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Estimation of some trace elements in serum of children with jaundice

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تقدير العناصر النادرة فى الاطفال المصابين باليرقان

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الخلاصة

موضوع هده الدراسة هو قياس التغيرات فىمستوى العناصر النادرة (الزنك،الكروم والنحاس) فىمصول الاطفال المصابين باليرقان و مقارنتهابالنتا ئج للاطفال الاصحاء باستخدام تقنية الامتصا ص الدرى حيث لوحظ انخفاض ملحوظ فى مستويات الزنك وارتفاع ملحوظ فى مستويات النحاس والكروم فى الاطفال المصابين باليرقان عند مقارنتها بالمصول لطبيعية حيث اوضحت ا الدراسة بان مستويات النحاس ،الزنك والكروم كانت (7.98±0.54 µg/dl),(95± 67 µg/dl), (175.6±75.5 µg/dl) على التوالى فى مصول الاطفال المصابين باليرقان اما فىمصول الاطفال الاصحاءفقد كانت القيم (109±13.72 µg/dl), (3.8±0.48 µg/dl) (106.55±11.7µg/dl) على التوالى.

Abstract

The objective of this study was to measure the alterations in serum trace elements copper (Cu), chromium (Cr) and zinc (Zn) in children with jaundice and compare them with the results of healthy individuals by using AAS. Significant low serum levels of Zn and high level of serum Cu and chromium were observed in children with jaundice as compared with normal healthy controls.. The study showed that Cu, Zn and Cr concentrations in serum of jaundice were (175.6±47,5 µg /dL ,95±67µg /dL and 7.98±0.54 µg /dL)respectively. In healthy individuals these concentrations were 109.3±13.72 µg /dL,106.55±11.7 µg /dL and3.8 ±0.48 µg /dL) respectively.

Key Word :Trace elements, Jaundice

Introduction

Jaundice implies diseases of the liver or biliary tract. It occur from excess ion haemolysis and cause yellowness of the skin and conjunctive, and may be associated with other cutaneous and systemic feature of liver diseases. The yellowness of skin sclerae, and other tissue due to excess circulating bilirubin mild jaundice best seen by examining the sclerae in natural light [1,2] . Trace elements play an important role in disease caused by liver diseases. The change in trace elements might also be associated with various diseases [3]. The relationship between chronic hepatitis and trace elements has not been understood clearly [4].Various trace elements are responsible for many biochemical, immunological, and physiological activities. Essential micronutrients are involved in many metabolic pathways in the liver, such as enzymatic functions, protein synthesis, oxidative damage and anti-oxidant defense, immunological competence, interferon therapy response regulations and alterations of the virus genomes [5]. Trace element measures in serum/plasma are easy and used commonly. Serum metal level has been reported to be highly sensitive in the diagnosis of liver diseases. The concentration of each trace element varies with different types of liver diseases because these elements may have a direct hepatic toxicity or may be decreased as a consequence of the impaired liver function. Trace elements such as Zn and Cu are required for the immune system to function efficiently[6].

MATERIAL AND METHODS

Experimental subject

The randomly selected study group comprised 39 children with jaundice and the control group comprised 44 healthy children.

Blood collection

Blood samples were taken from all subjects in accordance with standard procedure; six mL of blood was collected from the vein and protected in evacuated tubes without adding any anticoagulant agent.. Collected blood samples were placed in sterile place and allowed to clot. The blood samples were centrifuged at 3000 rpm for 10 minutes and the collected sera were stored in plastic vials at –20 ć **.**

Reagent and solutions

All chemicals used were of analytical grade supplied by fluka .BDH. Atomic Absorption Spectroscopic standard solution of Zn,Cu, and Cu of 1000ppm were prepared from certified standards Fluka .The internal standards were prepared from metal salts obtained from Fluka ,working standard solution were prepared by diluting the stock solution. .

Measurement of trace elements

The protocol adopted from that of (Saiki *et al* ,2006) all of sample series of standard solution of Zn,Cu, and Cr 1000ppm were atomized in air-acetylene flame with a Hitachi 180-50 AAS. Results were calculated from the calibration curve of obtained by statistical analysis of concentration Vs Absorbance data for elements using fitting of straight line by least square. .

RESULTS & DISCUSSION

The results in (table1) show that serum Cu concentrations of jaundice patients are significantly higher(175.6±47,5 µg /dL) than normal individual serum concentrations(109.3±13.72 µg /dL). These elevated serum Cu levels indicate an alteration of Cu metabolism during the acute phase of uncomplicated hepatitis [7]. It may be resulted from defense strategies of organism and induced by hormone like substances [8]. As the disease progresses from chronic hepatitis to liver cirrhosis, serum calcium, magnesium, phosphorus and zinc concentrations decrease while copper concentration increases [9]. It may be explained by the release of copper from damaged necrotic hepatocytes [10]. The results in (table1) also showed that serum Zn concentrations of jaundice patients are significantly lower,(95±67µg /dL) than normal individual serum concentrations(106.55±11.7 µg /dL) .

Table 1. Concentrations of Serum trace element in children with jaundice and in healthy controls

Trace elements µg/dl	Patients	Control	P-value	Significance
Zn	95±67	106.55±11.7	0.020	Significant
Cu	175.6±47,5	109.3±13.72	0.027	Significant
Cr	7.98±0.54	3.8±0.48g	0.001	Significant

.Zn is an essential element that is found in all cells. It stimulates the activity of approximately 100 enzymes [11] and binds to several viruses. The reduced zinc concentration indicates the severity of liver damage [12]. Kalkan *et al.* [13] have reported Zn concentration associated with viral hepatitis decrease with the development of hepatitis patients; it reveals that Cu concentration increases statistically while Zn, level decreases. Decrease in serum Zn is due to poor appetite, during the infection with the help of leukocyte endogen mediator (LEM) and uptake of more Zn to synthesize nucleic acid, protein and enzymes by liver cells. With progression of the liver damage, due to poor appetite, impaired function of intestines and stomach and high pressure of the portal vein, the zinc intake and absorption decreases and also the low content of serum albumin results in less combination with zinc and because of the diffusion characteristic of blood zinc, itis easily lost through urine and sweat [14, 15].

Fota Markowska *et al.* [16] studied the serum Zn level dynamics in patients with acute hepatitis B and the early recovery periods. They observed significantly decreased serum Zn levels during hospitalization and the supplementation of Zn to HBV patients resulted in early recovery. Loguercio *et al*. reported that cirrhotic patients` had a significant decrease of serum Zn and Fe level [17].It was observed that the level of chromium is higher in the jaundice patient7.98±0.54 μg /dL than normal individual serum concentrations and3.8 ±0.48 μg /dL) .high level of chromium might indicate the development and progression of liver damage. and indicate that jaundice affect chromium metabolism **[**18] .Assessment of the disorders of trace element metabolism should be based not only on the dietary intake, but also on various factors such as absorption, transportation, storage, excretion, and metalloproteinase and metallo-enzymes synthesis which are impaired when liver cell is damaged [19]. Change in trace elements associated with some biological reaction takes place in the liver further research, both basic and applied, is needed to assess properly the possible role of malnutrition in contributing to the emergence of novel liver diseases [20].

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