Original Research Article

Serum Ceruloplasmin/Albumin ratio in HIV patients with anti retroviral therapy

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Abstract

Background: HIV is a life long illness and requires regular monitoring and treatment as per the clinical, immunological and viral status of HIV patients. The various simple cost effective prognostic markers need to be examined as substitute to CD4 and viral load. Serum Ceruloplasmin/Albumin ratio has already proved its significance in monitoring of progression and treatment in various inflammatory diseases like tuberculosis. **Objective:** To estimate serum Ceruloplasmin /Albumin ratio in HIV patients with antiretroviral therapy. **Material and Methods:** It is a case control study. The study was conducted on 50 clinically diagnosed patients of HIV attending Centre of Excellence of HIV AIDS Sir JJ Group of Hospitals Mumbai. Fifty HIV seronegative age and sex matched subjects were taken as controls. Venous blood about 5 ml was collected and serum ceruloplasmin and serum albumin were measured on autoanalyser. **Results:** A statistically significant increased value of Ceruloplasmin /Albumin ratio was noted in HIV patients as compared to control ($p<0.001$). **Conclusion:** Our study may be evident of Ceruloplasmin/ Albumin ratio increase in HIV patients on ART. Further study of this ratio with different stages of HIV may assist in monitoring prognosis and treatment of HIV patients on antiretroviral therapy.

Key Words: albumin, antiretroviral therapy, ceruloplasmin, human immunodeficiency virus.

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INTRODUCTION

India has the third largest HIV global epidemic. In 2016, HIV prevalence was estimated to be 0.3% and there are 2.1 million people living with HIV[1]. HIV /AIDS is said to be lifelong illness which necessitate regular monitoring and treatment with clinical immunological and viral status of the patients[2]. Combination antiretroviral therapy for HIV infection progress immune functions and eradicates the risk of AIDS-related complications, but unable to reinstate full health. The various markers of inflammation are elevated in HIV disease and strongly predictive of the risk of morbidity and mortality[3]. The inflammatory response is identified by acute phase proteins. These proteins are also called as acute phase reactants. The reactants whose concentrations are elevated be called as positive reactants and the reactants whose concentration reduced are called negative reactants. Serum Ceruloplasmin is positive reactant and serum albumin is a negative reactant. Albumin is a one of the important serum proteins with 585 amino acids synthesized by liver. The important function of albumin is to maintain colloidal osmotic pressure. It also plays a role as antioxidant. Ceruloplasmin is a globulin synthesized by liver. It has 6-8 copper atoms. It is also called as extra cellular antioxidant and ferroxidase I. In tuberculosis many studies have focused on role of Ceruloplasmin /Albumin ratio as a marker to assist in diagnosis and progression[4,5]. This study was undertaken to find out role of Ceruloplasmin /Albumin ratio in HIV patients on antiretroviral therapy.

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MATERIAL AND METHOD

The study was conducted in Government Grant Medical College and Sir JJ Group of Hospitals Mumbai after getting approval from the Institutional Ethical Committee and National AIDS Control Organization New Delhi. It is a case control study. The patients attending Centre of Excellence of HIV/AIDS Sir JJ Group of Hospitals Mumbai were included in the study. A total of 100 subjects participated in this study. The subjects enrolled were of both sexes. The age ranging from 16 to 50 years and belonging to different socioeconomic status were included in the study. The written consent from the subjects was obtained. The subjects were divided into two groups. One group with seropositive 50 HIV patients on antiretroviral therapy and control group having 50 HIV seronegative. The HIV seropositive subjects detected by serial ELISA/Western blot method were included in the study. The patients with pre renal, pre hepatic dysfunction and burn cases were excluded from the study. The blood sample was collected in red top plain vaccum tubes. The samples were centrifuged 2 hours after collection at 3000 rpm for 5 minutes. The pooled serum samples were stored at -20^{0}C in sterile tube. The estimation of Serum ceruloplasmin was carried out by immunoturbidometric method at 340 nm. Serum albumin was estimated by Bromo Cresol Green method at 630 nm by using auto analyser. Depending upon estimated values of Ceruloplasmin in mgs / Albumin in gms was calculated in each subject. Statistical analysis was done by SPSS Software with appropriate statistical tests.

OBSERVATION AND RESULTS

Table 1: Ceruloplasmin /Albumin ratio in Control and HIV Seropositive group

Group	Number	Mean ±SD	P value
Control	50	9.05±1.21	< 0.001*
HIV Seropositive	50	16.21±5.24	

*Highly significant at 0.01% level, independent 't' test = 9.409

This was a comparative case control study conducted on 50 cases of HIV seropositive cases with anti retroviral treatment. The gender wise distribution shows 60% i.e. 30 were male and 40% i.e. 20 were female subjects. Initially Serum albumin, serum ceruloplasmin were estimated and ceruloplasmin /albumin ratio was calculated. The ceruloplasmin /albumin ratio was expressed as mean ± standard deviation. A statistically significant value of ceruloplasmin /albumin ratio (p value < 0.001) was noted in HIV seropositive cases as compared to controls.

DISCUSSION

In our study 60% of patients were male and 40% females. The difference in presentation of males and females is suggestive of the finding that males are migrants and primary disease spreaders. It can also be due to fact that females generally have poor health seeking behaviour. Various studies have shown serum albumin decreases significantly in HIV patients and serum ceruloplasmin increases significantly in HIV patients[6-9]. Thus, in our study Ceruloplasmin/Albumin ratio were significantly higher (p<0.001) in HIV positive subjects as compared to the control group. Human immunodeficiency virus infection is a globally widespread. It is a disease of the human immune system due to infection of human immunodeficiency virus (HIV). Ceruloplasmin is a major copper-containing protein. It plays role in iron metabolism. It was first described in 1948. It is a metalloenzyme synthesized in the liver. Ceruloplasmin carries about 70% of the total copper in human plasma while albumin carries about 15%. The molecular weight of human ceruloplasmin is reported to be 151kDa[10]. Ceruloplasmins have week O_2- scavenging activity. However, when lipid peroxidation is promoted by copper ions, ceruloplasmin exhibits a potent antioxidant activity. Thus it is appealing to contemplate that the marked increase in plasma ceruloplasmin levels in HIV patients seems to be physiological adaptation. It is the need for antioxidant protection in the event of a breakdown in other antioxidant defence mechanisms[11]. Albumin is a non-glycosylated protein of 66 kDa. Its half-life is ~ 20 days in normal conditions. The human serum albumin structure consists of a single-chain polypeptide of 585 amino acid residues and has got approximately 67% alpha-helix and no beta-sheet. Serum albumin exerts specific antioxidant functions due to its multiple ligand-binding capacities and free radical-trapping properties[12]. Low serum albumin is familiar as an important marker of poor nutritional status. It has also been observed to be associated with higher rates of mortality in various acute and chronic conditions. Serum albumin has been studied in HIV/AIDS by number of researchers. Some studies have shown that the levels of albumin are related to disease progression in HIV irrespective of nutritional status[13]. Ceruloplasmin is an acute phase protein and is usually found to be elevated in chronic infections and inflammations and albumin decreased. Ceruloplasmin and albumin change in diverse way. Thus, if ratio of Ceruloplasmin / Albumin (mgs / gms) is considered, then the change will magnify and its prognostic value is increased. Therefore the ratio of ceruloplasmin and albumin can be considered as a better indicator than serum ceruloplasmin or albumin single-handedly. The various studies have focused on importance of Ceruloplasmin / Albumin (mgs / gms) ratio in prognosis and thereby in the treatment of tuberculosis being one of the major inflammatory infectious diseases[14]. This

important aspect so far has received scant attention despite of its important role.

CONCLUSION

Our study showed that the Ceruloplasmin / Albumin ratio increases in HIV patients on antiretroviral therapy. Further study is required to find out the ceruloplasmin albumin ratio at different stages of HIV infection and this ratio may be incorporated as a surrogate marker to assist in prognosis and thereby deciding treatment modalities of HIV patients on antiretroviral therapy.

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