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Determination of Iron Deficiency among Human Immunodeficiency Virus Sero Positives

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Abstract: Problem statement: Iron is an important dietary mineral and involves in various body functions. In humans, iron is an essential component of proteins involved in oxygen transport. It is also essential for the regulation of cell growth and differentiation. Iron and its binding protein have immune regulatory properties and shifting of immune regulatory balances by iron excess or deficiency may produce severe, deleterious physiology effects. Human with advance human immunodeficiency virus infection present some evidence of iron accumulation. Ferritin concentration increases with HIV disease progression. Increased iron stores predisposed to certain microbial infections leading to the decreased iron level. This association may cause immune system impair by HIV. **Approach:** A total of 49 HIV patient serum sample were collected 16 HIV/AIDS male patients and 33 HIV/AIDS female patients. Serum iron concentration was analyzed by Atomic Absorption Spectrophotometer (AAS). **Result:** Presence study documented the prevalence of iron deficiency among HIV sero positive**s** **Conclusion:** Proper Iron supplementation provides sufficient iron to restore normal storage levels of iron and to replenish hemoglobin deficits thereby increase the survival of HIV sero positives.

Key words: HIV, iron, ferrous iron salts, oral erythropoietin, ferritin

INTRODUCTION

Human Immuno deficiency Virus (HIV) is a lent virus (a member of the retrovirus family) that causes Acquired Immunodeficiency Syndrome (AIDS), a condition in humans in which the immune system begins to fail, leading to life-threatening opportunistic infection. Trace elements are required by human body for proper functioning but unlike most vitamins and minerals that our body needs, trace elements are needed only in extremely low quantities. The human body needs about 72 trace elements for normal functioning. There are seven essential trace elements described in human body chromium, copper, cobalt, iodine, selenium and zinc. Iron is an important dietary mineral and involves in various body functions. In humans, iron is an essential component of proteins involved in oxygen transport. It is also essential for the regulation of cell growth and differentiation. Iron is main component of hemoglobin a complicated protein that carries oxygen and plays critical role to the whole respiration process of the total iron in the body 60-70% is stored in hemoglobin. The body contains between 3.5 and 4.5% of iron 2/3 of which is present in hemoglobin. The ubiquitous iron is an essential nutrient for most tissue cells and deficiency brings about recognizable deleterious results affecting many organs. The lymphoid apparatus is no exception. Iron deficiency with or without anemia is associated with partial atrophy of various lymphoid organs and alteration in many molecular and cellular immune functions. Iron and its binding protein have immunoregulatory properties and shifting of immunoregulatory balances by iron excess or deficiency may produce severe deleterious physiological effects. Iron play important role in immune system. People with low iron levels having lowered resistance to infection. Anemia in human immunodeficiency virus infected patients can have serious implication which varies from functional and quality of life decrement to an association with decreased progression and decreased survival. The prevalence of anaemia in HIV disease varies considerably ranging from 1.3-95%. Anaemia is more prevalent in HIV positive women, children and injected drug users. Human with advance human immunodeficiency virus infection present some evidence of iron accumulation (Goldin *et al*., 1993). Ferritin concentration increases with HIV progression increased iron stored predisposed to certain microbial infections (Weinberg, 1978).

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MATERIALS AND METHODS

Serum collection from study population: A total of 49 HIV patient serum sample were collected which includes 16 HIV/AIDS female patients and 23 HIV/AIDS male patients. About 10 mL of whole blood on one occasion from each participant was collected in sterile screw capped Laxbro vials with informed consent of the patient The Blood sample subjected for the separation of serum and was used for trace element analysis.

Trace element analysis by atomic absorption spectrophotometer: Atomic Absorption Spectrophotometer analysis if serum trace element zinc was carried out at characterization and Measurement lab of Center for Electrochemical Research Institute, CSIR, Karaikudi. All serum samples were independently prepared as per the procedure prescribed for iron trace element analysis.

RESULTS

Figure 1 represents the age wise prevalence of HIV Seropositives. Highest HIV seropositivity is observed in 31-45 age groups of males (57.5) and 16-30 age groups of females.

Figure 2 Indicates the percentage deviation in the age group of 45 and above in male category (3.6%) and not much greater deviation in the same age group of female category.

Figure 3 and 4 represent the comparative deviation of mean serum iron concentration among HIV seronegative and seropositive. However the higher deviation of serum iron concentration is witnessed in the HIV negative male.

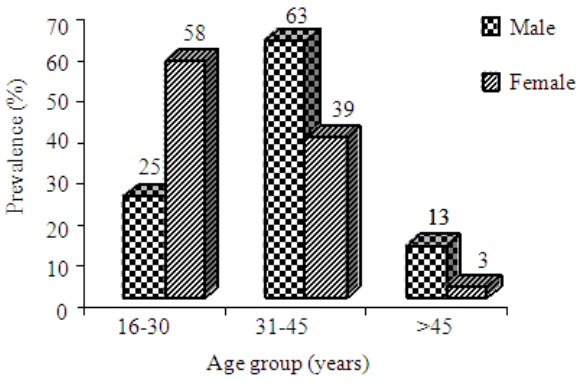

Fig. 1: Age wise prevalence of seropositive

DISCUSSION

Iron is an essential component of hemoglobin, transporting oxygen in the blood to all parts of the body. It also plays a vital role in metabolic reaction. Iron deficiency can cause anaemia resulting from low levels of hemoglobin in the blood. It's the most widespread mineral nutritional deficiency. Iron is essential and its deficiency significantly impairs cell proliferation and immune response.

The age wise prevalence of HIV positive among the study subjects reveals higher incidence in 16-30 age group of females and 31-45 age group of males. This shows heterosexual transmission and sexually active stage in both gender groups as reported elsewhere in Indian context (Abrams *et al*., 1993). Iron overload can enhance rate of progression of human immunodeficiency virus. Trace metal overload suppresses immune function and increase the morbidity and mortality (De Sousa, 1989). If the iron overload becomes severe (usually when the amount of iron in the body exceeds 15 g) the condition is diagnosed as hemochromatosis (Bullen *et al*., 1991).

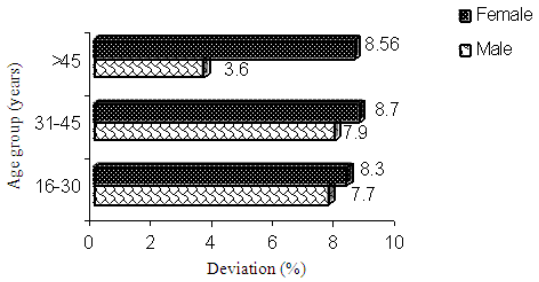

Fig. 2: Age wise deviation of mean serum iron concentration among seropositive

Fig. 3: Comparative deviation of mean serum iron concentration among HIV seronegative

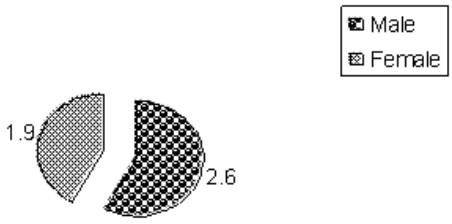

Fig. 4: Comparative deviation of mean serum iron concentration among HIV seropositive

Irons stored in the body become depleted and hemoglobin synthesis is inhibited. People with low iron levels having lowered resistance to infection. Iron is central to physiology in general and required for particular steps of the HIV replication life-cycle in cells. HIV associated with disturbances in host iron metabolism. In advance disease, anemia can coincide with increase ferritin and bone marrow iron content and the anemia is commonly unresponsive to iron supplementation. Increased bone marrow iron is associated with shortened survival and increased opportunistic infections (Castella *et al*., 1985). Iron plays an important role in the interaction between host and virus. Iron is a key regulator of the host-pathogen interaction. Host homeostasis adapt during deficiency, overload and infection to balance requirement against toxicity and availability to potential pathogens. Knowledge of these interactions is necessary to predict morbility response to disturbance in host iron homeostasis.

When hemoglobin levels are below normal, physicians often measure serum ferritin, the storage form of iron. A serum ferritin level less than or equal to 15 μg L^{-1} confirms iron deficiency anemia in women and suggests a possible need for iron supplementation. Supplemental iron is available in two forms: Ferrous and ferric. Ferrous iron salts (ferrous fumarate, ferrous sulfate and ferrous gluconate) are the best absorbed forms of iron supplements (Martin *et al*., 1991) For adults who are not pregnant, the CDC recommends taking 50-60 mg of oral elemental iron (the approximate amount of elemental iron in one 300 mg tablet of ferrous sulfate) twice daily for three months for the therapeutic treatment of iron deficiency anemia. It is recommended oral erythropoietin (Moore *et al*., 1988) therapy but not intravenous iron therapy to treat HIV associated anemia in its early stage of infection. Since the progression of human immunodeficiency virus infection towards its more advance stages is accompanied by increasing body iron stores there is urgent need for careful clinical studies to clarify the role of iron status on the course of HIV infection.

CONCLUSION

Iron supplementation provides sufficient iron to restore normal storage levels of iron and to replenish hemoglobin deficits. Thereby, initiate immune activation among HIV Seropositives.

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