# CORRELATION OF CD4 WITH TOTAL LYMPHOCYTE COUNTS IN HIV PATIENTS

**Rini Riyanti**, Department of Clinical Pathology, Medical Faculty of Jember University
Laboratotium of Clinical Pathology, dr. Soebandi General hospital, Jember
Kalimantan Street no 37, Jember, e-mail : riniriyanti.fk@unej.ac.id

## INTRODUCTION

Worldwide estimates of people living with Human Immunodeficiency Virus was approximately 32 million in 2007 with thousands of people getting infected every day therapy (Obirikorang et.al, 2012). Globally, 34 million people were living with human immunodeficiency virus (HIV) at the end of 2011 (Chen et.al, 2013). Most people living with HIV are from developing countries with less than 5% receiving antiretroviral therapy (Obirikorang et.al, 2012).

A CD4 count is a laboratory test that measures the number of CD4 T lymphocytes (CD4 cells) in a sample of blood. In HIV patients, it is the most important laboratory indicator of how well the immune system is working and the strongest predictor of HIV progression. Once a person is infected with HIV, the virus begins to attack and destroy the CD4 cells of the person's immune system. HIV uses the CD4 cells to multiply and spread throughout the body. This is the HIV life cycle.

The associated immune deficiency in human immunodeficiency virus (HIV) patients leading to infection by opportunistic pathogen is ascribed to depletion of CD4. CD4 count can therefore be regarded as the accurate measurement of the robustness and functionality of the immune capability to protect the body against general infection. CD4 T lymphocyte cell depletion is one of the hallmarks of progression of HIV infection and a major indicator of the stage of the disease in HIV infected individuals. World Health Organization recommended that most treatment initiation decisions be guided by CD4 measurement and clinical staging.

AIDS is the stage of HIV infection that occurs when the immune system is badly damaged and it is become vulnerable to *opportunistic infections*. When the number of your CD4 cells falls below *200 cells/mm3*, these are considered to have progressed to AIDS. (In a healthy immune system, CD4 counts are between 500 and 1,600 cells/mm3.)

The initiation of antiretroviral therapy is based on CD4 counts of less than 350 cells/mm3 according to the World Health Organization (WHO) and Centre for Disease Control (CDC). The determination of CD4 count however in resource-limited localities is difficult.

In April 2002, the World Health Organization (WHO) suggested that total lymphocyte count (TLC) could serve as a surrogate for CD4+cell count because TLC is easily obtained from routine complete blood cell counts by multiplying the percentage of lymphocytes by the white-blood-cell count (Chen et.al, 2013).Total lymphocyte count (TLC) is a derived immunological marker calculated from white blood cell count and relative lymphocyte count. For instance, if a patient has a total white blood cell count of $10.0 \times 10^9$/L and relative lymphocyte count of 30% obtained from differential leukocyte count, total lymphocyte count of such patient would be $3 \times 10^9$/L.

The aim of this study was therefore to ascertain existing relationships between CD4 count and TLC and to further ascertain if TLC could be used as a surrogate markerfor CD4 counts.

## METHOD

### Study design

This observational study was conducted at dr. Soebandi General Hospital. The method used in this study is a cross sectional analysis. The study was conducted between March and August 2016. Subjects are 24 HIV patients who had their CD4 count and TLC tested in dr. Soebandi General Hospital. Data was taken from medical record of HIV patients. The CD4 count using single platform flowcytometry in PIMA CD4 machine. TLC using Sysmex Xt 2000i.

### Statistical analysis

The results were analyze statistically using the Pearson's correlation coefficient and t-test.

## RESULTS

From the 24 participant. There were 12 Male and 12 Female (Table 1).

### Table 1. Gender Frequency Distribution

|  | Frequency | Percent |
|---|---|---|
| Male | 12 | 50 |
| female | 12 | 50 |
| Total | 24 | 100 |

### Table 2. Age Distribution

|  | Male | Female |
|---|---|---|
| < 20 yo | 1 | 0 |
| 20- 30 yo | 4 | 3 |
| 30-40 yo | 4 | 4 |
| >40 yo | 3 | 5 |
| Total | 12 | 12 |

### Table 3. General demographic characteristic of the sample

|  | CD4 count (cells/ mm$^3$) | |
|---|---|---|
|  | < 200 | 200-500 |
| **Gender** | | |
| Male | 8 | 4 |
| Female | 11 | 1 |
| **age** | | |
| < 20 yo | 0 | 1 |
| 20-30 yo | 3 | 4 |
| 30-40yo | 8 | 0 |
| >40 yo | 8 | 0 |

Mainly HIV patients who were subject in this research were age 30-40 years and more than 40 years old. They are mostly have CD4 count < 200 cells/ mm$^3$ .

The CD4 values ranged between 4 / μl and 421 / μl with the mean 282 / μl . The TLC values ranged between 279 per mm$^3$ and 3120 per mm$^3$ with the mean 1881 per mm$^3$. The Pearson's correlation coefficient showed  r = 0,6488 and  r table = 0,404. The t-test showed t = 4,003, t table = 2,074. This result showed CD4 level positively correlate with TLC level.

**DISCUSSIONS**

This result corresponds with the research of Obirikorang et.al (2012) at the Central Regional Hospital in Ghana. This research showed a positive correlation between 184 paired CD4 and TLC counts (r = 0.5728).

Another research conducted in China by Chen et.al (2013) concluded that there was a good correlation between TLC and CD4 count (r = 0.60).

An overall good correlation between TLC and CD4+T-cell counts (r=0.65) was noted by Fasakin et al (2014).

Daka et al (2008) revealed low sensitivity and specificity of TLC as a surrogate measure for CD4 count.

Sen et al (2011) in they study reveals the poor association of TLC, Hb, and ESR with CD4 counts in HIV infected adults, thus highlighting the need to review the utility of these surrogate markers, for predicting CD4 counts in people living with HIV/AIDS.

Fasakin et al (2014) reveal that Comparison of correlations between CD4 and total lymphocyte count at different CD4 count thresholds showed a correlation coefficient of r= 0.30,  0.55 and 0.58 for CD4 count <200, ≤350 and <500 cells/μL respectively (p < 0.05).

Our result corresponds with the research of Sulianto et.al (2013) at Hasan Sadikin Hospital in Indonesia. This research showed a good correlation between  CD4 and TLC counts.

**CONCLUSION**

We present results from HIV patients at dr. Soebandi General Hospital, there are positive corelation between  CD4 level with TLC level. This result similar with research conduct by Obirikorang et.al, Chen et.al, Fasakin et al, and Sulianto et.al.

Fasakin et.al state that when considering initiating highly active antiretroviral therapy in HIV-infected patients, our findings of overall modest correlation of r=0.65 between total and CD4+ T-lymphocyte count has shown that total lymphocyte count can be used as an alternative inexpensive and readily available surrogate marker at two clinically significant CD4 thresholds of ≤ 350 and < 500 cells/μL.

Our study in HIV patients who has CD4 count < 500 cells/ mm$^3$ , reveals that there is a significant correlation between CD4 and TLC in HIV patients in dr. Soebandi General Hospital. TLC can be used to surrogate CD4 in resource-limited settings..

Because so many debate of correlation CD4 and TLC counts, TLC count as surrogate marker must be used in conjunction with the clinical status.

**REFERENCES**

1.  Chen J., Li W., Huang X., Guo C., Zou1 R., Yang Q., Zhang H., Zhang T., Chen H., Wu H., Evaluating Total Lymphocyte Count as a Surrogate Marker for CD4 Cell Count in the Management of HIV Infected Patients in Resource-Limited Settings: A Study from China. PLOS ONE. 8 (7). (2013)

2. Daka, D., Loha, E., Relationship between Total Lymphocyte count (TLC) and CD4 count among peoples living with HIV, Southern Ethiopia: a retrospective evaluation. AIDS Res Ther. 5. 26-31 (2008)

3. Fasakin, K.A., Omisakin, C.T., Esan A.J., Adebara I.O., Owoseni I.S., Omoniyi D.P., Ajayi O.D., Ogundare R.G., Moronkeji M.B., Total and CD4+ T- lymphocyte count correlation in newly diagnosed HIV patients in resource-limited setting. Journal of Medical Laboratory and Diagnosis. 5(2), 22-28. (2014)

4. Obirikorang, C., Quaye, L., Acheampong, I., Total lymphocyte count as a surrogate marker for CD4 count in resource-limited settings. BMC Infectious Diseases. 12, 124:128. (2012)

5. Sen., S., Vyas, A., Sanghi, S., K Shanmuganandan, K., Gupta, R.M., Kapila, K., Praharaf, A.K., Kumar, S., Batra, R.B., Correlation of CD4+ T cell Count with Total Lymphocyte Count, Haemoglobin and Erythrocyte Sedimentation Rate Levels in Human Immunodeficiency Virus Type-l Disease. MJAFI. 67. 15-20 (2011)

6. Sulianto, I.A., Indrati, A.R., Wisaksana R., Noormartany, Korelasi jumlah CD4 dan Total Lymphocyte Count (TLC) pada Penderita HIV/ AIDS dengan dan tanpa Terapi Anriretroviral. Global Medical and Health Communication. 1 (1), (2013)