by gaining CD4 cells and weight and their ability to do routine work actively.

Table 7. Change in CD4 count and Weight of the positive among those who are on ART Therapy during follow up

S.N.	Variable	No. on ART	Baseline value (mean±SEM)	Follow-up value (mean±SEM)	Statistical significance (wilcoxon test)	
					V value	P value
1.	CD4 count	N=47	223.21±27.1	368.79±33.2	41	P<0.001**
2.	Weight in Kg	N=47	52.98±2.07	54.17±2.12	164	P<0.05*

*significant ** highly significant

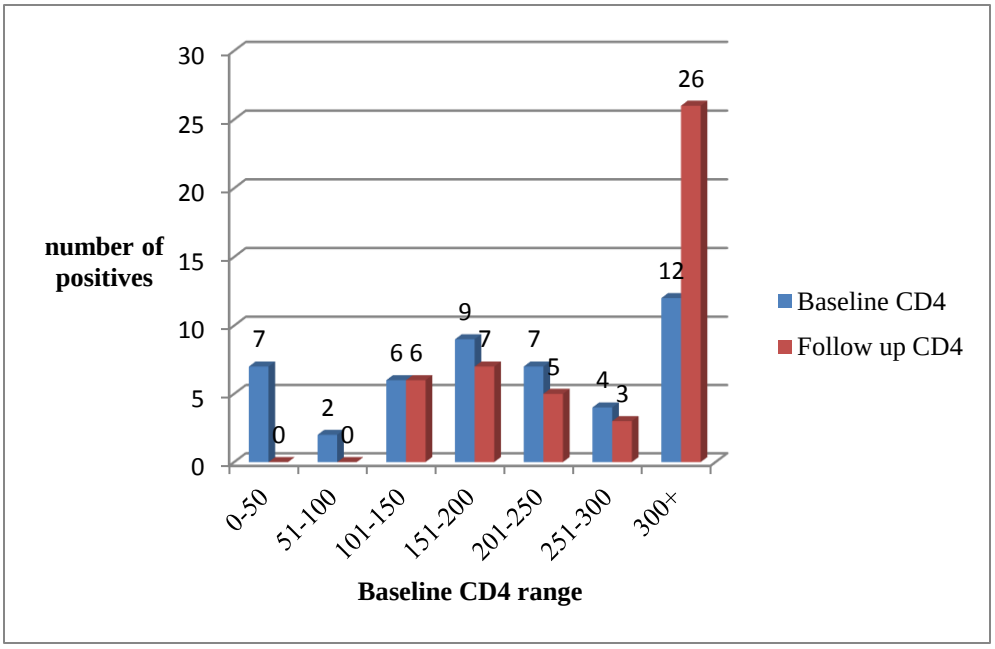
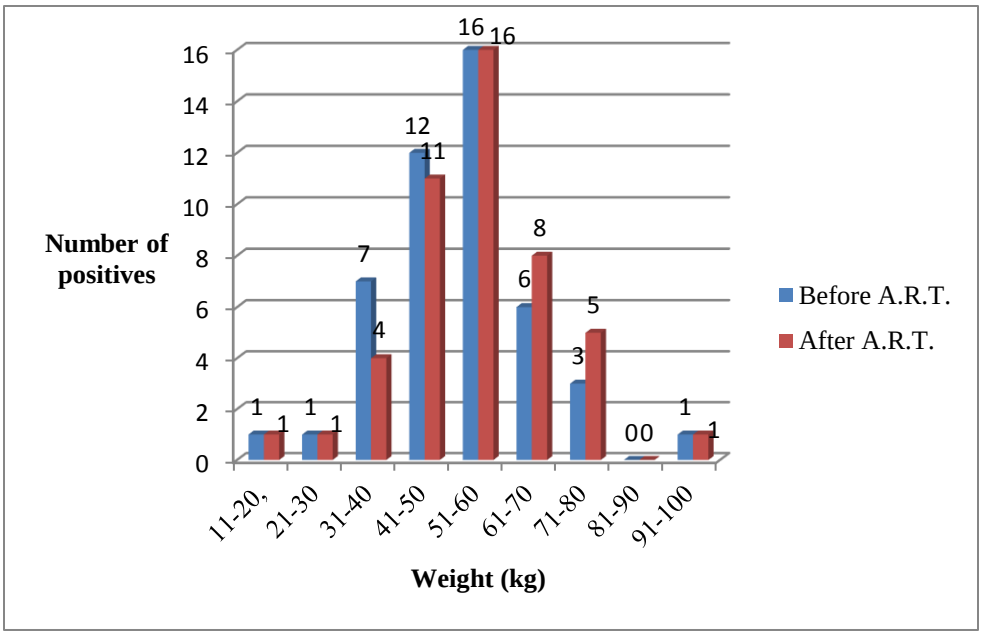


Figure 2: Distribution of PLHIV basing on Baseline and Follow up CD4 cell count



. **Figure 3**: Distribution of PLHIV basing on baseline and follow up weight in Kg

Discussion

As per the NSASC national guidelines, currently in Nepal, absolute CD4 cell count is being used as the basis for initiation of ART (NCASC 2012). In the present study, baseline mean CD4 cell count was 223.21±185.98 cells/µl of blood which is higher than the studies among similar positive groups from Nepal (Tiwari et al. 2008 and Dhakal and Aryal 2012). But Gautam et al. 2008 reported a much lower CD4 cell count of 112.1±60.29 cells/µl of blood which is much lower than the present study. CDCP has explained the AIDS surveillance case definition to include all HIV infected persons with CD4 + T- lymphocyte counts of less than 200 cells/µl of blood or a CD+ percentage of less than 14 (CDCP 1992). In the present study 56.41% cases with CD4 count less than 200 cells/µl was reported which is lower than the percentage (89.2%) reported by Gautam et al. 2008. In my study 57.69% were females which are lower than the percentage (69.29%) reported by Woldemedhin and Wabe (2012). The age group 21-30 years was predominant followed by 31-40 as reported by Sharma et al. (2009) which is similar to the present study. Sunita et al. (2011) reported in India that the majority of the positives taking ART have CD4 cell count between 50-250 cells/µl which is similar to the present study. In a study from the US, it is said that the CD4 absolute count is the best predictor of an adverse event when the CD4 count is less than 200 cells/µl while CD+ percentage is a better predictor when CD4 count is above 200 cells/µl (Pirzada et al. 2006).

The antiretroviral drug Zidovudine was introduced in 1986 for the treatment of HIV/AIDS (NCASC). Over the next few years, also other antiretroviral drugs such as nucleoside reverse transcriptase (NRTIs), non-nucleoside reverse transcriptase (NNRTIs) and protease inhibitors (PIs) will be introduced. And at present, three or more ART drugs are recommended worldwide for the treatment of HIV+ (CDCP 2002).

In this study, the mean CD4 cell count in positives at first visit to the ART center was 223.21 cells/µl of blood which increased significantly to 368.79 cells/µl of blood after six months of follow up. This finding indicated that the treatment was effective. In a study conducted by Tiwari et al. (2008) the mean CD4 cell count in the positives at first visit to Nepal Public Health Laboratory (NPHL) was 155 cells/µl of blood which increased to 297 cells/µl of blood significantly after 6 months of ART. The baseline value was quite lower than the present study and also the follow up value was lower than this study. In a study conducted by

Sunita et al. (2011) in India and Wright et al. (2011) in Australia showed that mean CD4 counts increased to above 500 cells/µl which is much higher than the present study.

Paudel et al. (2009) reported that 1 out of 53 positives (1.8%) showed decrease in CD4 cell count even after taking ART but in the present study 4 out of 47 positives (8.51%) showed decrease in CD4 cell count even after taking ART. Moore and Keruly (2007) reported 92% of the positives having an increment in the CD4 cell count which is similar with the present study (91.49%).

In the present study both NVP and EFV had similar rise in CD4 cell count from baseline and at any given point of time there was no significant difference in the rate of increase of CD4 count between the two treatments ($P<0.05$) as reported by Sunita et al. (2011). The most common 1st line regimen in this study was Zidovudine/Lamuvudine/Nevirapine which is totally different than the study done by Woldemedhin and Wabe (2012) who reported the 1st line regimen to be Stavudine/Lamivudine/Nevirapine which was similar to the study done by Kumarasamy et al. (2006).

The mean baseline weight in the study was 52.98±2.07 kg which increased to 54.17±2.12 kg which is little higher than reported by Sunita et al. (2011) who showed the baseline weight 48.7±1.0 and increment to 52.8±1.1 kg after six months of follow up of ART.

People have begun using VCTC services, which reflects a change in their attitude towards HIV. The study provides us a clue to formulate an effective approach to educate people as well as health personnel who are thought of as one of the important sources of discrimination.

Conclusion

Thus, HIV infection is in decreasing order though is one of the major infectious diseases in Nepal, and being chronic lifelong in nature, its impact is huge compared to other infectious diseases. People with high risk behavior and the spouse of the infected and affected couple need to be educated for primary and secondary preventive measures of the HIV infection. PLHIV should be educated that the timely initiation and continuous intake of antiretroviral therapy will not only prolong their survival but will also decrease the viral load and transmission of the disease. Provision of free antiretroviral treatment by the government of

Nepal is a step in the right direction, and it should be extended to the entire country, as antiretroviral treatment does change the quality of life of the positives as well as his/her family and the positive is able to get back to work and restart his/her livelihood.

Hence, ART service was found to be effective enough to increase the CD4 count significantly after 6 months of therapy.

It can be concluded that ART is effective enough in slowing the progression of HIV infection to AIDS and increasing the survival rate of positives with good performance. This study reflects the real situations of ART service in resource limited setting and help to promote the ART service to other parts of the country. On the basis of this study it can be recommended that HIV should be diagnosed earlier so that ART can be started in appropriate time.

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