Short Communications

Zinc and copper levels in hydatid cyst fluid and patient's blood

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Abstract

Eighteen patients with hydatid disease from Basrah General Hospital were involved in the study during 2007. Their ages ranged from 23-56 years with mean of 33.55 ± 10.4 years. The control group consisted of 25 apparantly healthy individuals. Zinc and copper levels in the sera and hydatid fluids were estimated by atomic absorption spectrophotometer. Mean values of zinc and copper concentrations in sera of patients were 124.33 ± 30.04mg/dl and 88.05 ± 15.91mg/dl respectively in comparing with those of the control group (P<0.0001). On the other hand, mean values of both zinc and copper levels in sera of patients were lower than those of the hydatid cyst fluids which were statistically significant. There was a positive correlation between sera zinc and copper concentrations of patients and the control group while negative correlations were observed with other relationships.

Introduction

A prospective case-control study was conducted in Basrah General Hospital during 2007. Eighteen patients with hydatid cyst were included in the study which was approved by the ethical committee of Basrah Medical College. Their ages ranged from 23-56 years with mean of 33.55 ± 10.4 years. They were nonsmokers, with no history of acute febrile illnesses or chronic diseases, no history of irradiation, cytotoxic medications or recent hormonal treatment during the last 6 months. The control group consisted of 25 apparently healthy individuals.

Serum was obtained by centrifugation of blood samples of patient and control groups at 3000 r.p.m for 15 minutes. A dilution used was 1:10 by deionized water. The absorbance of each sample against blank was measured by flame atomic absorption spectrophotometer (Pye Unicam 2900) according to a standard calibration curve obtained from zinc and copper standard solution (Wako Pure Chemical Industries Ltd. Japan).[1]

Each sample of hydatid cyst fluid (0.5-3 ml) which was obtained after surgical operation was added to an equal volume of acid digestion mixture (perchloric acid and nitric acid) in 10 ml plastic tube. Shaking the sample for one minute enhanced the rate of digestion. The digestion was completed in an oven at 37°C for 48 hours and finally a clear solution was formed which was diluted by 1:10 ml by deionized water. The measurement for each sample was done as above.

Statistical significance of differences between the

Table-1: Zinc and copper concentrations in sera of patient and control groups.

Parameters	Patients N = 18	Control N = 25	P- Values
S. Zn µ g/dl	118.32 ± 30.19	90.16 ± 22.50	0.0001
S. Cu µ g/dl	88.05±15.91	101.11± 15.29	0.0001

Values were expressed as mean ± SD.

Table-2: Zinc and copper concentrations in sera and hydatid cyst fluid in patients group.

Parameters	Serum N = 18	Cyst fluid N = 18	P- Values
Zn µ g/dl	118.32 ± 30.19	90.77± 27.04	0.0001
Cu µ g/dl	88.05±15.91	75.72 ± 11.28	0.016

Values were expressed as mean ± SD.

Table-3: Correlation coefficient (r) between all biochemical parameters in patients and healthy groups.

Parameters	Patients S. Zn	F. Zn	Patients S. Cu	F. Cu	Healthy S. Zn	Healthy S. Cu
Patients S. Zn	1	.483*	.385	.392	.970**	.321
F. Zn	.483*	1	.333	-.066	.434	.337
Patients S. Cu	.385	.333	1	-.005	.344	.971**
F. Cu	.392	-.066	-.005	1	.447	.000
Healthy S. Zn	.970**	.434	.344	.447	1	.221
Healthy S. Cu	.321	.337	.971**	.000	.221	1

Values expressed as correlation Coefficient (r).
*Correlation is significant at the 0.05 level (2-tailed).
**Correlation is significant at the 0.01 level (2-tailed).

mean values were analyzed by student's t-test. While the correlation between the data was tested statistically by simple linear regression test by using computer SPSS programme. The criterion for significance was ($p<0.05$).

Mean values of zinc and copper concentrations in sera of patients were 124.33 ± 30.04mg/dl and 88.05 ± 15.91mg/dl respectively in comparing with those of the control group there was a significant difference ($P<0.0001$) (Table-1). On the other hand, mean values of both zinc and copper levels in sera of patients were lower than those of the hydatid cyst fluids which were statistically significant (Table-2). There was a positive correlation between sera zinc and copper concentrations of patients and the control group while negative correlations were observed with other relationships as expressed in Table-3.

This study showed significant evidence of a rise in zinc and a decrease in copper in sera of patients with hydatid disease. On the other hand, levels of zinc and copper in hydatid cyst fluid were lower than those in sera of patients. Two studies have indicated a decrease in zinc and a rise in copper in sera of patients with hydatid disease.[2,3] To the best of our knowledge, there is no published work on zinc and copper levels in hydatid cyst fluid.

The metabolic function of zinc are based largely on its presence as an essential component of many metalloenzymes involved in virtually all aspects of metabolism.[4] Zinc is an integral component of nearly 300 enzymes. Important zinc containing metalloenzymes in human include carbonic anhydrase, alkaline phosphatase, RNA and DNA polymerase, thymidine kinase, carboxypeptidase and alcohol dehydrogenase. The zinc atoms are an integral firmly bound part of the metalloprotein molecule and are often involved in the active site. They also contribute to the conformation and structural stability of many metalloenzymes.[4] In a work which has been done in our department, many chemical compounds including organic, protein, enzymes have been encountered in the hydatid cyst fluid.[5] This indicates that these hydatid cysts are viable and need these components for the metabolic processes which are required for their growth and survival.

Zinc plays a major role in protein synthesis and gene expression. Metal binding by DNA and RNA affects the chemical and physical properties of the macromolecules in ways that may be related to replication and protein synthesis. In addition, zinc stabilizes the structure of protein and nucleic acids, preserves the integrity of subcellular organelles, participate in transport process and has an important role in the immune system.[3] Immunoglobulins A and G have been recovered in the hydatid fluid.[6] In addition, it is well known that hydatid fluid and cyst wall are a good source of antigen which can be used in sero-diagnosis of hydatid disease.[7]

Copper is absorbed from the stomach and small intestine. Factors affecting absorption include the amount ingested, the chemical form and certain dietary constituents which include other trace metals like zinc, iron, amino acids, fiber and phytates.[4] Copper plays a role in a variety of processes including mitochondrial energy generation, melanin formation and the cross linkage of collagen and elastin.[3] Some vital enzymes like ceruloplasmin, cytochrome C oxidase, super oxide dismutase and tyrosinase require copper as a cofactor. On the other hand, copper is toxic to humans only when it exists as unbound copper ion rather than the usual bound form. Any how, an inverse relationship between zinc and copper has been suggested. Although zinc is not generally regarded as a very toxic metal, signs of copper deficiency can be developed in rats if their diet contain high dose of zinc.[7]

Conclusion

This study was designed to estimate the zinc and copper levels in the hydatid cyst fluid and their relation to the respective levels in the patients blood.

The results of the study indicate that the hydatid cysts are viable and need these components zinc and copper for the metabolic processes which run for growing and surviving.

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