



PREDICTORS OF ANEMIA IN HIV SEROPOSITIVES WITH OPPORTUNISTIC INFECTIONS

Jyothsna Medarametla*¹, Divya Yedluri², Prathyusha Suddapalli³, Varoodha Kanneboina⁴, Bhanu Uday Shankar Sanakkayala⁵ and Venkata Ramarao Nallani⁶

^{1,2,3,4}Department of Pharmacy Practice, Chalapathi Institute of Pharmaceutical Sciences, Lam, Guntur

⁵Department of General Medicine, Government General Hospital, Guntur

⁶Department of Pharmacy Practice, Chalapathi Institute of Pharmaceutical Sciences, Lam, Guntur

ARTICLE INFO

Article History:

Received 20th October, 2017

Received in revised form 29th

November, 2017

Accepted 30th December, 2017

Published online 28th January, 2018

Key words:

HIV, WHO, Opportunistic infections, CD₄, anemia.

ABSTRACT

Background: In spite of the access to highly active antiretroviral therapy (HAART), anemia is still the most common hematological abnormality in HIV seropositives which results in rapid disease progression.

Methods: An observational study was conducted among a sample of 214 patients who met the inclusion criteria and the necessary data was collected in a priorly designed data collection form.

Results: Out of 214 patients, 197 (92%) were anemic and moderate anemia is comparatively higher in the sample population (97; 49.24%). Gender distribution reveals that anemia is comparatively higher in women 113 (57.36%) than in men 84 (42.64%). 77(39.1%) belong to the age group of 31-40 yrs. Tuberculosis was the most commonly observed opportunistic infection in the sample population.

Conclusion: Periodic screening for anemia with preventive and treatment strategies should be considered the prime importance in settings which offer HIV treatment and care.

Copyright©2018 Jyothsna Medarametla et al. This is an open access article distributed under the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

INTRODUCTION

Acquired Immunodeficiency Syndrome (AIDS) was first recognized as a distinct clinical entity in 1981 in previously healthy people with new onset profound immunological-deficits like Kaposi's sarcoma and *Pneumocystis carinii* Pneumonia. Later, the syndrome was found to be caused by HIV- I which was originated from African primate viruses – SIVs. In 1983, HIV was isolated and in 1984 it was demonstrated to be cause of AIDS (Longo et al., 2012 and Andrew, Mitchell 2008). Since its identification it has become a global health problem (Banwat et al., 2013) and is among the greatest health crises ever faced by humanity. Morbidity and mortality in HIV disease occur as a result of underlying immune-suppression which leads to life-threatening opportunistic infections (OIs) (Debasu et al., 2013). Opportunistic infections (OIs) are defined as infections that occur because of immune-suppression in HIV infected persons. (Moges and Kassa, 2014). Opportunistic infections (OIs), leading to significant morbidity and mortality might grossly affect the health and quality of life of people infected with HIV. There is global evidence that the overall incidence of opportunistic infections increases with the degree of immune-suppression resulting from disease progression (Banwat et al., 2013).

*Corresponding author: Jyothsna Medarametla
Department of Pharmacy Practice, Chalapathi Institute of Pharmaceutical Sciences, Lam, Guntur

Globally, rapid expansion and early access to antiretroviral treatment (ART) have resulted in a dramatic decrease in HIV-related mortality and mobility (Bach Xuan et al., 2013). Hematologic abnormalities are among the most common manifestations of advanced HIV infection and AIDS; of which anemia is the most common (Shen et al., 2013). Despite the advent of highly active antiretroviral therapy (HAART), HIV-related anemia is still common, and independently associated with decreased survival. World Health Organization (WHO) criteria for anemia in men and women are hemoglobin (Hb) levels <13 and <12 g/dl, respectively. Anemia may manifest as a mere laboratory abnormality in some individuals, whereas other may experience typical symptoms like dyspnoea, reduced exercise tolerance, diminished functional capacity (Bhusal et al., 2016). The causes of anemia have been reported to be multi-factorial. Direct effects of HIV and its viral proteins as well as immune dysregulations during HIV infection were found to be responsible for bone marrow suppression (Muluken et al., 2015). The risk of developing AIDS-associated anemia is increased in those patients; with a CD4 cell count < 200 cells/mm³, on zidovudine therapy, with a history of fever, with oral candidiasis or bacterial pneumonia, who belong to African descent, of the female sex, with lower muscle mass, advanced age or with a high viral load (Santos and Almeida, 2013). Screening of anemia, coupled with prevention and treatment efforts, should be included in HIV care initiatives (Bhusal et al., 2016).

Aim: To identify the anemic status of HIV patients with opportunistic infections and its relation to different clinical parameters and patient related factors.

Objectives:

1. To categorize patients under different grades of anemia using WHO anemia scale.
2. To compare patients anemic status with their age, CD₄ count, BMI, opportunistic infection, ART regimen.

METHODOLOGY

An Observational study was conducted from December 2016 to May 2017 at a tertiary care teaching hospital, ART Centre, Guntur after obtaining approval from the ethics committee of the hospital. All HIV patients who are greater than 13 years and suspected to have opportunistic infections and/or who were diagnosed with any one of the opportunistic infections and consented for study were included. Terminally ill patients and patients who were unwilling to participate in this study were excluded. Necessary data were collected from patients in a priorly designed data collection form which includes patient demographics, hemoglobin value, CD₄ count, type of opportunistic infection with which they were diagnosed, treatment regimen and analyzed.

RESULTS

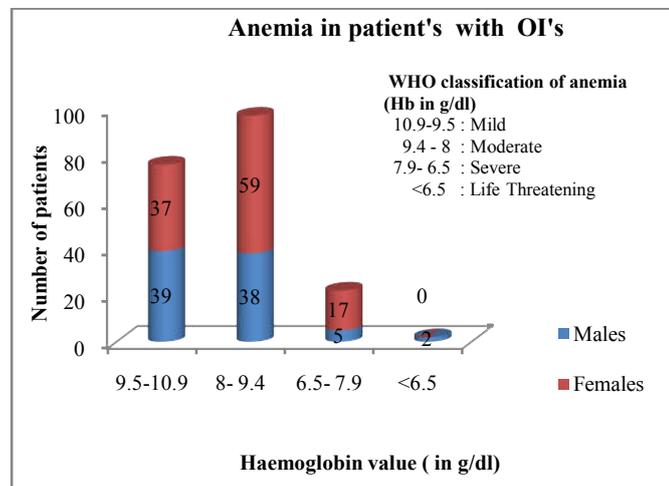


Figure 1 Anemia in patients with OI's

Figure 1 represents the anemic status of HIV patients with opportunistic infections. World Health Organization (WHO) classification of anemia was used to classify patient's anemic status as mild, moderate, severe and life-threatening anemia based on their hemoglobin value. Out of 214 patients, 197 patients fall under any one of the anemic grades and among them 113 (57.36%) were women and 84 (42.64%) were men. This shows that anemia is predominant in women when compared to men.

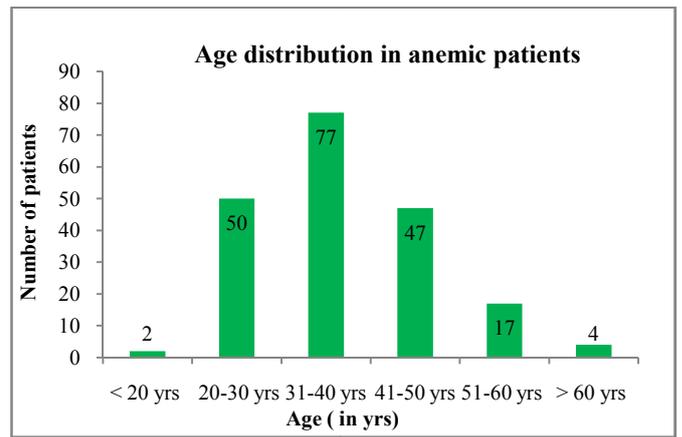


Figure 2 Age distribution in anemic patients with opportunistic infections

Figure 2 represents the age distribution of HIV patients with anemia. Out of 197 patients with anemia, 77 (39.1%) patients belong to 31-40 yrs age group which is followed by 50(25.4%) in the age group of 20-30 yrs and 47 (24%) in the age group of 41-50 yrs. Only 4 people were with age greater than 60 yrs.

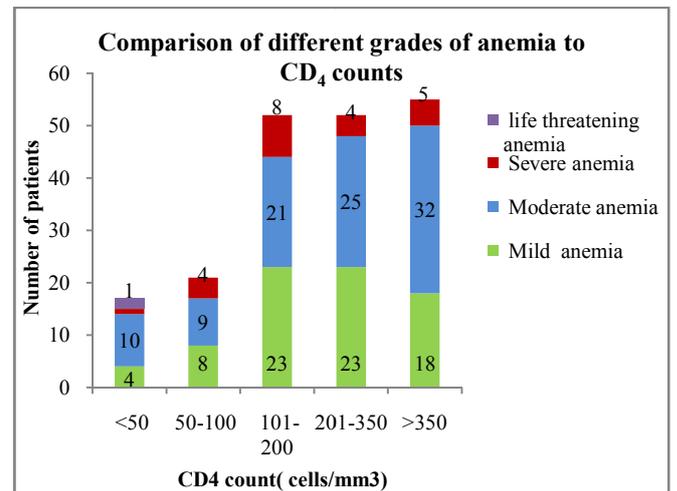


Figure 3 Comparison of different grades of anemia to CD₄ counts

Figure 3 depicts the comparison of different grades of anemia to CD₄ counts. Life- threatening anemia was observed in 2 patients at CD₄ count <50 cells/mm³. Mild anemia was predominantly observed when CD₄ count was between 100-350 cells/mm³. Prevalence of moderate anemia gradually increased as CD₄ count ranges gradually approaches to near normal range. Moderate anemia was seen in 32 patients when CD₄ counts were >350 cells/mm³. Severe anemia was comparatively seen in more number of patients, i.e. 8 when CD₄ count was between 101-200cells/mmm³.

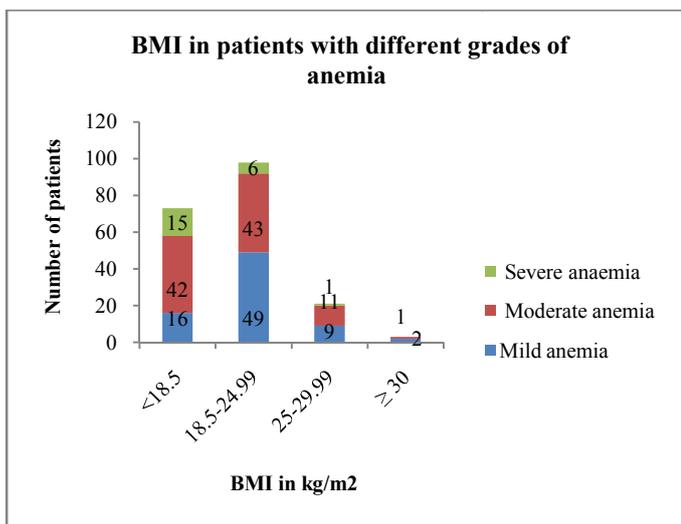


Figure 4 BMI in patients with different grades of anemia

Figure 4 represents the body mass index of patients who fall under different grades of anemia. Among patients who were underweight (BMI < 18.5 kg/m²), 16 (21.92%) were having mild anemia, 42 (57.53%) were having moderate anemia and 15 (20.55 %) were severely anemic. When BMI was between 18.5-24.99kg/m² mild anemia was predominant (n=49; 50%) which was followed by moderate anemia (n=43; 43.88%) and severe anemia (n=6; 6.12%). When BMI was between 25-29.99 kg/m², moderate anemia was comparatively higher (n=11; 52.4%) when compared to severe and mild anemia. Anemia was less common when BMI was ≥ 30 kg/m².

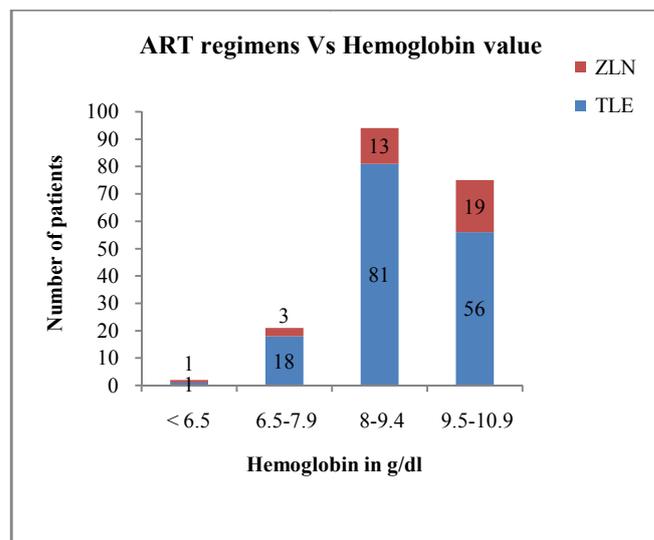


Figure 6 ART regimens Vs Hemoglobin value

Figure 6 demonstrates the ART regimens in patients with anemia. In patients with severe anemia, 18 were using TLE and 3 were using ZLN and in those with moderate anemia, 81 were using TLE regimen and 13 were using ZLN regimen. In those with mild anemia, 56 were using TLE and 19 were using ZLN as their current regimen. Majority of the patients were currently on TLE regimen. This might be either due to treatment initiation with TLE regimen since their diagnosis due to their low hemoglobin levels or due to treatment substitution after a period of time due to anemia.

DISCUSSION

In the present study, 197 patients are anemic and among them 113 (57.36%) were women and 84 (42.64%) were men. This shows that anemia is predominant in women when compared to men and which is comparable to that of (Ferede and Wondimeneh, 2013), Owiredu *et al.*, 2011) and Nadler *et al.*, 2003. Majority of the patients belong to 31-40 yrs age group (n=77; 39.1%) which was similar to the results of study done by Kumar A *et al.*, 2016. Moderate anemia was comparatively higher in this study. Majority of the patients with anemia were underweight (n=73; 37.05%); (BMI < 18.5 kg/m²) which is comparable to that of 22 (40 %) (Bhusal *et al.*, 2016). Tuberculosis was the most commonly observed opportunistic infection (n=115; 53.74%) which was comparable to studies done by Ghate *et al.*, 2000 (29%), Subhash *et al.*, 2003 (25.4 %), Krishnan *et al.*, 2014 in Kerala (20.3%), Gautam *et al.*, 2014 in Maharashtra (21.56%), Ghiya *et al.*, 2009 in Gujrat (49.2%) and Kamath *et al.*, 2013 (18.86%) , which was followed by candidiasis (n=110; 51.40%) Dhungel *et al.*, 2008 and Moore *et al.*, 1996. In patients who were suffering from TB, moderate anemia was predominant (n=53; 46.1%) whereas in patients with candidiasis, mild anemia was predominant (n=42; 38.2%) which needs to be ruled out by larger studies.

CONCLUSION

Our study reveals that moderate anemia was prevalent in the sample population. There exist issues of life threatening and severe anemia (majority) in patients who are with extremely low CD4 count (<50 cells/mm³) and underweight (based on BMI) respectively. The prevalence of anemia is comparatively higher in patients with tuberculosis. This might be due to the disease itself as well as the antitubercular therapy. Majority of

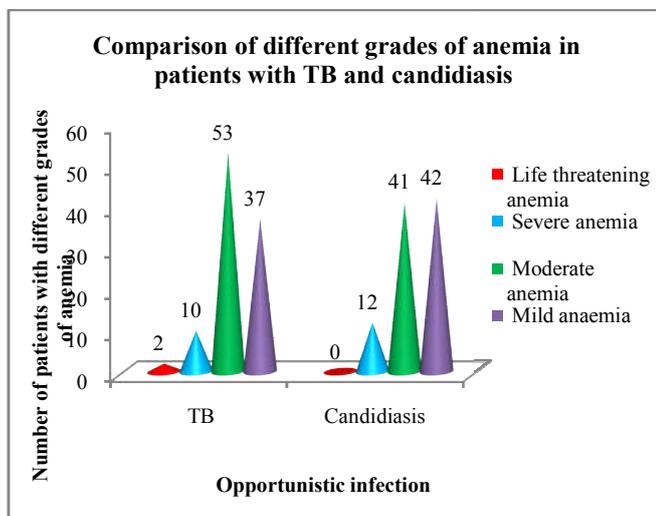


Figure 5 Comparison of different grades of anemia in patients with TB and candidiasis

Figure 5 depicts the anemic status of patients with tuberculosis and candidiasis. Among the 214 patients included in the study tuberculosis was the most commonly observed opportunistic infection (n=115; 53.74%) which was followed by candidiasis (n=110; 51.40%). In patients who were suffering from TB, moderate anemia was predominant (n=53; 46.1%) which was followed by mild anemia (n=37; 37.2%). In patients with candidiasis, mild anemia was predominant (n=42; 38.2%) which was followed by moderate anemia (n=41; 37.3%).

the patients are currently on TLE regimen which is the preferred regimen when hemoglobin levels are <9g/dl and in those using concomitant antitubercular therapy. Hence, all these parameters can be considered as possible predictors to identify and assess the severity of anemia. This signifies that if anemia remains untreated, results in significant morbidity and mortality and affects the quality of life. It also increases the susceptibility to opportunistic infections which further results in disease progression requiring multiple drugs and even antiretroviral regimen switch or substitution. Hence, periodic screening for anemia with preventive and treatment strategies should also be considered to be of prime importance in resource limited settings which offer HIV care and therapy.

Limitations

- Blood hemoglobin concentration is the sole laboratory test used to determine and classify patients under different grades of anemia. Other hematological tests which help to determine the possible etiology and the type of anemia couldn't be performed due to the resource limited nature of the study site.
- Prevalence of anemia is comparatively higher in patients with tuberculosis; but the mechanism underlying this association couldn't be studied in the sample under consideration due to lack of access to facilities.

References

1. Ana Célia Oliveira dos Santos and Ana Maria Rampeloti Almeida. Nutritional status and CD4 cell counts in patients with HIV/AIDS receiving antiretroviral therapy. *Revista da Sociedade Brasileira de Medicina Tropical*, 2013 Nov-Dec; 46(6):698-703.
2. Andrew R Zolopa, Mitchell H Katz. HIV Infections and AIDS. *Current Medical Diagnosis & Treatment*. 2008; 1(1): 1150-1176.
3. Bach Xuan Tran, Long Thanh Nguyen, Nga Hoang Nguyen, Quynh Van Hoang and Jongnam Hwang. Determinants of antiretroviral treatment adherence among HIV/AIDS patients: a multisite study. *Glob Health Action* (2013), 6: 19570.
4. Banwat ME, Yakubu NW, Olalude EO, Ogunsakin JA. An Assessment of the Nutritional Knowledge, Practice and Status of Adult HIV/Aids Patients Attending Art Centre in Jos, North Central Nigeria. *Health Care Current Reviews* 2013 (1): 101.
5. Bhusal KR, Devkota S, Shrestha M, Khadga P. Profile of Anaemia in HIV Positive Patients. *JCMS Nepal* 2016; 12 (2):70-3.
6. Debasu Damtie, Gizachew Yismaw, Desalegn Woldeyohannes and Belay Anagaw. Common opportunistic infections and their CD4 cell correlates among HIV-infected Patients attending at antiretroviral therapy clinic of Gondar University Hospital, Northwest Ethiopia. *BMC Research Notes* 2013 6:534.
7. Dhungel BA, Dhungel KU, Easow JM, Singh YI. Opportunistic infection among HIV seropositive cases in Manipal Teaching Hospital, Pokhara, Nepal. *Kathmandu Univ Med J* 2008; 6(3): 335-39.
8. Ferede G, Wondimeneh Y. Prevalence and related factors of anemia in HAART-naive HIV positive patients at Gondar University Hospital, Northwest Ethiopia *BMC Hematology* 2013; 13:8.
9. Ghate MV, Mehendale SM, Mahajan BA, Yadav R, Brahme RG, Divakar D, *et al.* Relationship between clinical conditions and CD4 counts in HIV-infected persons in Pune, Maharashtra, India. *Natl Med J India*. 2000; 13(4): 183-7.
10. Ghiya R, Naik E, Casanas B, Izurieta R, Marfatia R. Clinico-epidemiological profile of HIV/TB coinfecting patients in Vadodara, Gujarat. *Indian J Sex Transm Dis*. 2009; 30(1): 10-15.
11. Kamath R, Sharma V, Pattanshetty S, Hegde MB, Chandrasekaran V. HIV TB coinfection: Clinicoepidemiological determinants at an antiretroviral therapy center in Southern India. *Lung India*. 2013; 30(4): 302-306.
12. Krishnan CR, Sajeeth CI, Sivakumar R, Sukumaran L. Demographic and Clinical Profile of HIV Patients Accessing Care at ART Centre, Palakkad. *Am J Pharm Health Res*. 2014; 2(8): 192-97.
13. Kumar A, Singh S, Sahu NP. Evaluation of CD4 count and correlation with development of opportunistic infection among HIV seropositives. *Eastern J Med Sci*. 2016; 1(1): 12-16.
14. Laxmi G, Deshpande JD, Somasundaram KV. Prevalence of HIV-TB co-infection, clinical profile and CD4 count of HIV patients attending art centre of Ahmednagar, Maharashtra. *Int J Med Sci Public Health*. 2014; 3(9): 1105-1109.
15. Longo, Kasper, Fauci, Hauser, Jameson, Loascalzo. Infections due to Human Immunodeficiency virus. *Harrison's Principles of Internal Medicine* 2012; 2 (2): 2138-2159.
16. Moges NA, Kassa GM. Prevalence of Opportunistic Infections and Associated Factors among HIV Positive Patients taking Anti-Retroviral Therapy in DebreMarkos Referral Hospital, Northwest Ethiopia. *J AIDS Clin Res* 2014 5: 301.
17. Moore D, Chaisson RE. Natural history of opportunistic disease in an HIV infected urban clinical cohort. *Annals Int Med*. 1996; 124(7): 633-42.
18. Muluken Assefa M, Abegaz W, Shewamare A, Medhin M, Belay M. Prevalence and correlates of Anaemia among HIV infected patients on highly active retroviral therapy. *BMC Hematology, Ethiopia*, 2015; 15: 6.
19. Nadler JP, Wills TS, Somboonwit C, Vincent A, Lietz G, Marino K, Naik E, Powers S, Khan N, Almyroudis N, Laatz B. Anaemia prevalence among HIV patients: antiretroviral therapy and other risk factors. *Antivir Ther*. 2003; 8:1.
20. Owiredu WK, Quaye L, Amidu N, Addai-Mensah O. Prevalence of anaemia and immunological markers among Ghanaian HAART-naïve HIV-patients and those on HAART. *Afr Health Sci*. 2011; 11: 2-15.
21. Shen Y, Wang Z, Lu H, Wang J, Chen J. Prevalence of Anemia among Adults with Newly Diagnosed HIV/AIDS in China. *PLoS ONE* 2013 8 (9): e73807.
22. Subhash KH, Shroff HJ, Lanjerwar DD, Dolkia YN, Vandana P, Dupont HL. The natural history of human immunodeficiency virus infections among adults in Mumbai. *Natl Med J India*. 2003; 16(3).