

## ORIGINAL ARTICLE

# TOTAL LYMPHOCYTE COUNT AS A SUBSTITUTE TO CD4 COUNT IN MANAGEMENT OF HIV INFECTED INDIVIDUALS IN RESOURCE LIMITED SOCIETY

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**Background:** Pakistan is a resource limited society and gold standard parameters to monitor HIV disease activity are very costly. The objective of the study was to evaluate total lymphocyte count (TLC) as a surrogate to CD4 count to monitor disease activity in HIV/AIDS in resource limited society.

**Methods:** This cross sectional study was carried out at HIV/AIDS treatment centre, Pakistan Institute of Medical Sciences (PIMS), Islamabad. A total of seven hundred and seventy four (774) HIV positive patients were enrolled in this study, and their CD4 count and total lymphocyte count were checked to find any correlation between the two by using Spearman ranked correlation coefficient. **Results:** The mean CD4 count was  $(434.30 \pm 269.23)$ , with minimum CD4 count of (9.00), and maximum of (1974.00). The mean total lymphocyte count (TLC) was  $(6764.0052 \pm 2364.02)$  with minimum TLC (1200.00) and maximum TLC was (20200.00). Using the Pearson's correlation (r) there was a significant and positive correlation between TLC and CD4 count. ( $r^2=0.127$  and  $p=0.000$ ) at 0.01 level.

**Conclusion:** Our study showed a significant positive correlation between CD4 count and total lymphocyte count (TLC), so TLC can be used as a marker of disease activity in HIV infected patients.

**Keywords:** HIV (human immunodeficiency virus), CD4 count, Total lymphocyte count (TLC).

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## INTRODUCTION

HIV continues to be a major global public health issue, having claimed more than 36 million lives so far.<sup>1</sup> At the end of 2012, there were approximately 39 million people living with HIV. Out of these approximately 90% of people belong to low and middle income groups and an estimated 14.2 million people in these countries required HAART (highly active antiretroviral therapy)<sup>2</sup> Monitoring of disease activity in HIV/AIDS and response to antiretroviral therapy is dependent on measurement of CD4 count as a gold standard method. CD4 count is an expensive test and not all of the people living with HIV have ready access to it. In 2002 WHO guidelines suggested that total lymphocyte count (TLC) could serve as a surrogate for CD4 count<sup>3</sup> but the later guidelines didn't endorse it as a standard test to monitor disease activity and response to treatment.

Total lymphocyte count (TLC) is an easy alternative to monitor disease activity in resource limited society as it is readily available and in our study we evaluated it as an alternative to CD4 count, so that active monitoring of HIV should be done in resource limited societies such as ours. This is both, easy to carry out and economically beneficial in poor countries such as Pakistan.

## MATERIAL AND METHODS

This cross sectional study was carried out at HIV/AIDS treatment centre, PIMS hospital, Islamabad. Data for this study was collected from September 2008 to April 2013. A total of 774 HIV

infected patients were included in the study for measurement of CD4 and total lymphocyte count (TLC). HIV seropositive individuals were diagnosed based on HIV antibody ELISA test and confirmed by western blot.

For each study subject, blood samples for CD4 cell count and TLC were collected in sterile vacuum tubes. TLC was measured by an automated analyser. The CD4 cell count was done by using FAC Scan techniques. Correlation between CD4 cell count and TLC was evaluated using Pearson's correlation coefficient (r).

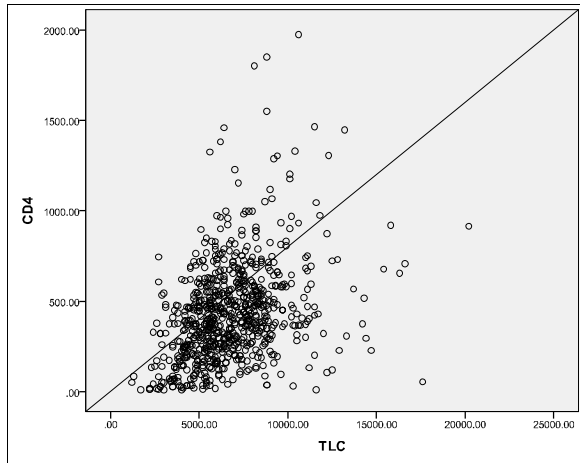
The data was analysed by using SPSS version 19.3. For all statistical analysis the level of significance was set at  $p < 0.01$ .

## RESULTS

The mean CD4 count was  $434.30 \pm 269.23$ , with minimum CD4 count of 9.00, and maximum of 1974.00. The mean TLC was  $6764.0052 \pm 2364.02$  with minimum of 1200.00 and maximum 20200.00 TLC. We compared means of CD4 count and TLC by using one sample *t*-test. With *t* values of 44.87 for CD4 count and 79.60 for TLC. Using this test values which fell within 95% of confidence interval (CI) for CD4 were (415-453) and those for TLC were from 6697-6980. using these values the scatter plot which we obtained is given below.

Simple linear regression using ANOVA model yielded  $r^2$  change of 0.127 and *F* change of 111.9. Using the Pearson's correlation there was a

significant and positive correlation between TLC and CD4 count. ( $r^2=0.127$  and  $p=0.000$ ) at 0.01 level of significance.



## DISCUSSION

HIV/AIDS has become an important health problem of national level in Pakistan. An important dilemma to understand in this context is that it is overwhelmingly common in poor people and intravenous drug abusers (IDU), who are living far below the poverty line. Pakistan is already a resource constrained society and diseases such as HIV/AIDS, by virtue of their diagnostic and management difficulties are a major burden on our economy and most of the poor and illiterate people cannot afford to have costly tests done to diagnose and monitor disease activity and response to ARTs.

In this resource limited settings TLC has emerged as a useful surrogate to CD4 count to monitor disease activity. WHO in 2002, suggested that TLC can be used to monitor disease activity in HIV/AIDS but subsequent guidelines didn't endorse it because some studies didn't show significant correlation between these two variables. However significance of TLC as a surrogate to CD4 count in resource limited societies is of utmost importance because in countries like Pakistan most of the people affected by this disease are living far below poverty line and in our society most of the effected people are intravenous drug abusers who had been abandoned by their families and are considered a social stigma in our society. This population subset is entirely dependent on government resources for their diagnosis and management of HIV/AIDS and in these settings it becomes imperative to devise means of cheap diagnostic modalities to diagnose and monitor disease activity in these poor patients.

Many studies in literature have shown significant positive correlation between CD4 count and TLC and this appears to be stronger for patients

with advanced disease.<sup>4-7</sup> some studies have also described that despite of less reliability of TLC as a surrogate for CD4, TLC is an important tool in absence of expensive equipment to measure CD4.<sup>8</sup> In the literature, studies correlating CD4 count and TLC showed variable results. Studies having high degree of sensitivity and specificity, concluded that total lymphocyte count was good surrogate to CD4 count to predict eligibility for initiation and monitoring response to antiretroviral therapy (ARVs).<sup>9-15</sup> while other studies didn't conclude TLC as a suitable surrogate marker to CD4 count in HIV/AIDS.<sup>16-18</sup>

## CONCLUSION

Our study showed a significant positive correlation between CD4 count and TLC, so TLC can be used as a marker of disease activity in HIV infected patients.

## REFERENCES

1. WHO HIV/AIDS fact sheet updated October 2013.
2. UN Joint program on HIV/AIDS (2012) Global report: UNAIDS report on the global AIDS epidemic 2012. Available: <http://www.unaids.org/en/resources/> Accessed 2013 Nov 24.
3. Department of health and human services (2012). Guidelines for use of antiretroviral agents in HIV infected adults. Available: <http://aidsinfo.nih.gov/guidelines>. Accessed 2013 Dec 28.
4. Beck EJ, kupek EJ, Gompels MM, Pinching AJ. Correlation between total and CD4 lymphocyte counts in HIV infection: not making the good an enemy of the not so perfect. *Int J STD AIDS* 1996;6:422-8
5. Spacek LA, Griswold M, Quinn TC, Moore RD. TLC and hemoglobin combined in an algorithm to initiate the use of HAART in resource limited settings. *AIDS* 2003;17:1311-7
6. Kumarasamy N, Mahajan AP, Flanigan TP, Hemalatha R, Mayer KH, Carpenter CC, *et al*. TLC is a useful tool for the timing of opportunistic infection prophylaxis in India and other resource constrained settings. *J Acquir Immune Defic Sndr* 2002;319:378-83
7. Gitura B, Joshi MD, Lule GN, Anzala O. Total Lymphocyte Count as a surrogate marker for CD4+ T cells count in initiating HAART at Kenyatta National Hospital, Nairobi. *East Afr Med J* 2007;84:466-72
8. Stebbing J, Sawleshwarkar S, Midailidis C, Jones R, Bower M, Mandiala S, *et al*. Assessment of the efficacy of total lymphocyte counts as predictors of AIDS defining infections in HIV-1 infected people. *Postgrad Med J* 2005;81:586-8
9. Kumarasamy N, Mahajan AP, Flanigan TP, Hemalatha R, Mayer KH, Carpenter CC, *et al*. Total lymphocyte count (TLC) is a useful tool for the timing of opportunistic infection prophylaxis in India and other resource constrained countries. *J Acquir Immune Defic Syndr* 2002;31:378-83.
10. Oudenhoven HP, Meijerink H, Wisaksana R, Oetojo S, Indrati A, van der Ven AJ, *et al*. Total lymphocyte count is a good marker for HIV-related mortality and can be used as a tool for starting HIV treatment in a resource limited setting. *Trop Med Int Health* ;16:1372-9.
11. Moore DM, Awor A, Downing RS, Were W, Solberg P, Tu D, *et al*. Determining eligibility for antiretroviral therapy in resource-limited settings using total lymphocyte counts, hemoglobin and body mass index. *AIDS Res Ther* 2007;18:1.

12. Schreiber T, Friedland G. Use of total lymphocyte count for monitoring response to antiretroviral therapy. *Clin Infect Dis* 2004;38:257–62.
  13. Susaengrat W, Mitchai M, Leerattanapetch N. Total lymphocyte count: a surrogate marker for predicting CD4+ count in enrolled process for antiretroviral therapy in resource-limited settings. *J Med Assoc Thai* 2008;91:1514–7.
  14. Srirangaraj S, Venkatesha D. Total lymphocyte count as a tool for timing opportunistic infection prophylaxis in resource-limited settings: a study from India. *J Infect Dev Ctries* 2010;4:645–9.
  15. Mwamburi DM, Ghosh M, Fauntleroy J, Gorbach SL, Wanke CA. Predicting CD4 count using total lymphocyte count: a sustainable tool for clinical decisions during HAART use. *Am J Trop Med Hyg* 2005;73:58–62.
  16. Akinola NO, Olosode O, Adediran IA, Onayemi O, Murainah A, Irinoye O, *et al.* The Search for a predictor of CD4 cell count continues: total lymphocyte count is not a substitute for CD4 cell count in the management of HIV-infected individuals in a resource-limited setting. *Clin Infect Dis* 39:579–81.
  17. Mbanya D, Assah F, Ndembu N, Kaptue L. Monitoring antiretroviral therapy in HIV/AIDS patients in resource-limited settings: CD4 counts or total lymphocyte counts? *Int J Infect Dis* 2007;11:157–60.
  18. Gupta A, Gupte N, Bhosale R, Kakrani A, Kulkarni V, Nayak U, *et al.* Low sensitivity of total lymphocyte count as a surrogate marker to identify antepartum and postpartum Indian women who require antiretroviral therapy. *J Acq Imm Def* 2007;46:338–42.
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