Trace elements status in psoriasis and their relationship with the severity of the disease

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Background: Psoriasis is a common and chronic inflammatory skin disease that has profound adverse effects on patients' wellbeing. Trace elements are essential to biochemical processes in the body and are involved in immunological and inflammatory reactions such as keratinization and melanin formation. The aim of this study was to evaluate the essential metals in psoriasis in comparision with healthy controls.

Method: We investigated serum levels of zinc, copper, and magnesium in 40 psoriatic patients and age and sex matched controls.

Result: Psoriatic patients showed significantly higher serum levels of copper / zinc and lower magnesium in comparison with the control group. No significant differences were seen in copper and zinc levels. There was no correlation between serum levels of these elements and psoriasis severity except for zinc; the serum level of zinc was inversely correlated with psoriasis severity.

Conclusion: This study demonstrated some disturbances in serum levels of metals in psoriasis. More studies are required to clarify the importance of these findings in etiopathogenesis or treatment.

Keywords: copper, magnesium, psoriasis, trace elements, zinc

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INTRODUCTION

Psoriasis is a common chronic inflammatory cutaneous disorder resulting from interactions between genetic predisposition and triggering environmental factors. It affects approximately 2% of the population and poses a lifelong burden on those affected [1,2]. Trace elements are essential to biochemical processes in the body and are involved in immunological and inflammatory reactions such as keratinization and melanin formation [3]. There are a number of studies on the serum level of trace elements in psoriasis with controversial findings [3-5].

With the objective of comprehending abnormal metabolism of the essential metals and binding proteins, we measured serum levels of zinc (Zn), copper (Cu), magnesium (Mg) and Cu/Zn in psoriatic patients and healthy controls.

PATIENTS AND METHODS

Psoriasis patients referred to the dermatology clinic of Shohada-e-Tajrish hospital from primary care centers between September 2010 and November 2011were assessed to be included in a case-control study to investigate the status of trace elements in psoriasis. Eligible patients were those with definitive clinical diagnosis of plaque type psoriasis and patients with the following conditions were

excluded: borderline or suspicious cases, receiving systemic psoriasis treatment during the last 3 months, receiving any medication that could change serum levels of trace elements such as diuretics, psychologic drugs, anti arrhythmic medications or supplements, diabetes, hypertension, metabolic disorders and skin problems other than psoriasis. The control group consisted of healthy sex and age-matched individuals. All patients provided written informed consent.

Blood samples were collected from fasting patients and healthy age- and sex-matched controls. Ten milliliters of blood was collected from everyone under sterile conditions. Standard precautions for determination of trace elements were taken and samples with signs of hemolysis were discarded. The sera underwent centrifugation at 3500 rpm for 15 minutes and kept frozen at −80°C until analysis. At the same time, the psoriasis area and severity index (PASI) scores of psoriatic patients were determined by a dermatologist. The PASI score accounts for both the extent of body surface area affected by the erythema, scaling, and thickness and the severity of these measures. The score ranges from 0 (no disease) to 72 (maximal disease). Patients with a PASI score equal to or more than 10 were regarded moderate to severe and those with a PASI score less than 10 as mild. The serum levels of trace elements were determined directly using atomic absorption spectroscopy (AAS), (Chemtech, Amsterdam, Netherlands).

Data were presented as mean±standard deviation (SD). Using SPSS package 16.0 (SPSS Inc. Chicago, IL, USA), the groups were compared with Student's t test for continuous variables and Chi-square test for non-continuous variables. Mann-Whitney's U-test was used for variables without a normal distribution. A two-tailed P-value of <0.05 was considered significant.

RESULTS

In this study, 40 patients (age range: 8 – 66 year with a mean age of 36.65±14.48years) including 18 females (45%) and 22 males (55%) and 40 controls (age range: 10-66 years with a mean age of 36.25±14.50 years) including 16 females (40%) and 24 males (60%) were evaluated and compared. Fourteen patients (7 female and 7 male patients) had PASI scores <10 and 26 patients (11 female and 15 male patients) had PASI scores more than 10 (Table.1). The serum levels of Zn, Cu, Mg and Cu/Zn are represented in Table 2.

Serum levels of Zn and Cu were not significantly different between patients and healthy controls while the serum level of Mg was significantly lower in patients versus controls (P<0.01). Moreover, the Cu/Zn ratio was significantly higher in patients when compared to healthy controls (P<0.01).

Comparison of patients with mild and moderate to severe psoriasis showed no significant differences in the evaluated parameters. Assessment of the correlation of these parameters with psoriasis severity (PASI score) showed a significant correlation only for the serum level of Zn (Figure 1) (P<0.01). None of the investigated parameters were correlated with the chronicity of the disease.

Table 1. General characteristics of patients and controls (Mean ± Standard Deviation)

Group	Age (year)	Duration of psoriasis (year)	PASI score
Control (N=40)	36.25 ± 14.50	–	–
Mild disease (N=14)	34.79 ± 14	7.50 ± 6.45	5.84 ± 2.41
Moderate to severe disease (N=26)	37.65 ± 14.65	11.56 ± 8.89	17.83 ± 8.76
Total patients (N=40)	36.65 ± 14.84	10.14 ± 8.27	13.64 ± 9.20

Table 2. Serum levels of trace elements and metal binding proteins in psoriatic patients and controls

Element	Total Patients N=40		Mild Patients PASI>10 N=26		Moderate to severe Patients PASI<10 N=14		Controls N=40	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Zn (µg/dl)	98.72	12.59	101.57	12.37	97.19	12.68	103.37	10.45
Cu (µg/dl)	124	11.79	124.14	16.61	123.92	8.57	119.65	6.7
Mg (mg/dl)	2.63	0.31	2.60	0.22	2.70	0.43	2.81	0.31
Cu/Zn	1.28	0.21	1.29	0.19	1.24	0.25	1.17	0.13

SD: Standard Deviation

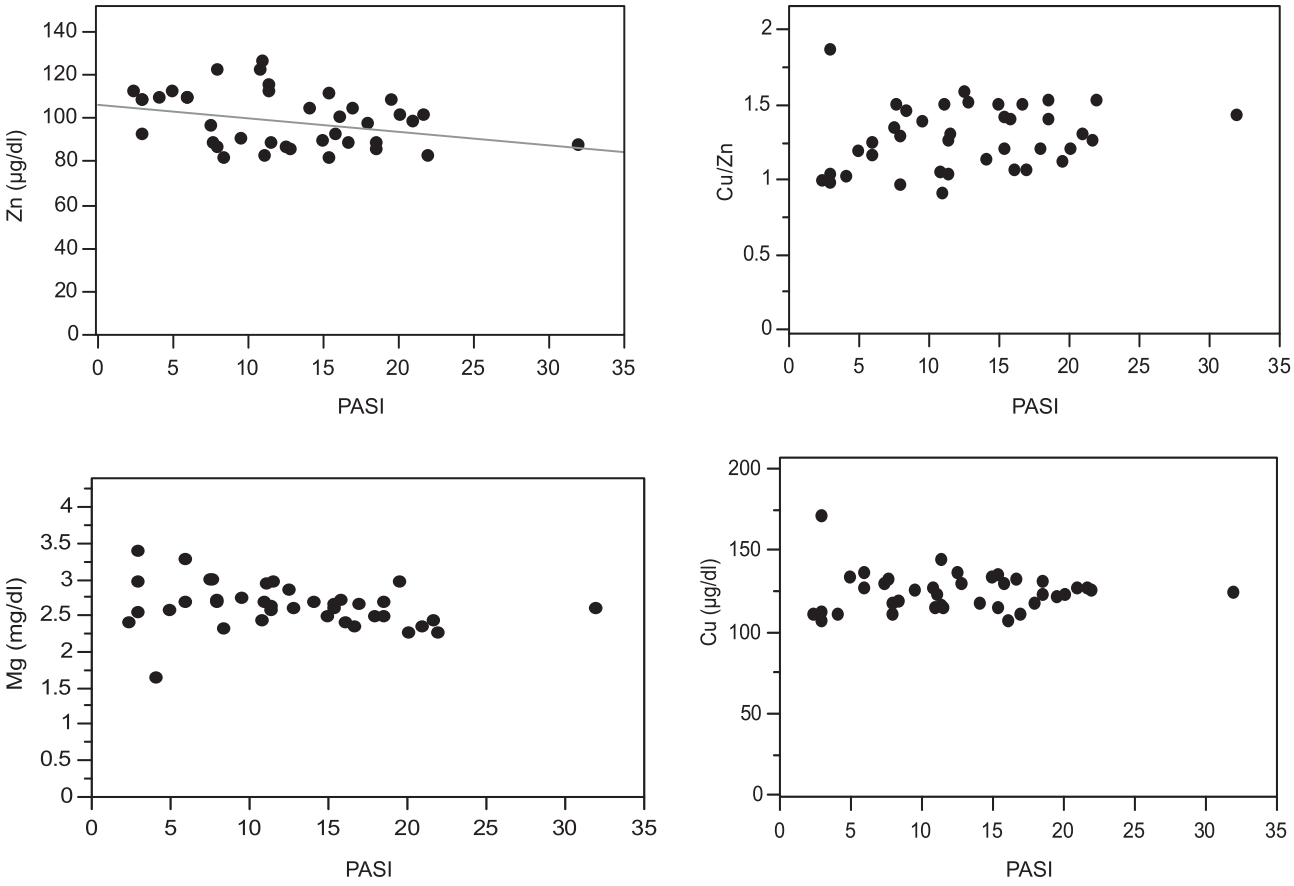

Figure 1. Correlation between disease severity (Psoriasis Area and Severity Index, PASI) and evaluated serum levels; Disease severity (Psoriasis Area and Severity Index, PASI) was correlated with serum Zn level (rho=-0.33, p=0.04).

DISCUSSION

There are contradictory reports regarding serum levels of trace elements in psoriasis. When serum levels of trace elements and Cu/Zn were compared against the PASI score and duration of the disease, the serum level of Zn showed a statistically significant correlation with the PASI score. McMillan et al, reported that psoriatic patients with more extensive skin involvement had lower Zn levels than those with minimal involvement [4]. Our results indicated that there was no statically significant difference between serum levels of Zn and Cu in psoriasis patients and age- and sex-matched controls group, while the Cu/Zn ratio was significantly higher in patients.

Some investigators have reported increased Zn concentrations in psoriasis scales, serum, urine and uninvolved skin of psoriasis patients [5]. However, Hinks et al, reported no change in serum Zn levels in psoriasis patients [6]. Basavaraj et al, found decreased Zn concentrations in both mild and severe psoriasis patients consistent with some studies and increased Cu concentrations in both mild and severe psoriasis groups [7-10]. Bhatnagar et al, in their study on active and remissive phases of psoriasis, reported an increase in serum Zn and reduced Cu levels [11]. Tasaki et al, demonstrated that, in three groups of skin cancer, inflammatory diseases, and non-inflammatory disease, the Cu/Zn ratio clearly reflected the severity of the progress [12]. Kreft et al, proposed that zinc replacement therapy in patients with psoriasis was indicated only in those with a documented zinc deficiency [13].

Mezzetti et al, found a strict relationship between copper/zinc ratio and systemic oxidative stress [14]. These inconsistent results may arise from different study designs. Overall, it seems that Cu/Zn is a more effective parameter rather than either Zn or Cu level alone, although it had no correlation with the severity of psoriasis in our study.

In the present study, we observed that Mg was significantly lower in patients in comparison with controls. Basavarij et al, reported higher

levels of Mg in the serum samples of both mild and severe psoriasis groups [7]; Suworow reported that magnesium deficiency was the focus of skin damage in psoriasis [15]. Interestingly, Schempp et al, demonstrated that magnesium ions specifically inhibited the antigen presenting capacity of langerhans cells and that they might contribute to the efficacy of Dead Sea water in the treatment of inflammatory skin disorders [16].

None of the elements were correlated to psoriasis chronicity. Interestingly, decreased serum Mg levels in patients with SLE has been reported in a study [17], which is similar to our finding, and may show some similarities in metabolic alterations in these inflammatory disorders. The mechanisms by which these alterations occur in certain inflammatory conditions need to be elucidated.

This study demonstrated some disturbances in serum levels of metals in psoriasis. More studies are required to clarify the importance of these findings in etiopathogenesis or treatment of psoriasis.

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