

Zinc toxicity associated with hydatid cyst infection among patients in Nasseriyah city \ Thi qar province , south Iraq

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ABSTRACT:

Hydatidosis is endemic disease in south of Iraq , zinc level are detected in sera of patient and hydatid cyst fluid by atomic absorption technique in colleges of Basrah university , the present study found that the zinc levels were increase in sera of patient when compare with control whom are not infected with disease . so the levels of zinc are also increase or high in hydatid cyst fluid .

Introduction :

Cystic echinococcosis or hydatidosis is an endemic disease caused by larval forms of the tapeworm *Echinococcus granulosus*. Hydatid cysts may develop in any organ of the human body, most frequently in the liver (60-70%) and the lungs (20-30%) (1). Hydatid cyst remains a significant public health problem in endemic areas such as Turkey, the Middle East, South America, and Australia. As an endemic disease, it causes social and economic losses for countries (2). Thus,

prevention of the disease as the first step by providing the basic hygiene and treatment as the second step are the important parts of the approach to hydatidosis. Zinc is one of the most abundant trace metals in humans and is found in all tissues and all body fluids. The total zinc content of the human body (70 kg) is in the range 1.5-3g. Most of this is found in muscle (60 %), bone (30 %), skin and hair (5 %), liver (3 %) and GIT and pancreas (2 %). In all other organs, the zinc content is $\leq 1\%$ (3) and (4).The highest concentrations of zinc in humans were found in liver, kidney, pancreas,

prostate and eye . Zinc is also present in plasma, erythrocytes and leukocytes (5) and (3). In healthy subjects, the normal plasma zinc concentration is 1 mg/L (6) and (7). Zinc is mostly bound to albumin (60-80 %) and to a lesser extent to α -2-macroglobulin and transferrin (8). This metal is effective at very low concentrations, and their concentration in the body fluids must be tightly regulated, deficiency or excess both cause severe illness and death (9). The aim of this study was designed to determine zinc level in sera and hydatid cyst fluid of patients with hydatidosis by atomic absorption spectrophotometer .

Key word : hydatid fluid , zinc toxicity , atomic absorption spectra

Materials and methods :

5 ml of blood was poured into test tubes free from anticoagulant to isolate blood serum to estimate zinc level in sera of patients . The blood was centrifuged at 1500 rpm for one minute and the sera were kept at - 20°C until the time of analysis . A

dilution used was 1:10 by deionized water. 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 (10). Zinc was estimated by Atomic absorption spectrophotometer

Statistical Analysis:

The data were subjected to analysis of variance and significant differences at ($P < 0.01$) and determined by ANOVA-one way ;SPSS v.12.0(2004).

Results and Discussion :

The result of the current study revealed an increase in zinc level of sera of patients with hydatidosis compared with healthy control group and show significant differences between the two previous groups but there is least significant differences in zinc level in sera of patients and

hydatid cysts fluid of the same patients where zinc level was raised in

sera of patient more than record in hydatid cysts fluids (Table,1). Mean values of zinc concentrations in sera of patients and healthy group were 203 $\mu\text{g \ dl}$ and 178 $\mu\text{g \ dl}$ respectively

(Table,1) : Zinc level among patient with hydatidosis , hydatid fluid, and healthy control group)

Parameters	Patients sera * N=30	Hydatid cyst fluid ** N=30	Control healthy *** N=30
Zinc	203 $\mu\text{g \ dl}$	197 $\mu\text{g \ dl}$	178 $\mu\text{g \ dl}$

- * & ** least significant differences
- * & *** significant differences

This results were nearly corresponded with (10) and disagreed with (11) and (12) . Trace elements are essential components of biological structures, but at the same time they can be toxic at concentrations beyond those necessary for their biological functions. According to (13) suggestion, the zinc toxicity causes an extensive vacillation of erythrocyte precursors in the bone marrow and that causes a defect of erythrocyte production which leads to anemia. Many studies in Iraq reported anemia

or reduced in RBC number among patient with hydatidosis such as (14) and (15) . The toxicological effect of zinc could be explained by accumulating the free radical of zinc ions (not connected with metallothionine) in the cells especially fatty cells caused lipid peroxidation mainly unsaturated fatty acids which are present in the RBC membranes and that increases the osmotic fragility and the easy destruction of RBC, which caused anemia (16). Excessive

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Patients nasseriya city/theqar province, south iraq

zinc can cause as many problems in the body as deficiency. The first signs of zinc toxicity include reduced feed intake, reduced weight gain, bone resorption. Zinc toxicity causes hepatosplenomegaly, which leads to the production of large numbers of the lymphocytes resulting in the increase of the total WBC count, therefore, the neutrophil count decreased. The increasing of the monocyte count could be due to the long period of the toxicity (17). The highest value of Zn has been reported in several parasites e.g. *Fischoederius*

into RNA (18).The biological activities of Zn is strongly associated with the biological systems; these metals are mostly bound to proteins, forming metalloproteins. Many of the metals in metalloproteins are part of enzymatic systems, have structural and storage functions, or join to the protein to be transported to their target site in the organism (19).

elongatus, *Fischoederius cobboldi*, *Gastrothylax crumenifer*, and *Orthocoelium orthocoelium* . Zinc is required for the initiation of DNA and protein synthesis, within the cell (18). The availability of Zinc within nucleolus leads to be increased mRNA synthesis and this in turn causes increased availability of enzymes for DNA synthesis or transcription of DNA

References :

1. Moraitaki, P.; Roussi, P.; Emmanouil, Y. Pechlivanidou, R.; Bitsakou, C.; Konstantinou, M. and Marosis, K. (2010). Pulmonary echinococcosis presenting as a pulmonary mass with fever and haemoptysis; a case report. *Pneumon. J.* 23, (2): 180 – 183.
2. Morar , R. and Feldman , C. (2005). Pulmonary echinococcosis . *Eur. Respir. J.* , 21 : 1069 – 1077.
3. Wastney, M.E.; Aamodt, R.L.; Rumble, W.F. and Henkin, R.I. (1986). Kinetic analysis of zinc metabolism and its regulation in normal humans. *Am J Physiol*, 251: R398-R408.
4. Aggett, P.J. (1994). Aspects of neonatal metabolism of trace metals. *Acta Paediatr Supp*, 402: 75-82.
5. Shaeffer, G.L. (2006). Evaluation of basic zinc chloride as a zinc source for cattle. M.Sc thesis in North Carolina State University. Animal Science. Raleigh.
6. Whitehouse, R.C.; Prasad, A.S.; Rabbani, P.I. and Cossack, Z.T. (1982). Zinc in plasma, neutrophils, lymphocyte and erythrocytes as determined by flameless atomic absorption spectrophotometry. *Clin Chem*, 28: 475-480.
7. Ohno, H.; Roi, R.; Yamamura, K.; Lizuka, S. and Taniguchi, N. (1985). A study of zinc destitution in erythrocytes of normal humans. *Blut*, 50:113-116.
8. Bently, P.J. and Grubb, B.R. (1991). Experimental dietary hyperzincurea tissue deposition of excess zinc in rabbits. *Trace Elem Med*, 8(4): 202-207.
9. Barbier, O.; Jacquillet, G.; Tauc, M.; Cougnon, M. and Pougeol, P. (2005). Effect of Heavy Metals on, and Handling by, the Kidney. *Nephron physiol*; 99: Pp.105-110.
10. Mahdi, J. ; Mohammad H. Al-Jawher; and Mahdi, N. K. (2010). Zinc and copper levels in hydatid cyst fluid and patient's blood . *J. Pak. Med. Assoc.* 60 (7) : 580-581.

11. Mahdi NK, Al_Baldawi ,F.A. and , Benyan, A.K. (1996) .Immunoglobulin levels in sera and cyst fluid of human hydatidosis. Med. J. Basrah Univ. , 14: 91-9.
12. Ozen N, Celik C, Ozkan K, Malazgirt Z, Isimer A, Sayal A. Trace elements in hydatid disease. J Trace Elem Electrolytes Health Dis 1992; 6: 67-70.
13. Julie, A.I.; Andre, M.; Gillian, L.; Kevin, F. and Louis, D.W. (2003). Element of caution: a case of reversible cytopenias associated with excessive zinc supplementation. CAMJ. 22; 169(2).
14. Khalaf ,A. KH. (2012). *In vitro* and *in vivo* studies of secondary metabolites extracted from some algae against protoscolices of *Echinococcus granulosus* in laboratory mice Balb/C strain in comparison to albendazole activity . PhD Thesis, College of Education . , Basrah University.
15. Al – Mobarak, Z.A. (2006). Effect of peel extracts of *Punica* fruits on on echinococcosis of *Echinococcus granulosus* . M. Sc. Thesis, College of Education . , Kufa University, (In Arabic).
16. Settelmine C.T. and Matrone, G. (1967). In vivo Effect of Zinc on Iron Turnover in Rats and Life Span of the Erythrocyte. Journal of Nutrition Vol. 92 No. 2 June, Pp.159 – 164.
17. De Oliveira, F.S.; Viana, M.R. and Antonio, A.R. (2001). Differential effect of lead and zinc on inhibitory avoidance learning in mice. Braz J Med Biol Bes 34:117-120.
18. Srivastav, S. K.; Murti, R. C. And Gupta Vinod , C . (2011). Quantitative Analysis of Trace Elements In *Fasciolopsis buski* and *Gastrodiscoides hominis* IJCPR,; 2(3):161-168
19. Fraga CG. (2005) . Relevance, essentiality and toxicity of trace elements in human health. Mol Aspects Med. 2005; 26(4–5): 235–24.

التأثير السمي لعنصر الزنك لدى المرضى المصابين بداء الاكياس العدرية في مدينة الناصرية

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الخلاصة :

يعتبر داء العدريات من الامراض المتوطنة في جنوب العراق ، تم في الدراسة الحالية متابعة مستوى الزنك في مصل المرضى وفي السائل العدري للكيس باستخدام جهاز طيف الامتصاص الذري المتوفر في كليات جامعة البصرة ، فقد وجد زيادة في مستوى عنصر الزنك في مصل المرضى المصابين بالمرض مقارنة بغير المصابين كما وجدت الدراسة زيادة بتركيز العنصر في السائل العدري للكيس .