

SERUM LEVELS OF COPPER AND ZINC IN PATIENTS WITH ATOPIC DERMATITIS IN IRAQ⁺

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Abstract

Serum copper and zinc were measured by atomic absorption spectrophotometer in (101) patients with atopic dermatitis they were (59 females and 42 males, with age range of 3-65 years) and (50) healthy volunteers. All patients were attending the Department of Dermatology and Venerology, Medical City Hospital in Baghdad during the period between 1997 and 1998. The mean serum copper of patients (127.66 µg\dl) was significantly higher than that of controls (109.08 µg\dl) ($P<0.001$). There was no significant differences between patients and controls in the concentrations of serum zinc and albumin. These findings suggest that the copper can be utilized as an additional test for the diagnosis of atopic dermatitis patients.

المستخلص

لقد تم قياس مستوى الزنك و النحاس في المصل باستخدام مطياف الامتصاص الذري في (١٠١) حالة من مرضى التهاب الجلد األمتأحل (٥٩ من الإناث و ٤٢ من الذكور) تراوحت أعمارهم بين ٣-٦٥ سنة و (٥٠) حالة من المتطوعين الأصحاء , كل المرضى كانوا من المراجعين لقسم الأمراض الجلدية والزهرية في مدينة الطب في بغداد خلال الفترة بين عام ١٩٩٧-١٩٩٨. أظهرت النتائج أن معدل مستوى النحاس في مصل المرضى ١٢٧.٦٦ (P<0.001). كذلك لوحظ أنه لا توجد أي اختلافات معنوية بين المرضى و مجموعة السيطرة بالنسبة الى تركيز الزنك و الألبومين في المصل. دلت نتائج الدراسة على إمكانية استخدام قياس مستوى النحاس في المصل كفحص إضافي لتشخيص مرضى التهاب الجلد األمتأحل.

Introduction

Atopic dermatitis (AD) is a chronic and relapsing inflammatory skin disease, which may occur at any age, approximately 48-75% of patients would manifest the disease by age of (6) months and 80-90% by age of (5) years. AD is a genetically determined disorder, it is one of the clinical manifestations of a topic syndrome. It is characterized by a number of immunological and non-immunological abnormalities [1,2]. Zinc is an active element in the body and behaves as a co-factor for many enzymes. It is required for DNA, RNA and protein synthesis as well as for cell

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mediated immunity, reproduction and development of epidermis [3]. Zinc level in body fluids and tissues varies according to age, sex and nutritional status. Circulating zinc level in serum does not accurately reflect whole body zinc because circulating zinc is in part bound to albumin, about 60-70% of serum zinc is loosely associated with serum albumin and 30-40% is more bound to globulins [3]. Depression of plasma zinc has been noted in both animal and human infections partly due to redistribution with an accelerated of zinc from the serum into the liver [4]. Measurement of serum zinc has resulted in conflicting data both reduced [5], and normal levels being reported [6,7].

Copper is an integral component of enzymes, Copper level in tissues and body fluids depends upon diet, sex, age and state of health. Serum copper concentration increases during infections or inflammations [8], the increase in serum copper may provide increased antioxidant activity against O_2^- free radicals. Serum copper has been reported as increased in patients with AD [6,9]. The role of copper and zinc in skin disease has been more widely investigated. The aim of this study is to assess the levels of zinc and copper in Iraqi AD patients.

Subjects and Methods

Patients

We studied (101) patients (59 females and 42 males; mean age is 16.34 ± 2.18 years, range 3-65 years).

The diagnosis of AD patients is confirmed by dermatologist in clinical basis. None of these patients received corticosteroides, antihistamines, or other systemic therapy at the time of study, and one month earlier. The patients were divided into two groups according to the severity of their dermatitis, (Table 1).

- Mild dermatitis group (<10% surface area involvement) which included 36 patients (23 females and 13 males). Their ages ranged between 3-56 years mean age 19.25 ± 1.61 years.
- Severe dermatitis group (>10% surface area involvement) which included 65 patients (36 females and 29 males). Their ages ranged between 4-65 years mean 14.12 ± 2.84 years.

Control

The control group consisted of (50) healthy volunteers, (26) females and (24) males. Their ages ranged between (4-58) years, with no symptoms and history of AD, (Table 1).

Venepuncture was carried out between 0.900 and 11.00 hours avoiding the effect of diurnal variation of the serum copper and zinc concentrations [10,11]. Blood samples were collected in polyethylene tubes, after centrifugation at 3000 rpm for 10 min, serum was removed and collected in polyethylene tubes then stored at -20°C to be assayed.

Serum copper and zinc were measured by atomic absorption spectrophotometer [12] and albumin was measured by a dye-binding procedure employing bromocresol green [13].

Statistical Analysis

Statistical analysis involves calculations of mean values (M), standard deviation (SD) and student t-test to find the significance of probability level (P) for the biochemical among the different groups. Levels of significance were established at ($P<0.05$) and ($P<0.01$).

Table- 1: Number and age of subjects per each group

Group	Diagnosis	No.	Age in Years	
			Mean	Range
TG	Total AD pat.	101	16.34	3-65
SG	Severe AD	65	14.12	4-65
MG	Mild AD	36	19.25	3-56
CG	Control	50	15.68	4-58

Results

The present study shows a significant increase in serum copper concentration among all groups of the patients as compared to the control group ($P<0.01$) (Table 2).

As shown in Table(2) there are no significant differences in the mean zinc concentration between patients and controls ($P>0.05$). Circulating zinc levels in serum does accurately reflect whole body zinc and since circulating zinc is in part bound to albumin so albumin concentration was measured in this study.

Statistically there are no differences in serum albumin concentration values among the various groups of AD patients as compared with that of control values ($P>0.05$) (Table 2).

Table-2: The [M $\pm$ SD] of serum copper, zinc and albumin among patients and control with their significance.

Groups		Control group (N= 50)	Mild group (N= 36)	Sever group (N= 65)	Total group (N= 101)	T (test) P-value
Copper	Mean	109.08	125.81**	128.69**	127.66**	P<0.001
	SD	± 21.17	± 44.69	± 38.02	± 40.55	
Zinc	Mean	95.70	93.88	92.69	93.28	NS
	SD	± 10.07	± 21.02	± 18.02	± 19.14	
Albumin	Mean	4.004	4.013	4.075	4.053	NS
	SD	± 0.218	± 0.310	± 0.296	± 0.302	

** : significant differences

NS: non significant

Discussion

High serum copper concentration of the present results is consistent with the finding of [6]. David et al., (1990) [9] who mentioned that the patients with AD had significantly higher serum copper concentration and there was no significant correlation between copper concentration and surface area affected by eczema. The present result disagreements with report of DiToro, 1987, which shows normal levels of serum copper, found in eczematous children [7]. Over 90% of copper in serum is bound to ceruloplasmin an acute phase reactive protein [14], and it has been suggested that the increased concentrations of copper and ceruloplasmin are attributable to the inflammation associated with the skin disease [6,9]. AD is a chronic inflammatory condition stimulates the release of leukocyte endogenous mediators and this polypeptide mediator is secreted by granulocytes, the action of leukocyte endogenous mediators may cause the elevated serum copper during the acute phase [15,16], so it can be assumed that copper can be used as an additional assay for the diagnosis of AD.

Our results are in disagreement with the studies of [9,17] who show a reduction in zinc level among AD patients. In contrary, the result of the present study is consistent with the reports of [6,9,7].

Normal level of serum albumin was documented by DiToro et al., (1987) [7] in 21 children with AD also Hinks et al., (1987) [6] in 24 eczematous adult and David et al., (1990) [9] noted normal level of albumin in serum of 134 children with AD. Present results of serum albumin Table (2) support our results of serum zinc concentration, since there is a linear relationship between albumin concentration and zinc concentration in the blood and circulating zinc is in part bound to albumin [8,18].

References

1. Wüthrich B., "The dry skin in a topic dermatitis" *Schweiz Rundschau Med.*, 75, 139- 200, 1986.
2. Poljacki M., Jovanovic M. and Matic M., "Immunologic response in patients with a topic dermatitis" *Med. Preg.*, 49, 305-307, 1996.
3. Underwood E.J., *Copper and zinc in trace element in human and animal nutrition*, 3rd ed. Academic Press, New York, 1971.
4. Beisel W.R., *Metabolism: Current aspects in health and disease*, Alan R. Liss, New York, 1977.
5. David T.j., Wells F.E., Sharpe T.C. and Gibbs A.C.C, "Low serum zinc in children with AD" *Br.J. Dermatol*, III, pp.597-601, 1984.
6. Hinks L.J., Young. S. and Calyton B. "Trace element status in eczema and psoriasis". *Clin. Exp. Dermatol.*, 12, pp.93-107, 1987.
7. DiToro R., Captorti M.G., Gialanella G. Moro R. and Perrone L., "Zinc and copper status of allergic children" *Padiatar. Scand.*, 76, pp.612-17. 1987
8. Solomons N.W. "On the assessment of zinc and copper in nutrition of man" *Ammere. J. Clin. Nutr.*, 32, pp. 856-865, 1979.
9. David T.j., Wells F.E., Sharpe T.G., Gibbs A.C.C and Devlin J., "Serum levels of trace metals in children with AD" *Br.J. Dermatol*, 122, pp.485-89, 1990.
10. Lifschitz M.D. and Henkin R.I., "Circadian variation in copper and zinc in man" *J. Appl. Physiol.*, 31, pp.88-92, 1971.
11. Gowenlock A.H, *Practical clinical biochemistry*, 6th ed., Heinemann, Medical Books, London, 1988.
12. Tietz N.W, *Text book of clinical chemistry*, W. B. Saunders Company, Philadelphia, London, 1986.

13. Wells F.E ., Adisson G. M. and Postlethwaite R., “ Albumin analysis in serum of haemodialysis patients” *Ann . Clin . Biochem*, 22 ,pp. 304-309 ,1985.
14. Beisel W. R,Pekarek R.S, “Acute stress and trace element metabolism” *Int. Rev. Neurobiol.*, 1,pp.5359 ,1972.
15. Pekarek R.S., Powanda M.C. and Wannemacher W.W, “ The effect of leucocyte endogenous mediators (LEM)on serum copper and ceruloplasmin concentration in the rat” *Proc. Soc. Exptl . Biol . Med .*, 141,pp.1029 – 1031,1972.
16. Wannemacher R.W., Dupout H.L., Pekarker M. C., Powanda A., Schwartz A. and Beisel WR., “An endogenous mediator of depression of amino acids and trace metals in serum during typhoid fever” *J. Infect. Disease*, 126,pp.77-81,1972.
17. Greaves M.W., and Boyde T.R.C, “ Plasma zinc concentrations in patients with psoriasis, other dermatoses and venousleg ulceration” *Lancet*, ii ,pp. 1019 – 1020 ,1967.
18. Giroux E.L., Durieux M. , and Schechter P.J., “ A study of zinc distribution in human serum” *Bioinorgan . Chem .*, 5,pp.211-216 ,1976.