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# Atomic for Traget Metals concentration in patients with falciparum

Saira Malakhi [1]

[1] Institut Sciences Chimiques de Rennes, UMR 6226 CNRS Université de Rennes, France.

**Abstract: Background:** *Falciparum Malaria* is the most severe type of malaria. Patients with *Falciparum Malaria* may not be apparently seriously ill but may develop serious complications. **Methods:** For the determination of trace metals thirty intravenous blood samples each from referred malarial patients and healthy control subjects were collected and immediately centrifuged to obtain the supernatant liquid, serum for analysis. Trace Metal were determined by Atomic Absorption Spectroscopy using air-acetylene flame (AAS, Model Varian A-20). **Results:** Serum Fe, and zinc concentrations were found to be significantly lower and Cu and Mg concentrations were significantly higher in patients as compared with the control subjects. **Conclusion:** In this study the trace metal content of copper, iron, magnesium and zinc in vary in *falciparum malarial* patients as compared to the control subjects. It may suggest that the decreased concentrations of iron and zinc can be maintained by giving as supplement of these metals in therapy.

**Keywords:** Copper; iron; zinc; magnesium, *falciparum malaria*

## 1. Introduction

Malaria is a communicable parasitic disease which is caused by female Anopheles mosquito, though it can also be acquired by use of contaminated syringes, through blood transfusion or transplacental route (Black lock DB, 1977, Al-Hassan NA, 2002 and Muchlenbachs A, 2007). It is a major public health problem throughout the world especially developing countries including Pakistan *Plasmodium falciparum* is the most serious type of all four types of malaria because of its fatal complications (Raziq F, 1995). That is why delay in the treatment of *Falciparum malaria* may lead to serious and fatal consequences (CDC, 1991).

Trace metals were reviewed briefly in this study of trace metals including copper, iron, and zinc in the serum of *falciparum malarial* patients in comparison to healthy control subjects. The deficiencies and excesses in serum have been documented during *falciparum malaria*, and also determined magnesium serum level, which is of possible but unconfirmed health significance. Little is known on the role of trace metals such as copper, iron, magnesium, and zinc level in *falciparum malarial* patients as compared to healthy control subjects. This Study will contribute to open a new way to therapeutic approach in treating *falciparum malarial* patients (Majumdar I, 2003).

## 2. Material and Methods

The metals copper, iron, magnesium, and zinc in the serum were determined by Atomic Absorption Spectrometry (AAS) (Model, A-20 Varian).Trace metals were determined using air-acetylene flame. The standards from 1 to 5 ppm for each of the metal separately were run on the spectrometer and the calibration curves were obtained prior to run the samples for the determination of metals in the blood serum of normal subjects and the malarial patients. Blood samples were collected from thirty healthy controls in fasting conditions and confirmed falciprum malaria patients. Each blood sample was centrifuged at 5000 rpm for 20 min. The supernatant blood serum was used for the analysis of metals copper, iron, magnesium, and zinc using Atomic Absorption Spectrometer inserting appropriate hollow cathode lamp in it.

All standards used were of analytical grade.

### Chemicals and reagents

Sulphosalicylic acid obtained from Merck, Germany and other chemicals to prepare standards were purchased from Sigma Chemical Company.

All chemicals were of analytical grade.

**Stock Solutions and working Metal standards**

Stock solution of 1000 ppm Cu, Fe, Mg, and Zn for each were prepared for corresponding sulphate salts of analytical grade (Sigma Chem.). Working standards were prepared from the stock solutions by diluting with appropriate volume of deionized water and addition of few drops of corresponding concentrated acid.

**3. Results**

Table shows the blood serum levels of metal contents in falciparum malarial patients with compare to control subjects. The results showed significant increase in serum copper and magnesium levels as compared to the controls, where as serum iron and zinc levels were decreased in falciparum malarial patients as compared to the controls with $p<0.001$,

**Table 1: shows the level of Metal contents in malarial patients Mg and Cu is significantly increased in falciparum malarial patients. Whereas, Fe and Zn shows decreased level in falciparum Malarial Patients.**

| Variables | Controls | Patients |
|---|---|---|
| **Mg** | **9.2387±.63122** | **16.5880±.68840** |
| **Fe** | **3.753±.1876** | **1.7307±.09912** |
| **Zn** | **4.240±.3247** | **3.7812±.50097** |
| **Cu** | **2.1063±.13163** | **2.9185±.21103** |

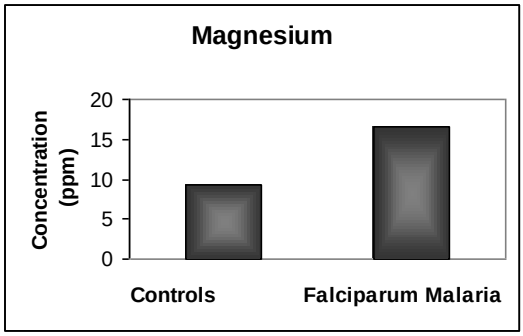


**Fig: (a)**

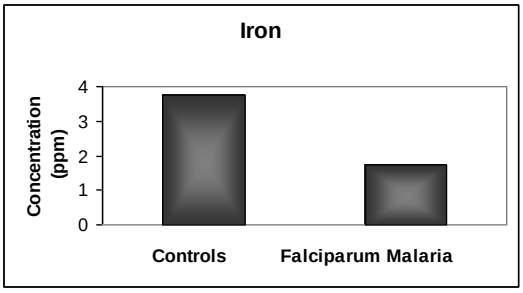


**Fig: (b)**

Figure (a) shows the elevated serum copper mean level in falciparum malarial patients as compared to the controls. Figure (b) shows the decreased serum iron mean levels in falciparum malarial patients as compared to the controls.

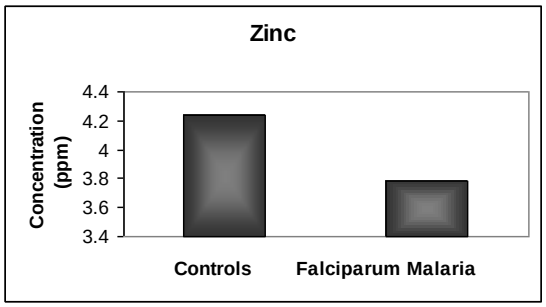


**Fig: (c)**

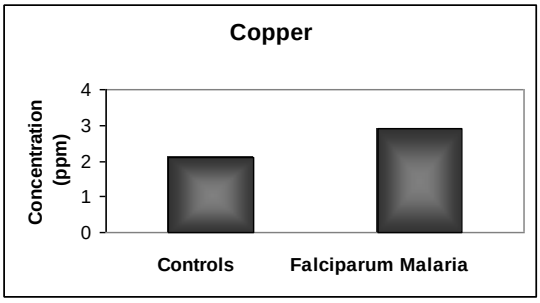


**Fig: (d)**

Figure (c) shows the elevated serum zinc levels in falciparum malarial patients as compared to the controls. Figure (d) shows the elevated serum copper levels in falciparum malarial patients as compared to the controls

**4. Discussions**

In *falciparum Malarial* patients the Metal contents serum magnesium (Mg) and serum copper (Cu) concentration increases, whereas, the serum iron and serum zinc concentrations were decreases as compared to the control subjects, as reported by Shankar et al. (2000) that in acute phase of malaria, zinc is redistributed from plasma to lymphocytes and to the liver, consequently decreasing plasma zinc levels in microbio-static environment (Shankar, B. 2000). It was also been reported by Isaksen and Fagerhol, (2001) that the reduced zinc levels in circulation reduce the metabolism of microorganisms during infection. Similarly the deficiency of iron in blood serum levels gave the same advantage as was for the zinc depletion (Beisel WR, 1995**,** Isaksen B, 2001)**.** The deficiency of iron has been found common during Malaria in Africa (Alice M. 2004)**.** The blood serum metal magnesium determined to be 16.5880ppm, copper 2.9185ppm zinc 3.7812ppm and iron (Fe) was 1.7307ppm and those for the control subjects determined to be 9.2387ppm**,** 2.1063ppm, 4.240ppm and 3.720ppm respectively, as reported by Vryonis et al. (1939) that the elevated serum Mg level might could be caused due to the hemolysis where, red blood cells contain high amounts of Mg which have potential applications as a biomarker of acute *falciparum* malarial patients. While malnutrition or malabsorption in the body due to falciparum Malaria can cause decreased serum Zn level, Iron has similar effects as it's for Zinc. Its been notified that Zn and Cu are always in a competition to repeal each other out from their absorption in the digestive tract, a diet, which is excessive in one of these minerals, may result in a deficiency in the other. According to this hypothesis one can assume elevated Cu levels in Malaria within low level of Zn. In the deficiency of Zinc, Copper leads and accumulates in the cells causing toxicity in resulting dysfunction of nervous system and thyroid gland. (Vryonis, G. 1939). The results suggest that the magnesium deficiency is related to the decrease in erythrocyte**.** In this study we have shown that the metals such as copper, iron, magnesium and zinc in human body may vary in *falciparum malaria*. Where results obtained were compared with those of the control. These results can play a vital role as supplementary research upon *falciparum Malaria* which can open a new door in therapeutic development to cure this disease from the abnormal levels of trace metals which shows the imbalanced metabolic system influenced by *falciparum malaria*.

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