Serum Levels of Copper, Zinc, Iron and Magnesium in Iraqi’s Women with HCMV infection

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ABSTRACT

The aim of this study was conducted to determine the alterations in serum trace elements, including zinc (Zn), copper (Cu), iron (Fe) and magnesium (Mg) in Iraqi’s women with human CMV (HCMV) infection and compare them with the results of age matched healthy individuals.

The study was carried out in Medical Research Unit, College of Medicine, Al-Nahrain University from 2010-2011. Fifty five women, 35 patients with HCMV and 20 healthy individuals were included in this study. Those women were examined serum zinc (Zn), copper (Cu), iron (Fe), magnesium (Mg) by using atomic absorption spectrophotometer. The
HCMV infection was determined using standard diagnostics criteria by using ELISA assay.

Serum zinc, copper, iron and magnesium concentrations were (Zn: 1.124±0.048, Cu: 1.052±0.192, Fe: 0.031±0.006 and Mg: 18.223 ±1.018) mg/L, respectively in patients with HCMV infection and (Zn:1.119 ±0.059, Cu: 1.096 ±0.238, Fe: 0.035± 0.013 and Mg: 20.299 ±3.393) mg/L in healthy controls, respectively. Serum zinc, copper, iron and magnesium concentrations were not statistically significant in patients with HCMV infection compared with those of healthy individuals (p>0.05).

INTRODUCTION

Human cytomegalovirus (HCMV) is a ubiquitous beta herpes virus that infects 88.93% of the general population and as much as 100% of people within some populations or in some geographic areas [1]. HCMV can infect a variety of cell types, including epithelial and glial cells, and generally replicates slowly in most cells [2]. It is well known that HCMV can be transmitted to 40-50 % of fetuses following infection through material fetal transmission; and approximately 10-15 % of infected babies had such abnormalities as microcephaly, seizures, sensorineural hearing loss (SNHL), cognitive, motor, and visual disorders [3]. Infection with cytomegalovirus (CMV) causes generation of intracellular reactive oxygen species, which activate NF-kappa B, a cellular transcription factor. NF-kappa B mediates expression of the CMV promoter and of genes involved in the immune and inflammatory responses [4]. Speir et al. reported that in the case of CMV, free radicals induce a viral promoter gene as well as turning on transcription of immediate-early and late proteins, and a number of virions [5]. Free oxygen radicals may protect against virus attack and can produce tissue damage during this protection by triggering inflammation [6]. Also, interact with neighbouring entities and can damage molecules, cells, tissues, DNA and finally the entire organs. The body has evolved mechanisms for neutralizing free radicals, including enzymes like superoxide dismutase (SOD: copper/zinc-SOD (Cu/Zn-SOD) and iron-SOD (Fe-SOD)), catalase and glutathione peroxidase [7,8]. The significance of the biochemical and nutritional roles of trace elements (i.e. zinc, copper) is widely recognized, since these elements are constituent components of many metalloproteins and metalloenzymes [9]. Many trace elements in these enzymes act as antioxidants or help such functions that not only regulate immune responses of the host, but also may alter the genome of the viruses [4]. Antioxidants inhibit intracellular reactive oxygen species, NFKappa B and CMV [5]. Zn is required, as a functional component, in more than 200 enzymes and transcription factors. It is also involved in the protection against vitamin E depletion, the stabilization of membrane structure and the maintenance of tissue concentrations of metallothioneins,
powerful free radical scavengers [10,11]. Copper is an essential element for the human organism, forming part of many copper-dependent enzymes which involved in oxide-reduction processes, such as superoxide dismutase, lysyl oxidase and ceruloplasmin, which have an important role in the protection of the organism against free radicals and, consequently, they are related to the oxidative stress[7,12-15]. Iron is another essential micronutrient required for a variety of biochemical processes, is essential for electron transfer reactions, gene regulation, binding and transport of oxygen, and regulation of cell differentiation and cell growth and also important for the immune system because it promotes immune cells and interferes with cell-mediated immune effector pathways and cytokine activities [16,17]. Magnesium is one of the most important micronutrients for both the innate and adaptive immune system. it participates in immune responses in various ways [18]. The present study were designed to explore the evaluation between serum zinc, copper, iron, and magnesium levels in women with HCMV infection and healthy women.

MATERIAL AND METHODS

The current study was conducted in Medical Research Unit, College of Medicine, Al-Nahrain University from 11/2010-2/2011. The randomly selected study group comprised of 55 women aged from (18-55 yr). Included: 35women as the patients group and 20 healthy subjects served as controls group.

Blood samples were taken from all subjects in accordance with standard procedure; five to eight mL of blood was collected from the vein in evacuated tubes without adding any anticoagulant agent. Collected blood samples were allowed to clot. The blood samples were centrifuged at rpm g for 10 min, sera were transferred and stored in plastic vials at –4 °C until further analysis. Enzyme linked immunosorbent assay (ELISA) was used to determine serum HCMV.

Trace Elements Analysis

Sera were diluted 10 folder with de-ionized water and analyzed by atomic absorption spectrophotometer AA 6200 Shimadzu (Kyoto, Japan) with computer.

Statistical Analysis

Statistical analysis has been performed using Statistical package for the social sciences (SPSS, version 11.0) for windows. Continuous variables were expressed as mean ± standard deviation (SD). Data were analyzed
using independent sample Student’s $t$ test. Significance was assigned for $P$ values ($P<0.05$) with 95% Confidence Interval.

**RESULTS AND DISCUSSION**

In **table.1**, the serum Cu, Fe and Mg concentrations were found to be (Cu: $1.052\pm 0.192$ mg/L), (Fe: $0.031\pm 0.006$ mg/L) and (Mg: $18.223\pm 1.018$ mg/L) in patients with HCMV, which was insignificantly lower than that of controls (Cu: $1.096\pm 0.238$ mg/L), (Fe: $0.035\pm 0.013$ mg/L) and (Mg: $20.299\pm 3.393$ mg/L). While serum Zn concentrations showed insignificant elevation (Zn: $1.124\pm 0.048$ mg/L) for patient compared with those of healthy individuals controls (Zn: $1.119\pm 0.048$ mg/L) at ($p>0.05$). The results of this study have been summarized in **Fig.1** and **2**.

**Table-1: Serum trace elements (Zn, Cu, Fe and Mg) in HCMV and healthy subjects**

<table>
<thead>
<tr>
<th>Trace element</th>
<th>Sample</th>
<th>Mean</th>
<th>Std. Deviation</th>
<th>$t$</th>
<th>$p$</th>
</tr>
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<tbody>
<tr>
<td>Zn</td>
<td>CMV control</td>
<td>1.124</td>
<td>0.048</td>
<td>0.21</td>
<td>0.83</td>
</tr>
<tr>
<td></td>
<td>control</td>
<td>1.119</td>
<td>0.059</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cu</td>
<td>CMV control</td>
<td>1.052</td>
<td>0.192</td>
<td>-0.50</td>
<td>0.61</td>
</tr>
<tr>
<td></td>
<td>control</td>
<td>1.096</td>
<td>0.238</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fe</td>
<td>CMV control</td>
<td>0.031</td>
<td>0.006</td>
<td>-0.91</td>
<td>0.36</td>
</tr>
<tr>
<td></td>
<td>control</td>
<td>0.035</td>
<td>0.013</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mg</td>
<td>CMV control</td>
<td>18.223</td>
<td>1.018</td>
<td>-2.17</td>
<td>0.09</td>
</tr>
<tr>
<td></td>
<td>control</td>
<td>20.299</td>
<td>3.393</td>
<td></td>
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</tr>
</tbody>
</table>

**Fig. -1 : Serum Zn, Cu and Fe Concentrations (mg/L) in the HCVM Patients (n=35) and the Control (n=20) Shown as Mean (p<0.05)**
There are two general classes of abnormality associated with trace elements: abnormality as a result of a specific deficiency from dietary inadequacies and imbalances, and abnormality secondary to other diseases. Furthermore, secondary changes occur as a result of diseases; these changes are not exactly understood. This is the first report indicating that the levels of some elements remained without significant variants in patients with HCMV; this may possibly affect some specific enzyme systems [7,19].

In the present study, we have demonstrated that serum Zn, Cu, Mg and Fe concentrations were not altered significantly in patients with HCMV infection. Although the level of Cu, Mg and Fe were decreased, and the slight elevation in Zn level in patients with HCMV. This mean, that infections with HCMV did not affect the Cu, Fe, or Zn-linked enzyme systems (such as alkaline phosphatase, superoxide dismutase, ferroxidase ceruloplasmin, ATPase…etc) [19].

Also, this changes are probably result from defence strategies of organism and were induced by the hormone-like substances, or could possibly due to the response of viral damaged tissues leaking intracellular metals into the plasma [7,14].

We concluded that serum essential trace elements Zn, Cu, Mg and Fe concentrations were probably altered by the some immune system as a defense strategy of organism during HCMV infection or because of the damage that occurred by virus. Further investigations will be needed to determine trace elements before and after treatment in order that the role of Cu, Zn, Fe and Mg levels in patients with HCMV can be established.
REFRENCES


