A Study on Erythrocytic Determination of Anemic Condition among Human Immunodeficiency Virus Sero Positives

M. Andrew Pradeep, M. Thiruvalluvan and V. Dhamodharan
Department of Immunology and Microbiology, The American College, Madurai, India

Abstract: Problem statement: Acquired Immuno Deficiency Syndrome (AIDS) is growing health hazard throughout the world. In developing countries like India anemia is highly prevalent in the population due to the malnourished condition apart, HIV infection is one among the major cause of anemia. The outcome of certain infectious diseases including HIV is worse when the host is malnourished. HIV infection is one of the major contributions to the development of anemia. As HIV infection advances progressive anemia is established. Hemochrome parameters and Erythroid indices are used as a marker for monitoring HIV status. Since hematological toxicity is the most common adverse effect related to long term administration of anti-viral drugs. **Approach:** Selection of study groups: A total of 49 HIV patient blood sample were collected which includes 16 HIV/AIDS male patients and 33 HIV/AIDS female patients attending Department of Sexually Transmitted Disease, Mohan Kumaramangalam Government Hospital, Salem where subjected in the present study. Determination of Erythroid Indices such a Mean Corpuscular Volume (MCV) Mean Corpuscular Hemoglobin Concentration (MCHC) Mean Corpuscular Hemoglobin (MCH) for Anemic condition. **Results:** Present study documented the prevalence of Hypochromic Microcitic anemia. **Conclusion:** Proper therapeutic management and nutiritional supplement might reduce the burden of anemia thereby increase the survival of HIV sero positives.

Key words: HIV, anemia, red blood cells, erythropoietin, hematopoiesis, erythroid indices

INTRODUCTION

The acquired immuno deficiency disease is a growing health hazard throughout the world. The spread of human immuno deficiency virus infection in India is associated with multifaceted complication and results in serious scenarios. In developing countries like Anemia is highly prevalent in the population due to the malnourished condition apart HIV infection is one among the major cause of anemia. As HIV infection advances progressive anemia is established. Anemia one of the most blood disorder due to reduced level healthy Red Blood Cells. Since RBC contain hemoglobin which carry oxygen for the functional part of organs. Anemia can cause variety of complication leading to the establishment of severe pathogenesis. Anemia is a frequent complication of infection with HIV and may have multiple cause. HIV infection may lead to anemia due to the change in cytokine production, subsequent effect of hematopoiesis (Camacho *et al*., 1992; Spivak *et al*., 1989), decreased erythropoietin concentration (Maciejewski *et al*.,

1994; Wang *et al*., 1993; Zauli *et al*., 1992), opportunistic infectious agents such as *Mycobacterium* sp. (Horsburgh, 1991) and administration of chemotherapeutic agents such as Zidovudine (Richman *et al*., 1987) and myelophehisis caused by cancer such as Lymphoscarcoma. Other mechanism for HIV associated anemia although uncommon include Vitamin B12 deficiency (Remacha *et al*., 1991) and auto immune destruction of red blood cells (Ciaffoni *et al*., 1992), direct infection of marrow precursor cells (Cleveland and Liu, 1996) has been hypothesized but not proven. Anemia has been associated with progression of AIDS (Morfeldt-Manson *et al*., 1991) and shorter survival time (Ellaurie *et al*., 1990; Salort *et al*., 1997) for HIV infected patients. Understanding the association between anemia and survival is an important tool for designing the treatment strategies there by improving the survival of HIV sero positives.

Present study attempts to find out the association of anemia in HIV progression among HIV sero positives.

Corresponding Author: M. Andrew Pradeep, Department of Immunology and Microbiology, The American College, Madurai, India

MATERIALS AND METHODS

Selection of study groups: A total of 49 HIV patient blood sample were collected which includes 16 HIV/AIDS male patients and 33 HIV/AIDS Female patients attending Department of Sexually Transmitted Disease, Mohan Kumaramangalam Government Hospital, Salem where subjected in the present study.

Collection and transport of specimen: Blood was collected on one occasion from each participants in sterile screw cap Laxbro vials with informed consent of the patient. Blood sample were transferred to the lab within 6 hours for determination of Erythroid Indices such a Mean Corpuscular Volume (MCV) Mean Corpuscular Hemoglobin Concentration (MCHC) Mean Corpuscular Hemoglobin (MCH) for Anemic condition.

Figure 1 represents the age wise prevalence of HIV Seropositives. Highest HIV seropositivity is observed in 31-45 age group of females (57.5%).
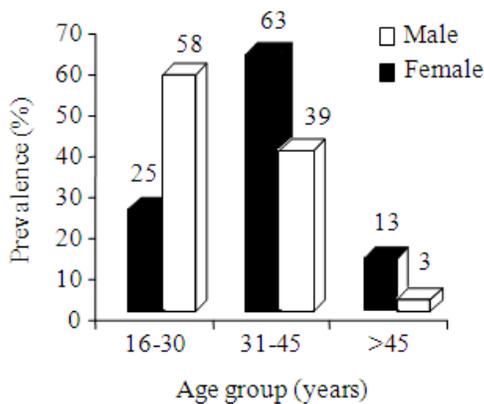
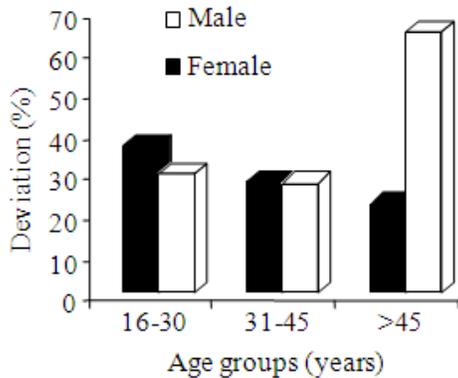Figure 2 represent percentage deviation of absolute erythrocyte (RBC) is greater (36.4%) with lesser mean value (3.5 mm^3) observed in age group of 16-30 male category. In contrast same is reported in age group of 45 and above in female categories (1.7 mm^3) with 64.6% deviation. the other two age groups of female HIV sero positives are (16-30 and 31-45 age group) resembling 31-45 and 45 and above age groups of male HIV sero positives in terms of mean RBC count.

Figure 3 represents erythrocyte mean corpuscular hemoglobin index of male and female categories. Greater deviation of MCH is reported in 45 and above male (8.4%) category and 16-30 female (5.3%) category. The remaining age groups show almost same MCH values.

Figure 4 represents percentage deviation of Mean Corpuscular Hemoglobin concentration in all age groups shows uniform MCHC value except the age group of 45 and above in both male and female HIV sero positives.
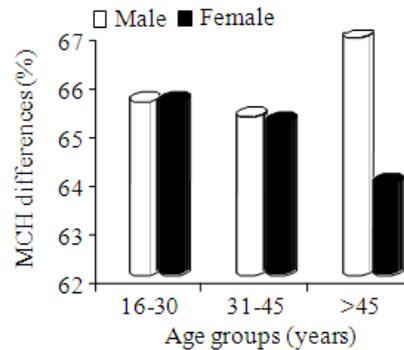

Fig. 1: Age wise prevalence of seropositive

Fig. 2: Percentage deviation of total RBC in different age group of HIV seropositive

Fig. 3: Percentage differences of erythrocyte Mean Corpuscular Heamoglobin (MCH) Index among HIV seropositive
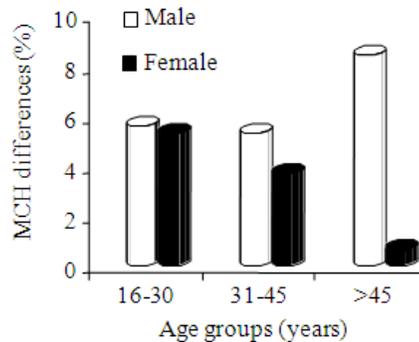

Fig. 4: Percentage differences of erythrocyte Mean Corpuscular Haemoglobin Concentration (MCHC) among HIV seropositive

RESULTS AND DISCUSSION

Anemia is a frequent complication of HIV infection that is associated with an increased risk of death and recovery of anemia is associated with decreased risk of death with HIV infected persons. The incident of anemia was strongly and consistently associated with progression of HIV disease as measured by diagnosis of an AIDS defining opportunistic illness and measurement of CD4+ count. This association explains the increased viral burden which could cause anemia due to cytokine mediated, Myelosuppression alternatively anemia may be surrogate marker for some aspect of disease progression.

Present study documents the prevalence of Hypochromic Microcytic anemic condition among HIV sero positives. Anemic condition characterized by increase circulating cytokine immune activation by a blunted response of Erythropoietin to anemia (Means Jr, 2000).

Tumor Necrosis Factor (TNF) plays a major role in suppression of Erythropoiesis during HIV infection (Murphy *et al.*, 1988; Wang *et al.*, 1993). A negative correlation was described between Hemoglobin and circulating receptors for TNF with advanced HIV diseases suggest the possible association between TNF and impairment of Erythropoietin production.

Iron deficiency has also contributed to half of the anemia occurrence among the HIV infective patient. Ferritin acts as a indicator of iron status. There is positive correlation of Ferritin as an indicator of immune inactivation such as lower Lymphocyte count suggesting the severity of HIV infection.

CONCLUSION

Iron supplementation might be a suggestive component to over the anemia among HIV patients.

Proper therapeutic management and nutritional supplement might reduce the burden of anemia thereby increase the survival of HIV sero positives.

REFERENCES

Camacho, J., F. Poveda, A.F. Zamorano, M.E. Valencia, J.J. Vázquez and F. Arnalich, 1992. Serum erythropoietin levels in patients with advanced human immunodeficiency virus infection. Br. J. Haematol., 82: 608-614. PMID: 1486042

Ciaffoni, S., R. Luzzati, C. Roata, A. Turrini, O. Antonello and G. Aprili, 1992. Presence and significance of cold agglutinins in patients with HIV infection. Haematologica, 77: 233-236. PMID: 1427429

Cleveland, R.P. and Y.C. Liu, 1996. CD4 expression by erythroid precursor cells in human bone marrow. Blood, 87: 2275-2282., PMID: 8630388

Ellaurie, M., E.R. Burns and A. Rubinstein, 1990. Hematologic manifestations in pediatric HIV infection: Severe anemia as a prognostic factor. Am. J. Pediatr. Hematol. Oncol., 12: 449-453. PMID: 2285125

Horsburgh, C.R., 1991. Mycobacterium avium complex infection in the acquired immunodeficiency syndrome. N. Engl. J. Med., 324: 1332-1338. PMID: 2017230

Maciejewski, J.P., F.F. Weichold and N.S. Young, 1994. HIV-1 suppression of hematopoiesis *in vitro* mediated by envelope glycoprotein and TNF. J. Immunol., 153: 4303-4310. PMID: 7523521

Means Jr., R.T., 2000. The anemia of infection. Ballière's Clin. Hematol., 13: 151-162.

Morfeldt-Manson, L., B. Böttiger, B. Nilsson and L.V. von Stedingk, 1991. Clinical signs and laboratory markers in predicting progression to AIDS in HIV-1 infected patients. Scand J. Infect. Dis., 23: 443-449. PMID: 1683492

Murphy, M., B. Perussia and G. Trinchieri, 1988. Effects of recombinant tumor necrosis factor, lymphotoxin and immune interferon on proliferation and differentiation of enriched hematopoietic precursor cells. Exp. Hematol., 16: 131-138. PMID: 3123270

Remacha, A.F., A. Riera, J. Cadafalch and E. Gimferrer, 1999. Vitamin B-12 abnormalities in HIV-infected patients. Eur. J. Haematol., 47: 60-64. PMID: 1868915

Richman, D.D., M.A. Fischl, M.H. Grieco, M.S. Gottleib and P.A. Volderding *et al.*, 1987. The toxicity of azidothymidine (AZT) in the treatment of patients with AIDS and AIDS-related complex. A double-blinded, placebo controlled trial. N. Engl. J. Med., 317: 192-197. PMID: 3299090

Salort, Y., M. Dupon, G. Chene, S. Farbos, C. Nouts and C. Marimoutou, 1997. Predictors of mortality in patients with advanced immunodeficiency. Proceeding of the 4rth Conference on Retroviruses and Opportunistic Infections, Jan. 22-26, Washington DC., pp: 1-1. http://gateway.nlm.nih.gov/MeetingAbstracts/ma?f=102225309.html

Spivak, J.L., D.C. Barnes, E. Fuchs and T.C. Quinn, 1989. Serum immunoreactive erythropoietin in HIV-infected patients. J. Am. Med. Assoc., 261: 3104-3107. PMID: 2716142

Wang, Z., M.A. Goldberg and D.T. Scadden, 1993. HIV-1 suppresses erythropoietin production *in vitro*. Exp. Hematol., 21:683-688. PMID: 8390370

Zauli, G., M.C. Re, G. Visani, G. Furlini and P. Mazza *et al.*, 1992. Evidence for a human immunodeficiency virus type-1 mediated suppression of uninfected hematopoietic (CD34+) cells in AIDS patients. J. Infect. Dis., 166: 710-716. PMID: 1382106