Iraqi JMS

Published by Al-Nahrain College of Medicine
P-ISSN 1681-6579
E-ISSN 2224-4719
Email: iraqijms@colmed-alnahrain.edu.iq
http://www.colmed-alnahrain.edu.iq
http://www.iraqijms.net
Iraqi JMS 2019; Vol. 17(2)

Assessment of Serum Zinc Level in Patients with Atopic Dermatitis

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Abstract

Background Atopic dermatitis (AD) is a common inflammatory skin disease with a chronic relapsed-remitting course with manifestations started at early childhood. AD is two types; extrinsic and intrinsic. Zinc has a crucial role in the immune system functions and antioxidant mechanisms, it also serves in the metabolism and cell growth through signaling several enzymes.

Objective To assess serum zinc level in patients with childhood AD.

Methods A case-controlled study was conducted in Dermatology outpatient's clinic in Al-Imamein Al-Kadhimein Medical City, from the period of September 2016- June 2017. Twenty patients with AD were enrolled in this study. AD severity was graded using the Scoring Atopic Dermatitis Index (SCORAD). The control group consisted of age-matched and sex-matched twenty healthy children were taken with weight above 80%. Fasting blood samples were taken from patients and controls between 8 AM and 10 AM.

Results Of the twenty patients of AD, 13 (65%) were males and 7 (35%) were females. Their mean age was 4.58±3.13. Regarding the control group 9 (45%) were males and 11 (55%) were females, their mean age was 4.29±2.46. No statistical difference in serum zinc level between AD patients and control groups. Concerning zinc level in males and females, no statistical differences was found in AD patients, but highly significant difference was found in control group. Serum zinc level was highly significantly low in patients with moderate AD than in those with mild AD. There was negative correlation between serum zinc level and severity of AD.

Conclusion There is a negative correlation between serum zinc level and severity of AD, also there is a gender variation in serum zinc level in normal children.

Keywords Serum zinc level, atopic dermatitis

Citation Farhood IG, Ahmed MA, Al-Bandar RT, Farhood RG. Assessment of serum zinc level in patients with atopic dermatitis. Iraqi JMS. 2019; 17(2): 103-107. doi: 10.22578/IJMS.17.2.2

List of abbreviations: AD = Atopic dermatitis, SCORAD = Scoring Atopic Dermatitis Index, Th = T helper cells

Introduction

Atopic dermatitis (AD) is a common inflammatory skin disease with a chronic relapsed-remitting course with manifestations started at early childhood [(1)]. It affects 10% of children and 2% of adults and causes a high impact on quality of life since [(2)]. There are 2 types of AD; Extrinsic AD which exhibits immunological deviations consists of increased total IgE levels, multiple Type-I sensitizations to several inhalant and/or food allergens and a CD4 dominated cellular infiltrate in the skin [(3)]. While; immunological phenomena are not present in patients with intrinsic AD and the cellular infiltrates are CD4, but also CD8 positive [(4)]. Also, there are

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physiological and biochemical defects of the skin barrier structure [5].

Zinc is one of essential trace mineral act as a key to nutrition and good health with zinc has a crucial role in the immune system functions and antioxidant mechanisms, it also serves in the metabolism and cell growth through signaling several enzymes. It is important for all cell proliferation. A sufficient daily intake of zinc is required for the proper immune function because there is no specific storage system [6].

This study was done to assess Serum zinc level in patients with childhood AD.

Methods

A case-controlled study was conducted in Al-Imamein Al-Kadhemein Medical City, in Dermatology outpatient's clinic from the period of September 2016 to June 2017.

Twenty patients with AD were enrolled in this study, Patients with asthma, allergic rhinitis, any acute/chronic diseases were excluded. Also, those patients taking systemic corticosteroid, zinc supplement, antibiotics were excluded. Severity was graded using the Scoring Atopic Dermatitis Index (SCORAD) [7]. According to SCORAD, AD was classed as mild (SCORAD <25), moderate (SCORAD 25-50), or severe (SCORAD >50) [7]. The control group consisted of age-matched and sex-matched twenty healthy children.

Fasting blood samples were taken from patients and controls between 8 AM and 10 AM.

Control group consists of twenty healthy children were taken with weight above 80% and having no acute or chronic problem at the time of collection of samples.

Results

Twenty patients were enrolled in this case-controlled study, 13 (65%) male patients and 7 (35%) female patients with atopic dermatitis. Their aged were ranged from 1-10 years with mean±SD 4.58±3.13.

Twenty other children enrolled as control group, 9 (45%) males and 11 (55%) females, their age ranged from 1-12 years with mean±SD 4.29±2.46 as shown in table (1).

Table 1. Comparison between patients with atopic dermatitis and control groups in regards to age and sex

Parameter		Patients N=20	Controls N=20	P value
Age (yr)	Mean±SD	4.58±3.13	4.29±2.46	0.743*
	Range	1-10	1-12	
Sex	Female	7	11	0.341**
	Male	13	9	

* unpaired ttest, ** Fisher exact test

We found no statistical difference in serum zinc level between patients with AD and control groups as shown in table (2).

There was no statistical difference in the level of serum zinc between males and female's patients with AD but there are highly significant differences in the level of serum zinc between males and females in control groups as in table (3).

Serum zinc level was highly significantly low in patients with moderate AD than in those with mild AD as in table (4).

There was negative correlation between serum zinc level and severity of AD as in table (5).

Table 2. Comparison of serum zinc level between patients with atopic dermatitis and control groups by unpaired ttest

Serum zinc	**Patients N=20 Mean±SD**	**Controls N=20 Mean±SD**	**P value**
(µg/dl)	85.82±7.35	86.02±7.38	0.932

Table 3. Comparison of serum zinc level between patients with atopic dermatitis and control groups in regards to sex by unpaired ttest

Serum zinc (µg/dl)	Patients N=20 Mean±SD	Controls N=20 Mean±SD	P value
Females	87.19±6.63	81.99±7.27	0.146
Males	85.08±7.87	90.93±28.97	0.052
P value	0.555	0.004	

Table 4. Comparison of serum zinc level between mild and moderate severity atopic dermatitis patients by unpaired ttest

Serum zinc	Mild N=12 Mean±SD	Moderate N=8 Mean±SD	P value
(µg/dl)	90.79±4.33	78.35±3.31	<0.001

Table 5. Correlation between serum zinc level with age and severity in patients with atopic dermatitis

Parameter	Serum zinc (µg/dl)	
	r	p
Age (yr)	0.376	0.102
Severity	-0.881	<0.001

Discussion

AD is a complex disease influenced by genetic predisposition and environmental factors with chronic nature [8].

Zinc is one of the most essential nutritional elements for human body with antioxidant importance since elevated oxidative stress (OxS) plays a role in the pathophysiology of childhood AD as well its importance in cell proliferation and differentiation [9]. Zinc has a critical role in immune system cells proliferation, apoptosis and differentiation. Also, it aids in T cell activation, T helper (Th) cells differentiation into their different subgroups (Th1, Th2, Th17, regulatory T cells (Treg)) [6]. Normal value of serum zinc level in males = 70-125 µg/dl and in females = 68-115 µg/dl [10]. Mild deficiency of zinc led to

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reduction in Th1 functions, as measured by the production of (interferon gamma) IFN-γ, interleukin 2 (IL-2), and tumor necrosis factor-α (TNF-α). Thus, zinc deficiency in humans resulted in an imbalance between Th1 and Th2 cells [11].

In the current study, serum zinc level was within the normal range in both patients and control group, and there was no significant difference in serum zinc level between both groups, which is consistent with other studies [12,13], and differ from the results of other studies which found low serum zinc level in patients with AD [14,15]. There was no clear explanation for the differences in serum zinc level but it could be due to confounding factors for serum zinc quantification include diet, co-medications, co-morbidities, risk of external contamination during specimen collection or analysis, Improper specimen processing, hemolysis can also falsely increase zinc concentration & can contribute to falsely elevated concentrations [16].

It is well known that free zinc is mainly inside the cells and the required zinc can be provided by the plasma. About one percent of the total body content represented by the serum zinc pool, so zinc transporters and zinc binding molecules tightly controlled the intra cellular zinc level for important physiologic functions. Zinc transporter are found in plasma and found also on intracellular membranes. If there is any defect in the transport mechanism; low cellular zinc levels could be found even if it is normal in the plasma [17].

In the current study, there was no statistical difference in serum zinc level between males and female's patients with AD, which differs from other study were they found sex differences [18], and that could be due to differences in serum albumin concentrations and in lean body mass since concentrations of albumin and zinc in serum were strongly correlated because 80% of zinc in the circulation is bound to albumin [19].

Serum zinc level was highly significantly low in patients with moderate AD than in those with mild AD, low zinc level could affect the severity of AD as it causes membrane barriers' problem, which could increase trans epidermal water loss, which lead to xerotic skin, and easier allergens penetration [20].

This study showed a negative correlation between serum zinc level and severity of atopic dermatitis, and no similar result was found previously. This may require to measure erythrocyte zinc levels, which may suggest a probable intracellular zinc transport defect and AD progression.

The current study concluded that there is negative correlation between serum zinc level and severity of AD. There is gender variation in serum zinc level in normal children.

Acknowledgement

I appreciate thankfully the role of all patients who participate in this study.

Author contribution

Dr. Farhood: Study conception and design, acquisition of data, interpretation, reasoning and critical revision, Dr. Ahmed: statistical analysis and final revision of the article, Dr. Al-Bandar: collecting data, Dr. Farhood RG: Drafting of manuscript.

Conflict of interest

The author declares that there is no conflict of interest.

Funding

Self-finding.

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Received Mar. 4th 2019
Accepted May 23th 2109

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