Original Article

Correlation of CD4 Lymphocyte Count with Haemoglobin Concentration in HIV Infected Patients at HIV Treatment Center P.I.M.S Islamabad

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ABSTRACT

Objectives: To find correlation between CD4 lymphocyte count and heamoglobin concentration in HIV infected patients.

Study Design: Descriptive observational study.

Place and Duration: HIV/AIDS treatment center Pakistan institute of medical sciences, Islamabad. The study was conducted between march 2013 to September 2013

Materials and Methods: Two hundred and ninety nine (299) HIV positive patients were enrolled in this study .Blood CP and CD4 counts were done as a part of baseline investigations. Hemoglobin concentration and CD4 counts were analyzed in all the patients and their correlation assessed.

Results: The mean blood hemoglobin concentration in 299 patients was (12.56±1.86) with minimum hemoglobin concentration of (6.7g/dl) and maximum of (17.6g/dl).Mean CD4 count was (475.89±286.76) with minimum CD4 count of (11) and maximum of (1464).Using the persons correlation there was a significant and positive correlation between hemoglobin concentration and CD4 count. (r^2=0.023 and p=0.009) at 0.01 level one tailed.

Conclusions: Anemia in HIV patients is associated with increased morbidity and mortality. Hemoglobin concentration in HIV patients depends on several factors such as co morbidities, use of ARVs etc. Our study shows that CD4 count is an important determinant of hemoglobin concentration and low hemoglobin counts portends a bad prognosis in HIV patients as they are positively correlated with patients' immune status.

Key Words: Hemoglobin, CD4 count, HIV,

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Introduction

Human immunodeficiency infection is caused by human deficiency virus(HIV) which is RNA virus of retrovirus family, that attacks the immune system[1] and counteracts both innate and acquired immunity.[2]The virus preferentially infects CD4 lymphocytes3 causing their destruction.it has been calculated that each day more than 10^9 CD4 cells are destroyed.4The decline in CD4 count is linked to HIV viral load and is used as a measure of disease progression.[4]

Cytopenias of all major blood lines are recognized in HIV infected individuals of these anemia is most common hematological abnormality that affects 60-80% of patients in late stage.[5,14] There are many etiological factors responsible for development of anemia in HIV infected individuals including dietary deficiencies of iron,B12, folic acid, malabsorption, decrease production of erythropoietin and bone marrow infiltration by malignancies and infectious processes.[5]

Pakistan is identified as a low-prevalence, high risk country for the spread of HIV infection,According to epidemiological fact sheet on HIV and AIDS 2008,number of people living with HIV is 96,000 with a range of (69000-1,50,000).[6]

There is no clear evidence that whether decline in CD4 count is directly related to fall in hemoglobin concentration or not. Purpose of our study is to elucidate any causal relationship between the two.

Materials and Methods

This was a descriptive observational study, carried out at HIV/AIDS treatment center Pakistan institute of medical sciences, Islamabad. The study was conducted between March 2013 to September 2013.

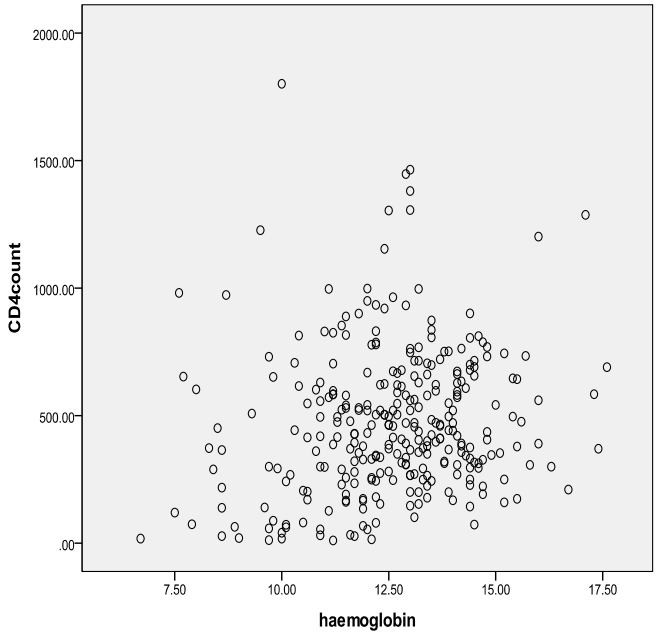
Two hundred and ninety nine(299) HIV positive patients were enrolled in this study. HIV infection was diagnosed by testing for HIV antibody PCR and western blot.at baseline visit blood was drawn for blood hemoglobin and CD4 lymphocyte count .the blood hemoglobin concentration was determined by an automated analyser.CD4 count was determined by flow cytometry.

Statistical analysis:

The data was analysed by SPSS version 19,mean and standard error of mean was calculated. Correlations were evaluated using

Results

The mean blood hemoglobin concentration in was (12.56±1.86) with minimum hemoglobin concentration of (6.7g/dl) and maximum of (17.6g/dl). Mean CD4 count was (475.89±286.76) with minimum CD4 count of (11) and maximum of (1464). we compared the means of CD4 count and hemoglobin using one sample t-test. with t value of 116.51 for Hb and 28.69 for CD4.using this test values which fell within 95% of confidence interval(CI) for Hb were(12.35-12.78) and those for CD4 were from(443.26 -508.53) .using these values the scatter plot which we obtained is given below.



We calculated simple linear regression using ANOVA model which yielded r^2 change of 0.023 and F change of 6.87. Using the pearsons correlation there was a significant and positive correlation between hemoglobin concentration and CD4 count.(r^2=0.023 and p=0.009) at 0.01 level of significance.

Discussion

Our study showed that low hemoglobin (Hb) is strongly associated with decline in CD4 –lymphocyte count in HIV infected patients. As disease progression occurs in HIV infection/AIDS there is increase in HIV viral load and subsequent death of CD4 lymphocytes.[4] Routine follow-up of HIV-infected patients includes measurement of CD4 cell count and viral load to assess virus replication.[11] CD4 count is therefore taken as most significant marker of disease progression and survival in HIV infection[10] i.e. lower the CD4 count higher the stage of disease and worse the prognosis.

Low hemoglobin occurs as a result of many pathogenic mechanisms in HIV/AIDS these include increased cytokine mediated myelosuppression, myelophthisis (bone marrow infiltration by lymphomas, atypical mycobateriosis), nonspecific effect due to chronic infection, insufficient intake of substrates of hematopoiesis(iron, folic acid.B12), increased red cell destruction (infections, hypersplenism, malignancies, autoimmune hemolysis, disseminated intravascular coagulation), impaired production of erythropoietin by renal tubular cells and drug induced myelosupression (methotrexates, ulfamethoxazole, Anti-retroviral drugs).[7,14] Low hemoglobin is independently associated with decline in CD4 lymphocyte count in HIV infected individuals.[15]

There is no clear documented causal relationship between low hemoglobin and poor patient outcome, but many retrospective analyses have shown association between low hemoglobin and decreased survival, impaired quality of life, and disease progression in HIV infected patients.[8,9,15,16] CD4 count and low hemoglobin concentration are two factors associated with increased mortality in HIV/AIDS[16].Many longitudinal studies have shown that low Hb increases the risk of death in patients with AIDS and advance immunodeficiency.[8]

Hemoglobin concentration can be checked easily by spectrophotometric method using a chromatography paper and is inexpensive.[13] Presence of anemia in HIV infected patients portends a bad prognosis; hemoglobin level monitoring could be used to alert physicians to HIV

infected patients who require more close and regular follow-up.[7]

On contrary CD4 lymphocyte count measurement requires much expensive test i.e. flow cytometry,which is not readily available in our resource limited country. [12]

Anaemia is a frequent complication that occurs in 20-80% of HIV-infected persons and is associated with faster disease progression and mortality. This makes it more common than thrombocytopenia or leucopenia in patients with AIDS.[17,18]

Our study has shown a significant positive correlation between hemoglobin concentration and their respective CD4 lymphocyte count, regular monitoring of hemoglobin concentration can be used as a marker of disease activity in HIV infected patients, so that those with progressing disease could be isolated for more close monitoring and treatment.

Conclusion

Our study showed a significant positive correlation between hemoglobin concentrations and their respective CD4 lymphocyte counts.

References

1. Sepkowitz KA (June 2001). AIDS—the first 20 years. *N. Engl. J. Med.* 344 (23): 1764–72.
2. Viviana Simon, David D Ho, and Quarraisha Abdool Karim.HIV/AIDS epidemiology,pathogenesis,prevention and treatment Lancet. 2006 August 5; 368(9534): 489–504.
3. Ronald Swanstrom1 and jhon coffin2 . HIV-1pathogenesis:the virus. Cold Spring Harb Perspect Med. 2012 Dec 1;2(12)
4. Davidson's principles and practice of medicine 21st edition pages 387-388.
5. .Mohsen Meidani,[1] Farshid Rezaei,[2] Mohammad Reza Maracy,[3] Majid Avijgan,[4] and Katayoun Tayeri[5] .prevalence,severity and related factors in HIV/AIDS patients.J Res Med Sci. 2012 February; 17(2): 138–142.
6. UNAIDS epidemic update 2008.
7. Kumasi,Ghana .blood hemoglobin measurement as a predictive indicator for the progression of HIV/AIDS in resource- limited setting.18 november 2009,journal of biomedical science2009,16:102
8. Paul A. Volberding, Alexandra M. Levine , Douglas Dieterich,Donna Mildvan,Ronald Mitsuyasu, Michael Saag .significance of anemia in HIV working group.oxford journal of medicine,clinical infectious disease,vol,38 issue 10(1454-1463).
9. Fangman JJ, Scadden DT " anemia in HIV infected adults,epidemiology,pathogenesis and clinical management" curr hematol Rep 2005,Mar4 (2):95-102
10. Simone E Langford, Jintanat Ananworanich, and David A Cooper AIDS Res Ther. Predictors of disease progression in HIV infection: a review. 2007; 4: 11. 2007 May 14
11. Grossman Z, Kra-Oz Z. HIV testing: the medical laboratory role in HIV diagnosis and monitoring. Harefuah. 2013 Aug;152(8):477-80, 498.
12. Dieye TN, Diaw PA, Daneau G, Wade D, Sylla Niang M, Camara M, Diallo AA, Toure Kane C, Diop Ndiaye H, Mbengue B, Dieye A, Kestens L, Mboup S. Evaluation of a flow cytometry method for CD4 T cell enumeration based on volumetric primary CD4 gating using thermoresistant reagents. J Immunol Methods. 2011 Sep 30;372(1-2):7-13.
13. Bond M, Elguea C, Yan JS, Pawlowski M, Williams J, Wahed A, Oden M, Tkaczyk TS, Richards-Kortum R. Chromatography paper as a low-cost medium for accurate spectrophotometric assessment of blood hemoglobin concentration. Lab Chip. 2013 Jun 21;13(12):2381-8. Epub 2013 May 7.
14. De Santis GC, Brunetta DM, Vilar FC, Brandão RA, de Albernaz Muniz RZ, de Lima GM, Amorelli-Chacel ME, Covas DT. Hematological abnormalities in HIV-infected patients. Int J Infect Dis. 2011 Dec;15(12):e808-11.
15. G. Miiro[1], S. Nakubulwa[1], C. Watera[1], P. Munderi[1], S. Floyd[2], H. Grosskurth Evaluation of affordable screening markers to detect CD4+ T-cell counts below 200 cells/μl among HIV-1-infected Ugandan adults.Tropical Medicine & International Health Volume 15, Issue 4, pages 396–404, April 2010.
16. Amanda J. Redig and Nancy Berliner Pathogenesis and clinical implications of HIV-related anemia in 2013,ASH Education Book December 6, 2013 vol. no. 1 377-381.
17. Belperio PS, Rhew DC. Prevalence and outcomes of anemia in individuals with human immunodeficiency virus: a systematic review of the literature. Am J Med. 2004;116(suppl 7A):27S–43S. doi: 10.1016/j.amjmed.2003.12.010.
18. Attili S, Singh V, Rai M, Varma D, AK G. Hematological profile of HIV patients in relation to immune status - a hospital-based cohort from Varanasi, North India. Turk J Hematol. 2008;25:13–19.