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Cardiovascular Diseases Correlation with Trace Elements in Hilla City

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Abstract

Cardiovascular disease (CVD) is a leading cause of global morbidity and mortality covers any disease of the circulatory system, however "trace elements" refers to chemical elements present in a natural material at concentrations < 0.1 %wt, besides the minor elements (0.1 - 1 %wt) and the major elements (> 1%wt).This study include 60 patients of acute myocardial infraction (AMI) and (40) healthy people . The results Showed that copper has increased in patients compared to control group , while zinc ,magnesium, and selenium decreased in patients compared to control group.

Keywords
Cardiovascular diseases, Trace elements, Atomic absorption spectrophotometer, Toxicity.

1. Introduction

Trace elements are those found in such small amounts in the living tissues, of the trace element appearing in the body, ten have been designed essential trace elements: Zinc, copper, manganese, iodine, iron, cobalt, molybdenum, tin, selenium and chromium (Mohamad, 2013).Trace elements play an important role in the structure of proteins, enzymes and complex carbohydrates to participate in biochemical reactions. Essential trace elements are involved in a number of metabolic activities, including neuroconduction, transport, excretory processes and serving as cofactors for enzymes. Some of the trace elements like Selenium, Zinc, Manganese, Magnesium and Copper are cofactors or structural components of antioxidant enzymes. Moreover, selenium and glutathione peroxidase play an important role in protecting cell membranes from oxidative damage and decreased blood selenium and are common in chronic renal failure patients. Zinc and Copper are the intensively and metabolically important trace metal for nutrients (Ramprasad and Al- Ghonaim, 2013).Although the trace elements are the essential components of biological structures, they may show toxic effect when they are more concentrated than the amount that are required for biological functions. In addition, the toxicity can be spread to other non-essential elements of very similar atomic characteristics that can mimic the reactivity of a trace element (Pirincci ., et al, 2013). Trace element determinations in blood serum have become important to investigate their vital role in human metabolism, as well as to obtain information regarding the health status of individuals (Saikia .,et al ,2007). serum levels of trace elements and vitamins may be changed in patients with CAD. The higher or lower levels may be both a cause and effect of atherosclerosis or the result of another unknown parameter (Cebi1.,et al, 2011).

2. Material and methods

All chemicals used in this study with highly purified material and no farther purification done.

2.1 Collection of specimens

Venous blood samples of 10 milliliters were drawn from patients of AMI within 12 hours of the heart attacks by using disposable syringes(10mL) in sitting position,1.8 mL of fresh blood drawn in plane tube contains (0.2mL) trisodium citrate solution 3.8% as anticoagulant for measuring fibrinogen, the remaining of the blood sample pushed slowly into plain disposable tubes .The blood was allowed to clot at 37^0C for 10-15 minutes, and then centrifuged at 3000 rpm for approximately 10-15 minutes then the sera were obtained and stored at -20^0C until analysis the level of some trace elements like (Cu,Zn,Mg,Se).

2.2 Determination of Copper

Atomic absorption spectrophotometer method was used to determine (copper) in serum samples. The serum samples were digestion first (Rasero, 1981**).** And then Stock standard solutions of copper were prepared(1000 Cu µg/ ml)**,** (Weatherby , 2000).

2.3 Determination of Zinc

Atomic absorption spectrophotometer method was used to determine (Zinc **)** in serum samples. The serum samples were digestion first (Weatherby and Feruson , 2004) **,** (Marczenko, 1976) . And then Stock standard solutions of Zinc were prepared (1000 Zn µg/ ml) , (Weatherby : 2000)

2.4 Determination of magnesium

Atomic absorption spectrophotometer method was used to determine(magnesium) in serum samples. The serum samples were digestion first (Weatherby et al : 2004). And then Stock standard solutions of magnesium were prepared(1000 Zn µg/ ml) **,** (Weatherby : 2000).

2.5 Determination of Selinum

Atomic absorption spectrophotometer method was used to determine(Selinum) in serum samples. The serum samples were digestion first (Weatherby and Feruson , 2004)**,** (Marczenko, 1976) **.** And then Stock standard solutions of Selinum were prepared(1000 Zn µg/ ml) **,** (Weatherby : 2000).

3. Results

Tables (1-4) shows trace elements concentrations evaluate in this study.

4.Discussion:

In-vivo antioxidant nutrients which include vitamin C, trace elements such as Se, Zn and Cu play a crucial role in defending against oxidant damage (Thangadurai ., et al ,2012) . The results showed that the levels of trace elements (Zn ,Mg ,Se) of patients significantly decreased compared with control. The lowering in these values was reflected the principle function of these elements acts as antioxidants (as free ion of elements or bounding with enzyme) in biological system (Paola .,et al , 2013) . The decrease in zinc level and its concomitant effect on copper level may affect the activity of some antioxidant enzyme that use these elements as cofactor within its structure. Hence those enzymes lose some of their activity and ability to remove free radicals(Beck ., et al,1997). Hypomagnesaemia is present in acute myocardial infarction (AMI) as shift of magnesium from extra cellular to intracellular compartments occur as it is taken up by adipocytes after catecholamine induced lipolysis and combined with soaps formed by free fatty acids. Although the total body Mg++ contents may not change with the onset of AMI. Extra cellular Mg++ declines markedly, especially over the first 24 to 48 hours after the onset of AMI. Hypomagnesaemia in the initial phase of post AMI period is very critical, as ventricular tachyarrhythmia sudden cardiac death and re-infarction are the usual outcome.(Ahmad ., et al,2010). Human body uses selenium to produce glutathione peroxidase,which works with vitamin E to protect cell membranes from damage caused by dangerous, naturally occurring substances known as free radicals produced by oxidative metabolism , Selenium is taking center stage as a potential anticancer agent by promoting formation of white blood cells which destroys the cancer cells and is an essential component of more than ten selenoproteins with multiple biochemical functions. Moreover, it boosts the immune system by increasing the activity and number of white blood cells and prevents premature aging, degenerative diseases, cardiovascular diseases, inflammatory diseases, stroke, cataracts, and rheumatoid arthritis. It is also necessary for normal thyroid functions and protection of heavy metal toxicity. Deficiency of the element can cause Keshan disease, characterized by an enlarged heart and poor heart function (Čuparigova ., et al,2011). Highly significant increase in copper level was observed in the sera of patients of compared with control. Among the cationic ligands, copper deserve particular consideration because it act as transition metal, it is very potent to generate ROS after a reaction with oxygen. Free Cu(II) ion can interact with hydrogen peroxide (H_2O_2) leading to the formation of the deleterious hydroxyl radical via the Fenton reaction. Bound to proteins, copper is generally less susceptible to participate in the Fenton reaction **(**Marjolaine ., et al , 2008).

$$H_2O_2 + Cu^{+1} \longrightarrow 2OH^{\bullet} + Cu^{+2}$$

5.Conclusion

Acute myocardial infarction seems to be due to alteration of levels of trace elements in serum of patients, in this specificity significantly increased of copper and decrease in (Zn,Mg,Se).

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Table (1): serum cupper levels in ppm of MI patients and healthy control

Sample	Number	S .Cu(ppm) Mean ±SD	P value
Control	40	1.4243± 0.16675	P<0.001
Patients	60	1.8535± 0.08218	

Table (2): Serum Zinc levels in ppm of MI patients and healthy control

Sample	Number	S .Zn(ppm) Mean ±SD	P value
Control	40	0.9468± 0.1158	P<0.001
Patients	60	0.4652± 0.07639	

Table (3): Serum magnesium levels in ppm of MI patients and healthy control

Sample	Number	S.Mg(ppm) Mean ±SD	P value
Control	40	16.9350± 0.8601	P<0.001
Patients	60	12.2317± 1.25435	

Table (4): serum Selenium levels in ppm of MI patients and healthy control

Sample	Number	B.Se(ppm) Mean ±SD	P value
Control	40	0.075428± 0.007234	P<0.001
Patients	60	0.051410 ± 0.004823	