

## Research Article

# Study of Viral Load and CD4 Count in Diagnosis of HIV-1 Positive Patients

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## Abstract

This study reports the distribution of CD4 counts and viral loads in first-time HIV positive patients.

One hundred cases of different kinds of HIV/AIDS were included in this study. Written consent was obtained from each participant for their information to be stored in the clinic database and used for research purposes. Blood samples were collected from these volunteers in the sterilized vials and processed for CD4 count and viral load. Data were analyzed with statistical package (SPSS 16.0) software and correlation coefficients and correlation matrix were determined.

One hundred cases (37 males and 63 females) of different kinds of HIV/AIDS were included in this study with a mean age ranged from  $33.45 \pm 13.052$ . Half of the patients below 29 years of age and only 4% are above 59 years of age. Relationship between the CD4 cell count and the dependent variable viral load. R, the multiple correlation coefficients, is the linear correlation between the observed and predicted values of the dependent variable viral load. Its large value indicates a strong relationship between CD4 cell count values and viral load ( $R=0.837$ ). If R value is small, then it takes large errors. For R square 0.701, nearly one third the variation in viral load is explained by the independent variable CD4 cell count. The Gender wise mean comparison of viral load in CD4 positive patients was found significant ( $p<0.05$ ).

HIV-infected men at their first HIV diagnosis are more likely to have lower CD4 counts and higher viral loads than women.

**Keywords:** CD4 Count; Viral Load; HIV Patients; Diagnosis; Gender

## Introduction

HIV RNA (viral load) and CD4 T lymphocyte (CD4) cell count are the two surrogate markers of antiretroviral treatment (ART) responses and HIV disease progression that have been used for decades to manage and monitor HIV infection. Viral load is the most important indicator of initial and sustained response to ART (AI) and should be measured in all HIV-infected patients at entry into care (AIII), at initiation of therapy (AIII), and on a regular basis thereafter.

Viral load is a marker of response to ART. A patient's pre-ART viral load level and the magnitude of viral load decline after initiation of ART provide prognostic information about the probability of disease progression [1]. The key goal of ART is to achieve and maintain durable viral suppression. Thus, the most important use of the viral load is to monitor the effectiveness of therapy after initiation of ART [2].

Measurement of CD4 count is particularly useful before initiation of ART. The CD4 cell count provides information on the overall immune function of an HIV-infected patient [3,4]. The measurement is critical in establishing thresholds for the initiation and discontinuation of opportunistic infection (OI) prophylaxis and in assessing the urgency to initiate ART.

This study reports the distribution of CD4 counts and viral loads

in first-time HIV positive patients.

## Materials and Methods

One hundred cases of different kinds of HIV/AIDS were included in this study. Written consent was obtained from each participant for their information to be stored in the clinic database and used for research purposes. Their age ranged between 18-60 years. All these subjects were selected from Sanjay Gandhi Post Graduate Institute of Medical Sciences, Lucknow, India. Blood samples were collected from these volunteers in the sterilized vials and processed for CD4 count and viral load. Viral Load testing was conducted using the Nuclisens Nucleic Acid Sequence Based Amplification (NASBA, bioMerieux,

**Table 1:** Distribution of age at different intervals with CD4 positivity in Case group.

| Age              | Cases (N=100)  |       |              |       |
|------------------|----------------|-------|--------------|-------|
|                  | CD4 +ve (n=73) |       | CD4 -ve (27) |       |
|                  | N              | %     | N            | %     |
| Less than 29     | 32             | 43.84 | 7            | 25.93 |
| between 29 to 39 | 16             | 21.92 | 9            | 33.33 |
| between 40 to 49 | 11             | 15.07 | 3            | 11.11 |
| between 50 to 59 | 11             | 15.07 | 7            | 25.93 |
| Above 59         | 3              | 4.11  | 1            | 3.70  |

Applied  $\chi^2$  test for significance. P value = 0.413.

**Table 2:** Gender distribution in CD4 positivity in Case group.

| Gender | Cases (N=100)  |       |              |       |
|--------|----------------|-------|--------------|-------|
|        | CD4 +ve (n=73) |       | CD4 -ve (27) |       |
|        | N              | %     | N            | %     |
| Male   | 30             | 41.10 | 12           | 44.44 |
| Female | 43             | 58.90 | 15           | 55.56 |

Applied  $\chi^2$  test for significance. P-value = 0.042\*; \* Significant.

**Table 3:** Gender distribution with CD4 cell count groups of CD4 positive patients in Case group.

| Gender | Cases (N=100)  |    |                    |       |                  |       |
|--------|----------------|----|--------------------|-------|------------------|-------|
|        | CD4 +ve (n=73) |    |                    |       |                  |       |
|        | Less than 200  |    | between 200 to 500 |       | Greater than 500 |       |
|        | N              | %  | N                  | %     | N                | %     |
| Male   | 8              | 40 | 16                 | 45.71 | 6                | 33.33 |
| Female | 12             | 60 | 19                 | 54.29 | 12               | 66.67 |

Applied  $\chi^2$  test for significance. P-value = 0.682.

**Table 4:** Frequency distribution of gender and age intervals according to CD4 positive patients.

| Gender | Age Category     | CD4 +ve (n=73) |       | CD4 -ve (n=27) |       | p-value |
|--------|------------------|----------------|-------|----------------|-------|---------|
|        |                  | N              | %     | N              | %     |         |
| Male   | Less than 29     | 14             | 19.18 | 5              | 18.52 | 0.071   |
|        | between 29 to 39 | 12             | 16.44 | 3              | 11.11 |         |
|        | between 40 to 49 | 4              | 5.48  | 2              | 7.41  |         |
|        | between 50 to 59 | 0              | 0.00  | 2              | 7.41  |         |
|        | Above 59         | 0              | 0.00  | 0              | 0.00  |         |
| Female | Less than 29     | 18             | 24.66 | 3              | 11.11 | 0.380   |
|        | between 29 to 39 | 4              | 5.48  | 5              | 18.52 |         |
|        | between 40 to 49 | 7              | 9.59  | 1              | 3.70  |         |
|        | between 50 to 59 | 11             | 15.07 | 5              | 18.52 |         |
|        | Above 59         | 3              | 4.11  | 1              | 3.70  |         |

Applied  $\chi^2$  test for significance.

Inc. Durham, NC) test platform for most tests (the detection limit for HIV viral load was <400copies/ml) and the Real Time HIV-1 Amplification Polymerase Chain reaction (PCR) (ABBOTT Molecular, Inc, Des Plaines, IL) platform in a few instances. CD4 cells were enumerated using the flow cytometry method.

Data were analyzed with statistical package (SPSS 16.0) software and correlation coefficients and correlation matrix were determined. Results were presented in simple tables with frequencies and percentages while statistical significance was taken to be p value  $\leq 0.05$ .

## Results

One hundred cases (37 males and 63 females) of different kinds of HIV/AIDS were included in this study with a mean age ranged from  $33.45 \pm 13.052$ . Half of the patients below 29 years of age and only 4% are above 59 years of age.

Frequency distribution of Age intervals according to CD4 positivity in case groups are summarized in Table 1. Statistically, this percentage difference among groups was not significant ( $p > 0.05$ ).

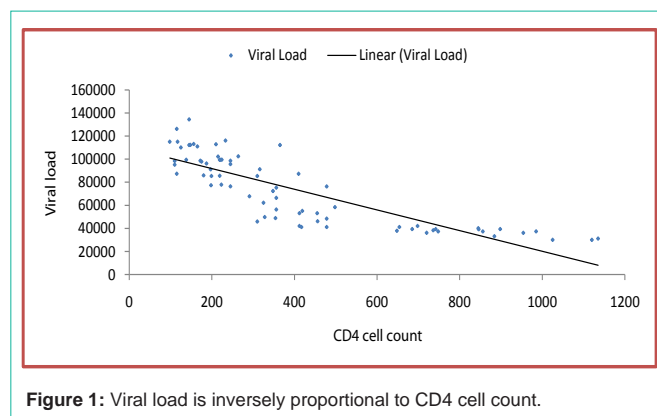
**Table 5:** Linear Correlation of viral load and CD4 cell count values in CD4 positive patients of treatment group (n=73).

| R     | R Square | Adjusted R Square | Std. Error of the Estimate |
|-------|----------|-------------------|----------------------------|
| 0.837 | 0.701    | 0.697             | 16495.586                  |

**Table 6:** Mean comparison of viral load distribution according to Gender in CD4 positive patients in treatment group (n=73).

|            | Male     |          | Female   |          | p-value |
|------------|----------|----------|----------|----------|---------|
|            | Mean     | SD       | Mean     | SD       |         |
| Viral load | 50103.10 | 30111.83 | 63297.47 | 36133.31 | 0.032*  |

Applied unpaired t test for significance. \*Significant.



Frequency distribution of Gender according to CD4 positivity in cases group is summarized in Table 2. Statistically, this percentage difference among groups was significant ( $p < 0.05$ ).

Frequency distribution of Gender according to CD4 positive patients according to CD4 cell count categories in cases group are summarized in Table 3. Statistically, this percentage difference among groups was not significant ( $p > 0.05$ ).

Frequency distribution of Gender with age category according to CD4 positive patients in cases group are summarized in Table 4. Statistically, this percentage difference among groups was not significant ( $p > 0.05$ ).

The above Table 5 reports the strength of the relationship between the CD4 cell count and the dependent variable viral load. R, the multiple correlation coefficients, is the linear correlation between the observed and predicted values of the dependent variable viral load. Its large value indicates a strong relationship between CD4 cell count values and Viral load ( $R = 0.837$ ). If R value is small, then it takes large errors. For R square 0.701, nearly one third the variation in viral load is explained by the independent variable CD4 cell count.

The ANOVA table reports a significant F statistic (F value=166.71; P value =  $< 0.001$ ) consider extremely significant.

Figure 1 shows that the viral load is inversely proportional to CD4 cell count.

The Gender wise mean comparison of viral load in CD4 positive patients of treatment group are summarized in Table 6. Statistically, this difference between males and females was found significant ( $p < 0.05$ ).

## Discussion

According to experimental work, major probability regarding occurrence of disease is more in age of below 29 years which is further elevated that male is more sensitive rather than female due to their physiological activities whereas in case of female specially under immature condition, chance for infection of HIV is more due to favorable structural designing of the female reproductive organs.

The strength of the relationship between the CD4 cell count and the dependent variable viral load. R, the multiple correlation coefficient, is the linear correlation between the observed and predicted values of the dependent variable viral load. Its large value indicates a strong relationship between CD4 cell count values and Viral load ( $R=0.837$ ). If R value is small, then it takes large errors. For  $R^2$  0.701, nearly one third the variation in viral load is explained by the independent variable CD4 cell count similar to other studies [5-8]. The viral load is inversely proportional to CD4 cell count [9,10].

The Gender wise mean comparison of viral load in CD4 positive patients of treatment group, statistically, this difference was found significant ( $p<0.05$ ). Other studies have noted gender differences in viral loads and CD4 at various stages of the disease, where females develop AIDS at higher CD4 counts and lower viral loads [6-8].

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