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Original Research Article

Hemoglobin and CD4 count in HIV patients initiating antiretroviral therapy at a tertiary care hospital in Goa

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ABSTRACT

Background: Hematological abnormalities are known to be independent predictors of morbidity and mortality in HIV-infected patients. The current study was conducted to evaluate the hemoglobin levels and CD4 count at the time of initiation of highly active antiretroviral therapy (HAART) of newly diagnosed HIV/AIDS patients attending ART centre at Goa Medical College.
Methods: A hospital based observational retrospective study was carried out in Department of Medicine of Goa Medical College in collaboration with ART centre from October 2015 to January 2016. Patient's relevant data about the infection was collected from patient's treatment record card at the ART centre using preformed questionnaire.
Results: The prevalence of anaemia in study participants was 66.35%. The prevalence of severe anaemia and mild-moderate anaemia was 9% and 57.3% respectively, while 33.65% of participants were not anaemic. Significant difference was observed in the prevalence of anaemia among immune deficient male participants (CD4 count <500 cells/mm^3) and participants with no significant immune deficiency (CD4 count ≥500 cells /mm^3) (77.5% versus 50%). Significant difference was also seen in the prevalence of anaemia among immune deficient female participants (CD4 count <500 cells/mm^3) and participants with no significant immune deficiency (CD4 count ≥500 cells /mm^3) (93.5% versus 56%).
Conclusions: The current study revealed high prevalence of anemia in HIV patients prior to the initiation of ART in both males as well as females. Mild to moderate anemia was predominant in the study participants than severe anemia. There was significant difference observed in the prevalence of anemia among immune deficient population and participants with normal CD4 count. Prompt diagnosis of anaemia, identification of the underlying cause of anaemia in HIV patients as well as the implementation of appropriate treatment is essential.

Keywords: Haemoglobin, CD4, Anaemia, HIV, AIDS, Immunodeficiency

INTRODUCTION

Hematological manifestations are commonly seen among patients of human immunodeficiency virus (HIV). Immunological impairment in the form of damage to cellular and humoral immunity is a sine-qua-non of AIDS. Immunological abnormalities in the form of reduction of CD4 counts associated with anemia are known to be strong predictors of mortality and morbidity in HIV patients. The severity of anemia is also associated with decreased survival in HIV patients. The prevalence of anemia in HIV patients is found to be between 1.3 to 95%.[1] Anemia in HIV is multifactorial affected by age, sex, stage of the disease and coexisting nutritional deficiency. Though numerous clinical studies have been carried out from across India, limited number of studies has been

undertaken on anemia in HIV in Goa till date. Therefore, the objective of the current study conducted was to evaluate the hemoglobin levels and CD4 count at the time of initiation of highly active antiretroviral therapy (HAART) of newly diagnosed HIV/AIDS patients attending ART centre at Goa Medical College.

METHODS

The present study was a hospital based observational retrospective study. The study was carried out in the Department of Medicine of Goa Medical College in collaboration with ART centre. The study was conducted from October 2015 to January 2016. Ethical approval was obtained from Goa Medical College ethics committee prior to the study. All HIV positive patients who were freshly enrolled for treatment in ART centre in Goa Medical College from July 2014 to July 2015 were included in the study. The sampling technique used was purposive sampling.

A total of 211 HIV/AIDS patients were enrolled in the study, based on inclusion and exclusion criteria. Patient's data about the infection, CD4 counts, staging of disease, associated systemic disease, laboratory investigations such as hemoglobin were collected from patient's treatment record card at the ART centre. The data was collected from the records prior to the initiation of antiretroviral therapy. Confidentiality and privacy was maintained throughout the study, data were stored safely and made accessible only to the researchers. The data was analyzed using mean, standard deviation and Chi-square test.

Inclusion criteria

All newly diagnosed HIV positive patients excluding paediatric group at either inpatient or at outpatient level who were registered at ART centre of Goa Medical College from July 2014 to July 2015 were included in the study.

Exclusion criteria

Patients who were known case of HIV and who are already on ART and children below 12 years were excluded from the study.

Definition of anemia

Anemia was defined as hemoglobin concentration less than 13 g/dl for adult males and less than 12 g/dl for adult females. It was further classified into mild (11–11.9 g/dl for women and 11–12.9 g/dl for men), moderate (8–10.9 g/dl) and severe (<8 g/dl) for both sexes.[2]

CD4 count was classified as per World Health Organization (WHO) guidelines into normal (>500cells/mm^3), mild immunodeficiency (350-499 cells/mm^3), advanced immunodeficiency (200-349 cells/mm^3) and severe immunodeficiency (<200 cells/mm^3).[3]

RESULTS

In the present study out of 211 patients, the male patients 112 (53.08%) outnumbered the female patients 99 (46.92%). Male to female ratio was 1.13:1. 170 patients (80.56%) were in the age group of 20-39 years.

The study showed preponderance of severe immunodeficiency in HIV patients at the time of initiation of ART. 83 of 213 patients had CD4 count less than 200/mm^3 whereas 51 patients had advanced immunodeficiency (CD4 count between 200 to 349 cells/mm^3). 39 patients of 213 patients had mild immunodeficiency with CD4 between350 to 499cells/mm3. 39 patients at the time of presentation showed a normal CD4 count.

The prevalence of anemia in study participants was 66.35 %. The prevalence of severe anemia and mild-moderate anemia was 9% and 57.3% respectively, while 33.65% of participants were not anemic. HIV patients prior to the initiation of ART had average hemoglobin of 11.3 gm%. Average hemoglobin in male patients was found to be 11.75 gm% whereas female patients had average hemoglobin of 10.81 gm%. 72 males (64.2%) had anemia at presentation of which 9 patients (12.5%) had severe anemia with hemoglobin less than 8 gm%. 68 of 99 female patients (68.6%) had anemia of which 10 patients (14.7%) had hemoglobin of <8 gm%.

Table 1: Number of male patients based on hemoglobin concentration.

Hemoglobin in gm%	No. of males
>13	40
11-12.9	31
8-10.9	32
<8	9
Total	112

Table 2: Number of female patients based on hemoglobin concentration.

Hemoglobin in gm%	No. of females
>12	31
11-11.9	20
8-10.9	38
<8	10
Total	99

The study showed that 77.35% of the male HIV patients with severe immunodeficiency (CD4 count <200) were anemic with majority having moderate anemia. 9% of these severe immunodeficiency patients had hemoglobin of <8 gm%. In advanced immunodeficiency cases, 59.2% of male patients had anemia of which majority of them had

mild anemia. In mild immunodeficiency cases, only 8 of 18 cases had anemia. 50% of HIV males with normal CD4 count were also found to have anemia. These results were statistically significant using chi square test at 0.05 (p=0.4679).

93.5% of female HIV patients with severe immunodeficiency at the time of presentation had anemia of which 75% had moderate anemia. Only 3 patients with severe immunodeficiency had severe anemia. Of the participants with mild and advanced immunodeficiency, 61% and 56% had anemia respectively. 56% of HIV female patients with normal CD4 count also were found to have anemia. This is described in Table 4. The difference in anemia prevalence among participants based on immune status in females was also statistically significant (Pearson Chi-square, p=0.0009).

Table 3: Number of participants in each group based on CD4 count and hemoglobin concentration in males.

CD4 count cells/m^3	Hemoglobin in gm%				Total number of participants
	>13	11 to 12.9	8 to 10.9	<8	
>500	7	4	2	1	14
350-499	10	5	2	1	18
200-349	11	10	4	2	27
<200	12	12	24	5	53
Total	40	31	32	9	112

Table 4: Number of participants in each group based on CD4 count and hemoglobin concentration in females.

CD4 count	Hemoglobin in gm%				Total number of participants
	>12	11 to 11.9	8 to 10.9	<8	
>500	11	5	8	1	25
350-499	7	5	2	4	18
200-349	11	6	6	2	25
<200	2	4	22	3	31
Total	31	20	38	10	99

DISCUSSION

Hematologic abnormalities are among the most common manifestations of HIV infection and acquired immunodeficiency syndrome (AIDS). Anemia has been reported to be one of the more common hematological disorders affecting patients with HIV.[4,5] Studies have shown that the prevalence of anemia in HIV disease can be up to 80% depending on region and threshold used to define anemia.[6] In HIV infection, the presence of anemia can lead to faster HIV disease progression.[7] Hematological complications such as mild-to-severe anemia are associated with HIV progression and subsequent reduced survival.[6]

HIV related anemia may be due to opportunistic infections, as a side effect of chemotherapeutic treatment, as a result of changes in cytokine expression with resultant decrease in blood cell production, or as a consequence of micronutrient deficiencies.[8-10] HIV infection itself causes anemia, probably as a consequence of HIV infection of stromal cells. Other common causes of anemia in AIDS are anemia of chronic disease, bone marrow suppression by ART, and haemolytic anemia induced by oxidant drugs.[8,11] Cytokines such as interleukin 1, tumour necrosis factor and the interferon impair erythropoietin response by reducing concentration of marrow progenitors and erythroid colonies. As ART generally diminishes these cytokines, anemia is less common than in the pre ART era. But commonly used myelosuppressive drugs in HIV may contribute to anemia. Anemia still continues to contribute to morbidity and reduced quality of life in HIV patients in the ART era.[6] Hence there is a need to diagnose anemia and treat the underlying causes.

Anemia was found to be highly prevalent (66.5%) in the current study. This was similar to the findings Ahumareze et al study done in children on HAART in Nigeria.[12] The prevalence of severe anemia was low (9%), suggesting that severe anemia may be a less prevailing occurrence in patients at diagnosis. However, mild-moderate anemia was still highly prevalent at 57.0% which was similar to the findings by Ahumereze et al. The mean value of hemoglobin was 11.75 gm% in patients with AIDS in the present study, which was in close relation to the hemoglobin level of 11.34 gm% reported in the study conducted by Treacy et al.[13] It is slightly higher than the mean value of 10.20 gm% as reported by Pranitha and Kulkarni, a mean value of 10.20 gm% as reported by Tagoe and Evelyn Asantewaa, and 10.8 gm% as reported by Kaloutsi et al.[7,14,15] The low levels of Hemoglobin as well as the red blood cells (RBC) counts might be a result of decreased red blood cell production and/or ineffective erythropoiesis seen in the HIV-infected patients and those with AIDS. The factors that could have contributed to the high prevalence of anemia seen amongst this study could be probably due to the coexistence of tuberculosis diagnosed at the time of diagnosis, anemia due to chronic

disease, myelosuppression secondary to HIV and nutritional anemia.

Significant difference was observed in the prevalence of anemia among immunodeficient male participants (CD4 count <500 cells/mm^3) and participants with no significant immune deficiency (CD4 count ≥500 cells/mm^3) (77.5% versus 50%), p=0.783. Significant difference was also seen in the prevalence of anemia among immunodeficient female participants (CD4 count <500 cells/mm^3) and participants with no significant immunodeficiency (CD4 count ≥500 cells/mm^3) (93.5% versus 56%), p=0.783. Our results are similar to previous reports of increased prevalence of anemia in HIV positive persons with lower CD4 count.[10,16,17] Our findings suggest that for this group of non HAART participants, hemoglobin concentration is associated with immune status based on CD4 count.

Limitations

The current study was a hospital based study and included limited number of study population. Secondly, the data at the time of initiation of ART was analyzed. It would be valuable to follow up these patients to see the trends of hemoglobin and CD4 count after the ART initiation.

CONCLUSION

The current study revealed high prevalence of anemia in HIV patients prior to the initiation of ART in both males as well as females. Mild to moderate anemia was predominant in the study participants than severe anemia. There was significant difference observed in the prevalence of anemia among immunodeficient population and participants with normal CD4 count. The high prevalence of anaemia in this study may be a reflection of possibly high prevalence of anaemia amongst adults specially females in Goa. However, the direct effect of anaemia on HIV related morbidity and mortality requires that particular attention. Prompt diagnosis of anaemia, identification of the underlying cause of anaemia in HIV patients as well as the implementation of appropriate treatment is essential.

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