ALTERATION IN THE LEVEL OF SOME TRACE ELEMENTS IN THE SERA OF PATIENTS WITH KALA AZAR

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Abstract

Background: Visceral leishmaniasis (Kala-azar) is an important endemic disease in Iraq (WHO 2000) .The disease appears to affect infants and young children mostly under 2 years old .The disease is very dangerous and fatal if it is left without treatment .Trace elements have an important role in the treatment and prognosis of different types of parasitic infection

Objective: Study the relationship between serum trace elements and the disease which may be used as an indicator of the course of the disease

Methods: 14 male and 12 female patients (positive IFAT) their age were between 6 months and 15 years were used in this study .Serum copper (Cu), zinc (Zn), and magnesium were measured using atomic absorption spectrophotometer.

Results: There is a significant increase ($p<0.05$) in serum Cu and significant decrease in serum Zn of kala-azar patients.

Conclusions: Body reaction against parasite infection is associated with different changes in serum level of trace elements.

Keywords: kala-azar, trace elements, copper, zinc, magnesium, visceral leishmaniasis

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Introduction

It has become well established that many trace elements play an essential role in a number of biological processes through their action as activator or inhibitor of enzymatic reaction by competing with other elements and proteins for the binding sites, by influencing the permeability of the cell membrane[1], or through other mechanism[2]. Several biological mechanisms have been proposed to explain how trace elements could reduce the incidence of a number of different cancer and infectious disease[3]. Visceral leishmanasis is an important endemic disease in Iraq[4,5]; the disease appears to affect infants and young children , mainly under 2 years of age , and especially those under 1 year of age[6] . It is very dangerous and it is fatal if left untreated with mortality rat of 1%-29%. The presence of leishmania parasite in reticuloendothelial cells (RECs) of liver spleen and bone marrow is accompanied by physiological and biochemical changes in these organs and trace elements may be one of these changes. Therefore, in this study we aim to find the effect of parasitic infection on the level of trace elements in the sera. This raises the possibility of the use of trace elements as an indicator of the course of disease.

Materials & methods

Twenty-six kala-azar patients were studied depending on their positive IFAT test. The age ranges was between 6 months and 15 years. Twelve patients

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were females and 14 males. Samples were collected from patients attending Al-Kadhimiya teaching hospital.

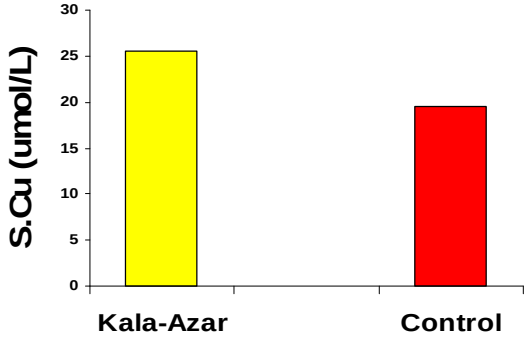
Venous blood samples were collected from patients before administration of any medications. Sera were separated and kept at (-20^{o}C) until used.

Assay: 0.1ml of serum diluted to total volume of 1ml using 6% n-butanol solution and analyzed for their copper and zinc contents using atomic absorption spectrophotometer (Shimadzu AA-646) with an. Copper and zinc hallow cathode lamps were used at wavelengths of 324.75 nm and 213.9 nm respectively. The assay for magnesium estimation was carried out by adding 4.9 ml. of (1% lanthanum chloride) solution to 0.1 ml. of serum. These solutions were aspirated directly into air-acetylene flame and the magnesium hallow cathode lamp were used at a wavelength of 285.2 nm.

Statistical methods: The results were analyzed statistically, and their values were expressed as (mean ± SED).The level of significance was determined by employing (t) test .Only when the p value was less than 0.05; the difference between two groups considered statistically significant.

Results & Discussion

The mean and standard deviation values of serum copper, magnesium, and zinc of healthy controls and patients with kala-azar are presented in Figure 1.



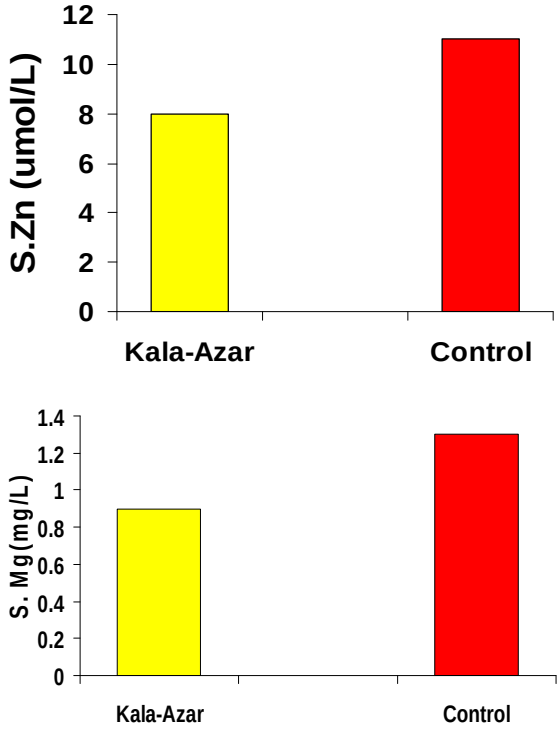


Figure 1: Serum copper, zinc, and magnesium of normal and kala-azar patients

The results showed that there is a significant increase in serum copper in kala-azar patients as compared with healthy controls. This result is due mainly to the body reaction against infection.

Cerruloplasmin which is a copper containing protein is one of the acute phase reactant proteins that increased in inflammation and hence leading to increase serum copper. α-Cerruloplasmin inhibits the oxidant injury of the cells by scavenging the superoxide radicals through dismutation reaction similar to superoxide dismutase enzyme[7] or by reduction the copper ions within the protein[8]. Other workers[9] have proposed that cerruloplasmin acts by converting the reduced iron(Fe^{+2}) to an oxidized form (Fe^{+3}) because it acts as ferroxidase enzyme. Yet, the majority of the antioxidant activity in the serum is dependent on the level of this copper containing protein[10]. There is also other cause explaining the increase of

serum copper in those patients is due to shed copper ions from damaged hepatocells which is the late complication of the disease[11] .This fact is confirmed by reports that recorded an elevation in the level of liver enzymes in the sera of kala-azar patients[12].

There is a significant decrease at ($p<0.05$) in serum zinc in kala-azar patients as compared with healthy controls .This may be due to in part to the hypoalbuminaemia developed in those patients after a period of incubation of the disease[13]. Zinc is transported mainly bound to albumin molecules and the decreased in albumin concentration in serum leads to decrease zinc level in serum. Other reason is associated with the immune changes in kala-azar patients .Those patients have impaired immunity[14] and because there are good evidences about the relationship between the zinc level and immunity[15]; it can be concluded that the zinc is decreased as the immunity attenuated. These results are in agreement with other previous work regarding serum trace elements levels in cutaneous Leishmaniasis patients[16].

Serum magnesium of patients with kala-azar are insignificantly decrease in comparison with healthy controls. Magnesium level is normally kept within narrow limits, which implies close homeostatic control and about 35% of the magnesium in plasma is protein-bound mainly to albumin[17]. Hence this decrease is attributed mainly to the hypoalbuminaemia state in kala-azar patients[13].

Figure 2 shows the relationship between the serum metals as a function to the sex in kala-azar patients. There is a significant increase in serum copper in male patients as compared with female while there is an inverse correlation in serum zinc between males and females. Serum magnesium is not significantly different in both sexes. There is no simple explanation for these results and more investigations are necessary to predict the sexual variance in the level of the metals.

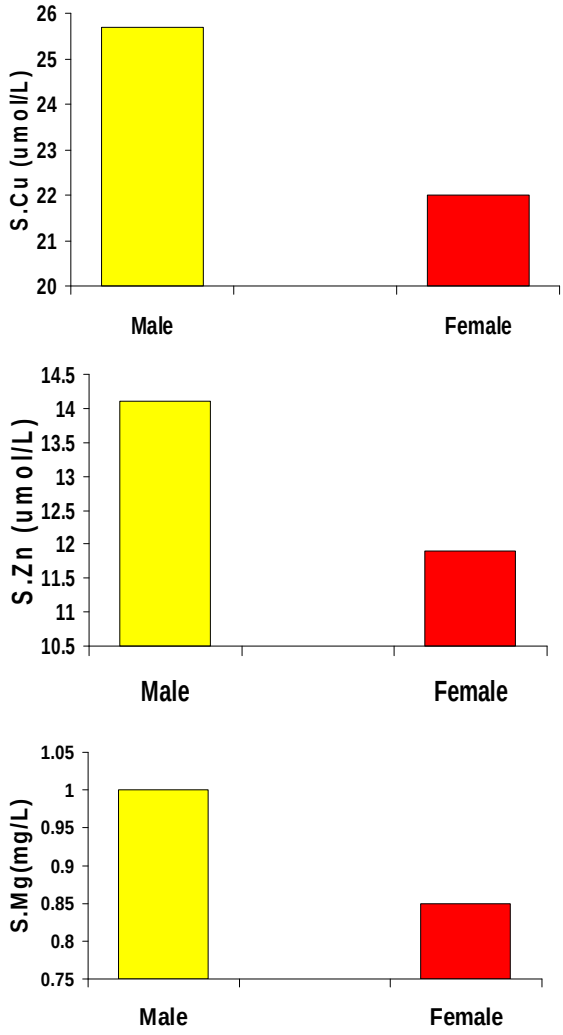


Figure 2: Serum copper, zinc, and magnesium of male and female patients infected with kala-azar

Figure 3 shows that there is age dependence of serum copper but not zinc or magnesium in kala-azar patients. The patients who were of one-year age. Others had a higher serum copper than patients of more than one year of age. This variation may be related to the rate of development and homeopoiesis between these two groups.

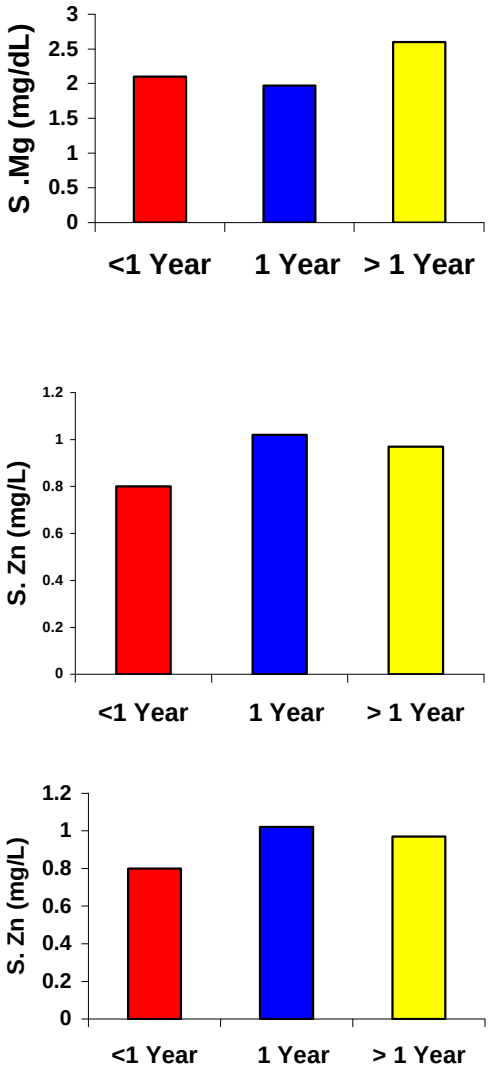


Figure 3: Serum copper, zinc and magnesium of patients of different ages infected with kala-azar

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