

Evaluation of Baseline CD4+ T Cell Counts and ART Requirement in Newly Diagnosed HIV Seropositive Individuals in a Tertiary Care Hospital of Northern India

SONALI BHATTAR¹, BHANU MEHRA², PREENA BHALLA³, DEEPTI RAWAT⁴

ABSTRACT

Introduction: Antiretroviral Therapy (ART) has changed the outlook of Human Immune-deficiency Virus (HIV)/Acquired Immuno Deficiency Syndrome (AIDS) patients worldwide.

Aim: To analyse the trends in baseline CD4+ T cell counts and ART requirements in newly diagnosed HIV seropositive individuals in a Tertiary care hospital of Northern India.

Materials and Methods: Out of 1263 HIV seropositive clients identified from January 2012 to June 2014, the baseline CD4+ T cell counts of only those 470 clients were analysed, who registered at the linked ART centre.

Results: The mean baseline CD4+ count of the study group was 249.77 ± 216.0 cells/mm³ and that of male and female

were 300.31 ± 240.47 cells/mm³ and 232.38 ± 204.25 cells/mm³ respectively.

A total of 259 of 334 (77.54%) HIV reactive males, 83 of 130 (63.85%) HIV reactive females and overall 348 of 470 (74.04%) required antiretroviral treatment on enrolment.

Conclusion: In the present study, about three-fourth of newly diagnosed HIV positive Indian patients required initiation of ART at registration. The relatively low baseline CD4+ T cell counts in this population highlights the need for timely baseline CD4+ counts testing of HIV positive patients and the urgency of initiating treatment in HIV reactive individuals in Indian health care settings.

Keywords: Antiretroviral therapy, Integrated counselling and testing centre, National AIDS control organization

INTRODUCTION

India is third highest HIV prevalent country after South Africa and Nigeria respectively. Nearly 0.116 million new HIV infections and a total of 2.09 million HIV infected patients were reported among Indian adult population in 2011 [1]. In the year 2011, the national adult HIV prevalence was reported as 0.27% and of Delhi as 0.22% [2]. There is a steady decline in HIV prevalence overall in the country from a peak of 0.38% in 2001-03 through 0.34% in 2007 and 0.28% in 2012 but rising trend has been observed in low prevalence state such as in Delhi [2].

The National AIDS Control Organization (NACO) plays a key role in controlling the HIV epidemic in India. Since the year 2004, ART is available in India free of cost at various ART centres. After the implementation of the WHO 2010 guidelines the ART coverage had increased from 3.57% in the year 2009 [3] to 24.7% and 36% in the year 2011 [1] and 2015 [4] respectively. Wider access to ART between the years 2007-2011 had resulted in 29% reduction in annual death due to AIDS related causes. Till the year 2011, 0.15 million people has been saved due to ART [1].

The measurement of CD4+ T cell count is a strong predictor of HIV progression as well as a means of monitoring ART. The consequences of presenting with a low CD4+ T cell counts are many. Patients are more likely to be diagnosed with severe opportunistic infections, the risk of mortality is higher, the rate of immunological improvement may be slower [5], the likelihood of transmitting the virus to other individuals is higher [6] and there is strong probability of posing a higher financial strain on national health services [7].

There is a paucity of data from an Indian perspective, regarding the ART requirements of HIV seropositive individuals. Keeping this in mind, the present study was undertaken to analyse the trends in baseline CD4+ T cell counts and ART requirement in newly

diagnosed HIV seropositive individuals attending a tertiary care medical centre in Northern India.

MATERIALS AND METHODS

The present study was conducted from January 2012 to June 2014 at the Department of Microbiology of a tertiary care health centre in New Delhi. Of the 1263 HIV seropositive clients diagnosed during this study period, only those 470 HIV seropositive clients were included who were ART-naïve, registered at the linked ART centre and whose baseline CD4+ counts were available. All ART-experienced patients; registered patients referred from other centers and patients below the age of 18 years were excluded from the analysis. Information regarding the socio-demographic and risk behaviour profile of HIV seropositive attendees was retrieved retrospectively from records of the Integrated Counselling and Testing Centre (ICTC).

Diagnosis of HIV infection was done as per the standard protocol that included a pre-test as well as post-test counselling and the practice of obtaining written informed consent from the client before HIV testing. Serodiagnosis of HIV was done as per strategy III of NACO guidelines [8]. All HIV seropositive subjects were referred to the ART clinic of the linked hospital. The registered clients were then referred back to our laboratory for evaluation of CD4+ counts. CD4+ counts were determined by employing the BD FACS Count™ system (Becton, Dickinson and Company, San Jose, CA, USA).

All the data was entered in Microsoft excel sheet and statistical analysis performed using the SPSS software, version 20. Qualitative data was analysed by Chi-square test and Fisher's exact test, while quantitative variables were analysed using the One-Way ANOVA followed by post-hoc test. The differences were considered to be statistically significant when the obtained p-value was less than 0.05.

RESULTS

Of the total 470 HIV seropositive patients analysed during the study period, 256(54.47%) were between 30-45 years of age. The mean age of the study population was 35.35±10.18 years with the mean age of HIV seropositive males and females being 35.48±9.93 years and 35.06±10.91 years respectively. The study population comprised of 334(71.06%) males, 130(27.66%) females and 6 (1.28%) transgenders. With regard to level of education, most of the patients (172; 36.60%) were educated up to primary school level. Majority of study subjects were daily wagers (47.87%). Heterosexual route (448; 95.32%) was the most common route of HIV transmission, followed by intravenous drug abuse (9; 1.91%). The socio-demographic profile of the study population is summarized in [Table/Fig-1].

Most of the HIV seropositive individuals (287; 61.06%) were referred clients, of which 246 (52.34%) were referred from government health facilities. One hundred and eighty three (38.94%) seropositive clients were direct walk-in ICTC attendees [Table/Fig-2].

The baseline CD4+ count distribution of HIV seropositive individuals is summarized in [Table/Fig-3]. As per the 2010 WHO guidelines for initiation of ART in asymptomatic HIV reactive patients (considering a CD4+ count of 350cells/mm³ as cut-off) [9], 348 (74.04%) of the 470 registered patients required ART on enrolment.

The correlation of CD4+ counts with socio-demographic profile and the type of client is depicted in [Table/Fig-2,4] respectively.

Characteristic		Number of clients	Percentage (%)
Age group in years	18-29	145	30.85
	30-45	256	54.47
	46-59	51	10.85
	≥60	18	3.83
Gender	Male	334	71.06
	Female	130	27.66
	Transgender	6	1.28
Education	Illiterate	160	34.04
	Primary school	172	36.60
	Secondary school	98	20.85
	College and above	40	8.51
Occupation	Daily wages	225	47.87
	Unemployed men and Housewives	125	26.60
	Business	25	5.32
	Salaried	77	16.38
	Student	18	3.83
Marital Status	Married	393	83.62
	Single	59	12.55
	Divorced	3	0.64
	Widowed	15	3.19

[Table/Fig-1]: Socio-demographic of study population(n=470).

Type of ICTC* client	Number of clients with CD4+ count<350 cells/mm ³ (%)	Number of clients with CD4+ count >350cells/mm ³ (%)	Total no. of clients	Mean (Median) CD4+ count	Interquartile Range (IQR)	
Direct walk-in	113(61.74)	70(38.25)	183(38.93)	317.40±220.30(271)	153-438	
Referred	NGOs †	4(44.44)	5(55.56)	9(1.91)	445±219.79(468)	285-568
	DOTS † clinic	10(66.67)	5(33.33)	15(3.19)	253.73±221.11(148)	123-376
Govt health facilities	OPD †	74(74.74)	25(25.25)	99(21.06)	264.80±213.15(208)	119-340
	Ward	136(92.52)	11(7.48)	147(31.27)	135.55±157.65(85)	39-179.5
STI † clinic	11(64.71)	6(35.29)	17(3.61)	314.6±212.3(226)	158.5-412	

[Table/Fig-2]: Baseline CD4+ counts of study population in relation to type of ICTC* client.

ICTC*: Integrated Counseling and Testing Centre; NGOs†: Non-Government Organizations; DOTS†: Directly Observed Treatment, Short-course; OPD†: Outpatient Department; STI†: Sexually Transmitted Infection.

No. (%) of subjects with CD4 cell count	Male(n=334) Number (%)	Female(n=130) Number (%)	Transgender (n=6) Number (%)	Total number (%)
<200cells/mm ³	189(56.58)	55(42.31)	5(83.33)	249(52.98)
200-349cells/mm ³	70(20.96)	28(21.54)	1(16.67)	99(21.06)
350-499cells/mm ³	37(11.08)	26(20)	0(0)	63(13.41)
≥500cells/mm ³	38(11.38)	21(16.15)	0(0)	59(12.55)

[Table/Fig-3]: Baseline CD4+ cell count distribution of study population (n=470).

Ninety one (62.76%) of 145 HIV seropositive clients between 18-29 years of age presented with CD4+ count < 350cells/mm³ and required ART, versus 14 (77.78%) of 18 clients ≥60 years of age (p=0.001). Two hundred and fifty nine (77.54%) males, 83(63.85%) females and all transgenders presented with CD4+ count < 350 cells/mm³ [Table/Fig-2].

The mean CD4+ count of the study group was 249.77± 216.0cells/mm³. HIV seropositive clients between 18-29 years of age had significantly higher mean CD4+ counts as compared to clients more than 60 years of age (p=0.013) Females had higher mean CD4+ counts as compared to males and the difference was statistically significant (300.31±240.47cells/mm³ versus 232.38±204.25cells/mm³; p =0.002). Married and widowed clients had mean CD4+ counts of 246.96±213.41cells/mm³ and 148.80±146.31cells/mm³ respectively (p =0.08) [Table/Fig-4].

The mean CD4+ count of direct walk-in clients was higher (317.40±220.30cells/mm³) as compared to referred ones (206.66±202.24cells/mm³) and the difference was statistically significant (p<0.001). Two hundred and thirty nine (83.30%) of 287 referred clients had CD4 count < 350cells/mm³ and required ART versus 113 (61.74%) of 183 direct walk-in clients and the difference was statistically significant (p<0.001). Among the referred clients CD4+ count of ward patient was lowest i.e. 135.55±157.65cells/mm³ followed by DOTS clinic patients [Table/Fig-2].

DISCUSSION

The mean CD4+ counts were higher among young individuals compared to older age groups. Similar findings have been reported in another Indian study conducted by Shastri S et al., [10]. A possible explanation is that older individuals though get infected at younger ages, have a delayed diagnosis [11]. We report mean CD4+ counts of 232.38±204.25 and 300.31±240.47cells/mm³ in Highly Active Anti-Retroviral Therapy (HAART)-naive, HIV positive males and females respectively and an overall mean CD4+ count of 249.77 ± 216.09cells/mm³ which is in concordance with the study conducted by Akinbami A et al., [12]. On the other hand in the another study conducted in eastern India the mean CD4+ counts of male and female were 142.19 ± 139.33cells/mm³ and 235.92± 185.11cells/mm³ respectively and an overall mean CD4+ count of 176.04±163.49cells/mm³ [13]. A plausible hypothesis for the higher mean CD4+ counts reported among females is that, females present to care and get tested for HIV earlier through expanded HIV testing programs in pregnancy and through

		Number of clients with CD4+ count <350 cells/mm ³ (%)	Number of clients with CD4+ count >350 cells/mm ³ (%)	Mean (Median) CD4+ count	Interquartile Range (IQR)
Age group in years	18-29	91(62.76)	54(37.24)	318.63±245.62 (276)	110.5-414.5
	30-45	54(21.09)	202(78.91)	230.15±196.09 (176)	85-333
	46-59	41(80.39)	10(19.61)	183.12±198.67 (111.5)	66.5-214
	≥60	14(77.78)	14(22.22)	179.81±156.27 (95)	67-205
Gender	Male	259(77.54)	75(22.46)	232.38 ±204.25 (173)	80.5-334
	Female	83(63.85)	47(36.15)	300.31±240.47 (247.5)	110.5-418
	Transgender	6(100)	0(0)	123.66±64.71 (117.5)	85-138
Education	Illiterate	112(70)	48 (30)	268.02±238.46 (188.50)	80.25-402.25
	Primary school	134(77.91)	38(22.09)	234.64 ±216.01 (172.50)	87.25-333.00
	Secondary school	74(75.51)	24(24.49)	229.46±163.72 (184.00)	101.75-339.00
	College and above	28(70)	12(30)	291.70±230.76 (252.00)	94.00-458.75
Occupation	Daily wages	181(80.44)	44(19.56)	230.51±215.97 (166)	73.50-333.50
	Unemployed men and Housewives	79(63.20)	46(36.80)	300.34±239.62 (241.00)	111.50-422.00
	Business	17(68)	8(22)	269.40±141.69 (226.00)	165.50-382.50
	Salaried	59(76.62)	18(23.38)	211.34±177.39 (150.00)	71.50-325.00
	Student	12(66.67)	6(33.33)	276.78±232.58 (216.00)	99.75-409.50
Marital status	Married	292(74.30)	101(25.70)	246.96±213.41 (183.00)	87.00-348.50
	Single	41(69.49)	18(30.51)	290.95±241.62 (241.00)	104.00-397.00
	Divorced	1(33.33)	2(66.67)	313.67±215.99 (412.00)	66-412.00
	Widowed	14(93.33)	1(6.67)	148.80±146.31	41.00-179.00

[Table/Fig-4]: Baseline CD4+ counts of study population in relation to socio-demographic variables of clients.

expanded partner testing programs after their spouse tests positive [10]. With regard to marital status, widows presented with lower CD4+ counts, indicating the difficulties in accessing the health care system in Indian setting, a finding in concordance with study conducted by Alvarez Uria G et al., [14]. Furthermore, similar to findings of Thompson LH et al., HIV reactive patients from in-patient settings had lower CD4+ counts compared to those from out-patient departments [15]. In our study, 38.94% seropositive clients were direct walk-in ICTC attendees while in another study conducted in West Bengal only 6% visited the ICTC voluntarily [16]. This discrepancy may be due to difference in education level and awareness among the general population.

Using a CD4+ count of 350cells/mm³ as cut-off criterion for initiation of ART, 74.03% of our registered patients required ART on enrolment. Another Indian study [13], documented that 86.67% of the HIV reactive patients required treatment, while according to Singh K et al., 58.91% of HIV positive clients required treatment on enrolment [17]. In another study conducted by Shastri S et al., 65% of HIV positive patients presented with a CD4+ count

below 350cells/mm³ [10]. This shows that, majority of HIV positive patients in Indian setting do not present for care and treatment until the disease is advanced [18]. Late initiation of ART results in less favourable outcomes [14,15,17] and is associated with increased medical costs [18,19]. Furthermore, untreated people may contribute to the spread of HIV for several years.

The 2010 WHO guideline implementation in India, requires immediate implementation of ART to more than two third of newly diagnosed HIV infected patients in the country. As the side effects of ART are common and many of the patients are asymptomatic, this has become challenging. Intensive counselling of the various side effects of the drugs and long term benefits of the regime is essential so that patients are not lost during follow-up.

LIMITATION

Being a retrospective analysis, data on clinical manifestations of the patients was not available. Thus, some of the patients with CD4+ counts more than 350cells/mm³, who may have required initiation of ART because of their HIV-related symptoms were missed out.

CONCLUSION

Our study provides, an insight into the demographics of newly diagnosed HIV seropositive individuals in this part of India. In addition, our finding that nearly three-fourths of newly diagnosed HIV positive Indian patients require initiation of ART at registration reinforces the need for timely baseline CD4+ cell count testing of HIV positive patients, as well as the urgency of initiating treatment in HIV reactive individuals in Indian health care settings.

REFERENCES

- [1] National AIDS Control Organization (NACO). Department of AIDS Control, Ministry of Health and Family Welfare. Annual report 2013-14. Available from: http://www.naco.gov.in/upload/2014%20mslms/NACO_English%202013-14.pdf.
- [2] National AIDS Control Organization (NACO). Indian council of Medical research, Ministry of Health and Family Welfare. India HIV estimation 2015. Technical report. Available from: <http://www.naco.gov.in/.../2015%20MSLNS/HSS/India%20HIV%20Estimations%202015>.
- [3] National AIDS Control Organization (NACO). Department of AIDS Control, Ministry of Health and Family Welfare. Annual report 2008-2009. Available from: http://www.naco.gov.in/upload/REPORTS/Annual_Report_NACO_2008-09.pdf.
- [4] Global AIDS Update. UNAIDS REPORT 2016. Available from: <http://www.unaids.org/en/resources/documents/2016/Global-AIDS-update-2016>.
- [5] Mocroft A, Vella S, Benfield TL, Chiesi A, Miller V, Gargalianos P, et al. Changing patterns of mortality across Europe in patients infected with HIV-1. EuroSIDA Study Group. *Lancet*. 1998;352(9142):1725-30.
- [6] Sabin CA, Smith CJ, Gumley H, Murphy G, Lampe FC, Phillips AN, et al. Late presenters in the era of highly active antiretroviral therapy: uptake of and responses to antiretroviral therapy. *AIDS*. 2004;18(16):2145-51.
- [7] Garcia F, de Lazzari E, Plana M, Castro P, Mestre G, Nomdedeu M, et al. Long-term CD4+ T-cell response to highly active antiretroviral therapy according to baseline CD4+ T-cell count. *J Acquir Immune Defic Syndr*. 2004;36(2):702-13.
- [8] "Guidelines for HIV testing." National AIDS Control Organisation, Ministry of Health and Family Welfare. Available from: <http://naco.gov.in/upload/Policies%20&%20Guidelines/5-GUIDELINES%20FOR%20HIV%20TESTING.pdf>
- [9] Antiretroviral therapy for HIV infection in adults and adolescents. Recommendations for a public health approach: 2010 revision World Health Organization. Available: <http://www.who.int/hiv/pub/arv/adult2010/en/index.html>. Accessed: 20September2015.
- [10] Shastri S, Boregowda PH, Rewari BB, Tanwar S, Shet A, Kumar AM. Scaling up antiretroviral treatment services in Karnataka, India: Impact on CD4+ counts of HIV-Infected people. *PLoS One*. 2013;8(8):e72188.
- [11] Althoff KN, Gange SJ, Klein MB, Brooks JT, Hogg RS, Bosch RJ, et al. Late presentation for human immunodeficiency virus care in the United States and Canada. *Clin Infect Dis*. 2010;50(11):1512-20.
- [12] Akinbami A, Dosunm A, Adediran A, Ajibola S, Oshinaike O, Wright K, et al. CD4+ Count Pattern and Demographic Distribution of Treatment-Naive HIV Patients in Lagos, Nigeria. *AIDS Res Treat*. 2012;2012:352753.
- [13] Bishnu S, Bandyopadhyay D, Samui S, Das I, Mondal P, Ghosh P, et al. Assessment of clinico-immunological profile of newly diagnosed HIV patients presenting to a teaching hospital of eastern India. *Indian J Med Res*. 2014;139(6):903-12.
- [14] Alvarez-Uria G, Middle M, Pakam R, Kannan S, Bachu L, Naik PK. Factors associated with late presentation of HIV and estimation of antiretroviral treatment need according to CD4+ lymphocyte count in a resource-limited setting: Data from an HIV cohort study in India. *Interdiscip Perspect Infect Dis*. 2012;2012:293795.

- [15] Thompson LH, Sochocki M, Friesen T, Bresler K, Keynan Y, Kasper K, et al. Medical ward admissions among HIV-positive patients in Winnipeg, Canada, 2003-10. *Int J STD AIDS*. 2012;23(4):287-88.
- [16] Ghosh S, Mukherjee S, Samanta A. Profile of HIV seropositive patients attending Integrated Counseling & Testing Centre (ICTC): an experience from a medical college in West Bengal, India. *Global Journal of Medicine and Public Health*. 2013;2(5).
- [17] Singh K, Jindwani K. Clinical and demographical profile of newly detected HIV positive patients registered at antiretroviral therapy centre of a Medical College. *J Clin Diagn Res*. 2012;6(7):1167-70.
- [18] Lundgren JD, Sabin ML, Monforte Ad, Brockmeyer N, Casabona J, Castagna A, et al. Risk factors and outcomes for late presentation for HIV-positive persons in Europe: Results from the Collaboration of Observational HIV Epidemiological Research Europe Study (COHERE). *PLoS Med*. 2013;10(9):e1001510.
- [19] Baker JV, Peng G, Rapkin J, Abrams DI, Silverberg MJ, MacArthur RD et al. CD4+ count and risk of non-AIDS diseases following initial treatment for HIV infection. *AIDS*. 2008;22(7):841-48.

PARTICULARS OF CONTRIBUTORS:

1. Senior Resident, Department of Microbiology, Maulana Azad Medical College, New Delhi, India.
2. Senior Resident, Department of Microbiology, Maulana Azad Medical College, New Delhi, India.
3. Director Professor, Department of Microbiology, Maulana Azad Medical College, New Delhi, India.
4. Assistant Professor, Department of Microbiology, Maulana Azad Medical College, New Delhi, India.

NAME, ADDRESS, E-MAIL ID OF THE CORRESPONDING AUTHOR:

Dr. Preena Bhalla,
Department of Microbiology, Maulana Azad Medical College,
2-Bahadur Shah Zafar Marg, New Delhi-110002, India.
E-mail: preenabhalla@gmail.com

Date of Submission: **May 24, 2016**Date of Peer Review: **Jun 09, 2016**Date of Acceptance: **Aug 24, 2016**Date of Publishing: **Nov 01, 2016****FINANCIAL OR OTHER COMPETING INTERESTS:** None.