

Serum Zinc Levels in Patients Suffering From Various Clinical Types of Psoriasis in Pakistan

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ABSTRACT

Objective: The compelling evidence shows that proper Zinc (Zn) nutrition is important for human health. Hence an attempt was made to evaluate the serum Zn levels in different clinical types of psoriatics patients.

Study Design: Case-control study.

Place and duration of Study: This study was conducted at Bannu University of science and technology with the collaboration of Govt. Sifwat Ghayur Shaheed Memorial Children Hospital Peshawar and National Physical Standard Laboratory PCSIR Islamabad from April 2013 to April 2015.

Materials and Methods: 500 psoriatics and 100 normal controls of both genders with an age range 18-60 years were selected for this study. Serum zinc levels were measured with atomic absorption spectrophotometer (AAS).

Results: The serum zinc concentration was found to be low in 80% patients. Mean $\pm$ SD of serum zinc were $585.50 \pm 1.70 \mu\text{g/L}$ in psoriatic patients and $770.15 \pm 3.32 \mu\text{g/L}$ in controls respectively. In psoriatic patients serum zinc concentration was significantly lower than that of healthy controls ($P < 0.001$).

Conclusion: We may conclude that Zinc deficiency may play a role in the pathogenesis of psoriasis since most patients have low serum Zn level

Key Words: Zinc, types of psoriasis, AAS, Pakistan

Citation of article: Dilawar S, Burki MFK, Jabeen F, Shah A. Serum Zinc Levels in Patients Suffering From Various Clinical Types of Psoriasis in Pakistan. Med Forum 2017;28(3):119-122.

INTRODUCTION

Among skin diseases, psoriasis is one of the most common. It is a chronic, inflammatory and autoimmune disease characterized by hyperproliferative disorders of the skin with unknown etiology and by production of reactive oxygen species due to activation of tumor necrosis factor alpha (TNF - α), which is considered to be an important factor in the induction and maintenance of psoriatic lesions^{1,2}. Between 2 and 4.8% of the world population have psoriasis³. This pathology occurs in all age groups, and it appears in both men and women⁴. More than 50% of patients report that the onset of psoriasis occurs before the age of 40⁵. Factors that may have modulatory effects on inflammatory diseases such as psoriasis are little known. In addition, psoriasis is characterized by a defect of keratinization⁶. It has been shown that the unique process of keratinization is a dependent enzyme

that cannot be influenced by deficiencies or excess trace elements⁷. Thus, it has been established that zinc plays an important role in the process of normal keratinization of the skin of animals⁸. Indeed, zinc is an essential trace element for the skin and has healing properties. Zinc is a cofactor of various functions including growth, immunity and skin repair and protects against free radicals^{9,10,11}. Therefore, the presence of zinc is essential for the proper functioning of the skin cells¹². Decreases in zinc levels have been observed for many skin disorders such as psoriasis¹³. In Pakistan psoriasis is a common dermatological disorder but still there is lack of data on the epidemiology and prevalence of psoriasis in Pakistan. There have been very few studies so far on the comorbidities and risk factors of psoriasis. Most of these are observational descriptive studies. And, little work has been done on the analysis of zinc in the serum of different clinical types of psoriasis in Pakistan.

MATERIALS AND METHODS

Selection of psoriatic patients: In this study 500 samples of psoriasis patients, including males and females with the age range of 18-60 years were selected from different hospitals and clinical Labs of Pakistan. All the patients were examined by the dermatologist and their complete medical history were documented.

Selection of control group: A total number of 100 male and female healthy individuals aged between 18-60 years were selected with the conditions of, no

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Received: January 23, 2017; Accepted: February 22, 2017

smoking habits, no history of viral hepatitis, no alcoholic and absence of any severe or chronic pathology.

Inclusion criteria: The following individuals were included, who were; Suffered with visible psoriasis and those looking apparently healthy.

Exclusion Criteria: The following patients were excluded, who were; On minerals, hormones and vitamin therapy. Non-co-operative patients (who refused or did not have an interest to participate in the study). Suffering with acute or chronic diarrhea. Pregnant and having cutaneous diseases other than psoriasis.

Chemicals and Reagents: All reagents used were of analytical grade. All standard solutions were prepared in a 0.01 M HNO₃.

Collection and preparation of samples: 5 ml blood was taken from the antecubital vein of healthy subjects and patients. The samples were transferred to vacutainers and left undisturbed for 1 hour to clot and then centrifuged at 5000 rpm for 15 min. The sera were stored in Eppendorff vials at -20°C until further analysis. 1 ml of serum was added to a Teflon beaker and digested in mineral acids under optimum heating. The temperature of the hot plate was increased steadily in a range 175 °C to 250 °C until fumes of HClO₄ appeared.

Analysis of serum samples: For the execution of this work, an AAS (Contra 700, Analytic Jena) was used and the digested serum samples were analyzed in triplicate. The standards used in the preparation of the working curve for Zinc were prepared daily by direct dilution of the concentrated solutions of the analyte in 0.01 M HNO₃ for a concentration range of 20, 40, 80 µg/L of standard solutions.

Validation of the analytical methods: Inter lab comparison (ILC) for quality control of serum samples was used for validation purpose. In this regard a composite sample was prepared from 100 serum samples. The composite sample was properly centrifuged. The same composite sample was also analyzed by AAS. Both results were compared and a close relationship was observed.

Statistical Analysis: Statistical analyses in connection of data's significance were carried out using the student's T-test. P values <0.001 were considered significant.

RESULTS

The study included 500 psoriasis patients (M = 250, F = 250) and 100 age and sex matched healthy controls. The overall mean of serum Zn level in control group and patients with age range 18-60 years was 770±3.77µg/L and 585.50±4.30µg/L respectively (Table 2). A statistically significant difference (p<0.001) was found among patients and control group.

Table No.1: Inter-Lab comparison of the composite samples for Se

Laboratories	Sample Type	Zn (µg/L)
Chemical Metrology Division, NPSL (Contra 700, Analytic Jena)	Diseased	689±1.55
	Healthy	720±0.79
PCSIR Labs Complex, Karachi, (Hitachi 8000 with Zeeman background correction, Japan)	Diseased	677±1.90
	Healthy	705±0.75
Abdul Wali Khan University, KPK (AA Analyst 100, Perkin Elmer, with Zeeman Background Correction)	Diseased	680±1.95
	Healthy	710±0.55

Values are the mean of three replicates ± SD

Table No.2: Serum Zinc levels in control and patient groups

Samples	Age (Years)	No. of Individuals		Conc. (µg/L)
		Male	Female	Mean±SD
Control	18-60	50	50	770.15±1.3
Psoriasis patients	18-60	250	250	585.50 ±2.8

P<0.001 (highly significant)

Figure 1. Shows zinc concentration among control and different clinical types of psoriasis. A significant difference p<0.005 was found between control group and psoriatic groups and within psoriatic groups a statistically significant difference p<0.005 between the mean serum Zn levels of patients with plaque psoriasis (724.11±1.89µg/l) versus guttate psoriasis (699.23±1.50µg/l), scalp psoriasis (670.13±1.90µg/l), erythrodermic psoriasis (630±1.22µg/l), and pustular psoriasis (620±1.77µg/l).

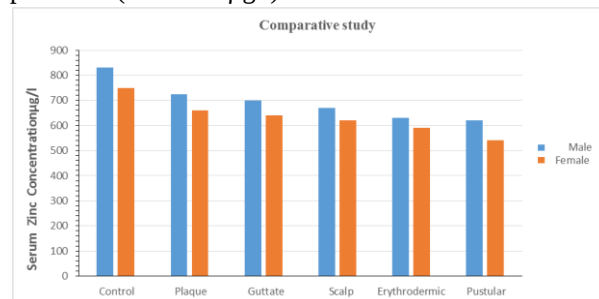


Figure No.1: Serum zinc concentration regarding to types of psoriasis.

Psoriasis is usually classified as mild, when it affects less than 3% of the body, moderate, when it affects 3 to 10% of the body, or severe > 10%. PASI is used for graduating the severity of psoriasis.

Figure 2 (a):- showed serum Zn Conc. in male and female groups whose affected body surface area is greater than 10 % of the total body surface area.

Figure 2 (b):- showed serum Zn Conc. in male and female groups whose affected body surface area is less than 10 % of the total body surface area. Thus, the deficiency sequence of serum Zn in relation to percentage of body involvement in different types of

Psoriasis is as pustular > erythrodermic > scalp > guttate > plaque.

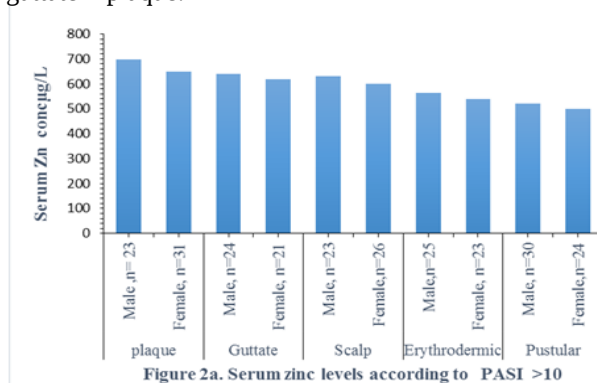


Figure No.2a: Serum zinc levels according to PASI > 10

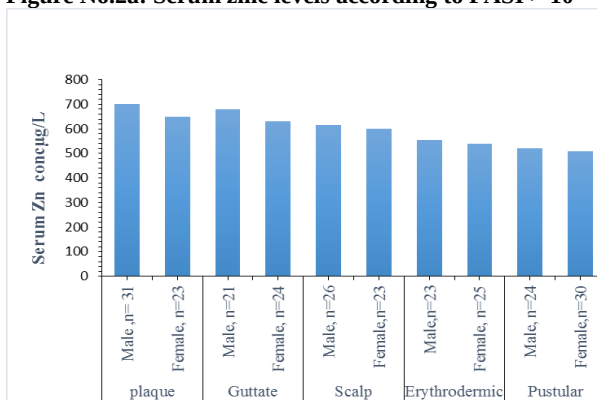


Figure No.2b: Serum zinc levels according to PASI < 10.

DISCUSSION

It is noted in our study that the mean serum zinc levels of the patients is significantly lower than that of the controls. It has been reported in the literature that normal skin and psoriatic skin do not show no significant differences for zinc¹⁴. Furthermore, no significant changes in serum zinc levels were observed in psoriasis on the basis of age, sex, duration of disease and involvement of joints and nails⁶. Many researchers have observed a significantly low level of serum zinc in psoriatic patients^{15,16} while others found normal levels¹⁷. Thus, the measurement of the plasma zinc level in psoriatics resulted in contradictory data, reduced¹⁸ high¹⁹ and normal zinc levels²⁰ were found. It has been suggested that the possible reason for the contradictory results of zinc levels in serum in psoriasis may be due to the lack of consideration of the degree of skin affected by psoriasis. As a result, the relationship between the skin surface affected by psoriasis and zinc levels in serum has been reported¹⁵. But Hinks et al have not demonstrated such a relationship in psoriasis¹⁹. Then, Sung YL. et al. reported that serum concentrations of zinc are influenced by several factors, including infections and trauma¹¹. In our study, a significant variation in zinc content in serum was observed in the general population of psoriatic patients compared to controls. This is in agreement with the findings of some studies^{21,22}. Bertazzo et al. reported

that sex had no influence on zinc content²³. While in our study, a significant decrease in zinc level was found in the Serum of psoriatic females as well as psoriatic males. Studies have shown that psoriasis is not primarily a skin disease but an immunological disturbance under the skin. Skin manifestations are the result of excessive stimulation of the superficial cells of the skin (Langerhans cells). Thus, psoriasis is considered as disorders, mainly epidermal keratinocytes, but now it is recognized as one of the most common autoimmune disorders²⁴. A first study in 1971 concerning the correlation between age and plasma zinc in 204 male subjects aged 20 to 84 and 54 female subjects aged from 20 to 58 years gave a significant linear decrease in plasma zinc with age in both groups²⁵. Also, a significant zinc reduction in serum was also found for the 'oldest age group' (≥ 90 years) in a comparative study between healthy elderly people aged 65-89 and elderly adults 20-64 years (26). Psoriasis is an inflammatory disease of chronic and recurrent skin. The forms of psoriasis are mild, moderate or severe according to the PASI (Psoriasis Area Severity Index) score. Patients with a body surface area of more than 20% psoriasis had significantly lower serum zinc levels than others (6). McMillan observed that the concentration of zinc in the serum of psoriatic patients with more than 10% of the area of the affected body was significantly lower than for those with less than 10% surface area¹⁵ which is in agreement with our study. A reduction in the concentration of zinc in the blood with the increase in psoriatic surface area may be due to the depletion of the secondary zinc by the loss of zinc by exfoliation. Another possibility is that the perturbation of the zinc state in the serum could actually be translated by a greater involvement of the psoriatic surface²⁷. The results obtained by Basavaraja K.H. et al²⁸ indicate that zinc concentrations in mild and severe psoriasis groups show a downward trend that is consistent with other studies²³. On the other hand, Bhatnagar M. et al. in their study of active and remission phases of psoriasis reported an increase in serum zinc²⁹. In their study, Nigam et al. reported no significant change in serum zinc levels in psoriasis on the basis of disease duration⁶. Factors which may have modulatory effects on inflammatory diseases such as psoriasis are not well known. It has been proposed that trace elements such as zinc may play an active role in psoriasis³⁰.

CONCLUSION

The comparison of the concentrations of trace elements in the serum of psoriatic patients must be done between subjects matched by age and sex. Finally, the data obtained in this study can guide physicians and other health professionals in the identification of essential trace element (Zn) deficiencies in biological samples the patients suffering from psoriasis.

Conflict of Interest: The study has no conflict of interest to declare by any author.

REFERENCES

1. Pujari VM, Suryakar AN, Ireddy S. Oxidants and antioxidant status in psoriasis patients. *Biomedical Res* 2010;21(2): 221-223.
2. Nazıroğlu, Yıldız MK, Tamtürk B, Erturan I, Flores-Arce M. Selenium and Psoriasis. *Biological Trace Element Res* 2012;150 (1-3): 3-9.
3. Gelfand JM, Weinstein R, Porter SB, Neimann AL, Berlin JA, Margolis DJ. 2005b. Prevalence and treatment of psoriasis in the United Kingdom: A population-based study. *Arch. Dermatol* 2005b; 141 (12):1537–1541.
4. Raychaudhuri SP, Farber EM. The prevalence of psoriasis in the world. *J Eur Acad Dermatol Venereol* 2001;15(1):16–1.
5. Naldi L, Gambini D. The clinical spectrum of psoriasis. *Clin Dermatol* 2007;25:510–518.
6. Nigam PK. Serum zinc and copper levels and Cu: Zn ratio in psoriasis. *Indian J Dermatol Venereol Leprol* 2005;71(3):205-206.
7. Afridi HI, Kazi TG, Jamali MK, Kazi GH, Shar GQ. The status of trace and toxic elements in biological samples (scalp hair) of skin disease patients and normal human subjects. *Turk J Med Sci* 2006;36(4):223–230.
8. Day C, McCollum EV, 1940. Effect of acute dietary zinc deficiency in rat. *Exp Biol Med* 1940; 45(1):282–284.
9. Halsted JA, Smith JC. Irwin MI. Conspectus of research on zinc requirements of man. *J Nutr* 1974; 104:345.
10. Bannister JV, Bannister,WH, Rotilio G, Aspects of the structure, function, and applications of superoxide dismutase. *CRC Crit Rev Biochem* 1987;22(2):111–180.
11. Sung YL, Hong KL, Jung YL, Jong SL, Analyses of serum zinc and copper levels in psoriasis. *Korean J Invest Dermatol* 1996;3(1): 35-38.
12. Pories WJ, Mansour G. In: Prasad AS, Oberleas D, editors. *Trace Elements in Human Health and Diseases*. Acad Press New York 1976.p.115–142.
13. Prasad AS. Clinical endocrinological and biochemical effects of zinc deficiency. *Clin Endocrinol Metab* 1985;14 (3):567–589.
14. Molokhia MM, Portnoy B. Neutron activation analysis of trace elements in skin. Copper in normal skin. *Br J Dermatol* 1969;81:110-4.
15. McMillan EM, Rowe D. Plasma zinc in psoriasis: Relation to surface area involvement. *Br J Dermatol* 1983;108(3):301-305.
16. Saxena N, Sharma RP, Singh VS. A study of serum zinc and copper levels in psoriasis. *Indian J Dermatol Venereol Leprol* 1990;56:216-218.
17. Portnoy B, Molokhia M. Zinc and copper in psoriasis. *Br J Dermatol* 1972;86(2):205
18. Greaves M, Boyde TRC. Plasma-concentrations in patients with psoriasis, other dermatoses and venous leg ulcerations. *Lancet* 1967;2:1019-1020.
19. Voorhees JJ, Chakrabarti SG, Botero F, Miedler L, Harrel ER. Zinc therapy and distribution in psoriasis. *Arch Derm* 1969;100:669-673.
20. Withers AFD, Baker H, Musa M, Dormandy TL. Plasma-zinc in psoriasis. *Lancet* 1968;(7562): 278-282.
21. Rocha-Pereira P, Santos-Silva A, Rebelo I, Figueiredo A, Quintanilha A, Teixeira F. The inflammatory response in mild and in severe psoriasis. *Br J Dermatol* 2004;150:917-28.
22. Kumar P, Lal NR, Mondal AK, Mondal A, Gharami RC, Maiti A. Zinc and skin: a brief summary. *Dermatol Online J* 2012;18:1.
23. Bertazzo A, Costa C, Biasiolo M, Allegri G, Cirrincione G, Presti G. Determination of copper and zinc levels in human hair: Influence of sex, age, and hair Pigmentation. *Biol Trace Elem Res* 1996;52 (1): 37-53
24. Griffiths CE, Barker JN, Pathogenesis and clinical features of psoriasis. *Lancet* 2007;370:263-71.
25. Lindeman RD, Clark ML, Colmore JP. Influence of age and sex on plasma and red-cell zinc concentrations. *J Gerontol* 1971;26:358-363.
26. Ravaglia G, Forti P, Maioli, Nesi, Pratelli L, Savarino L, et al. Blood micronutrient and thyroid hormone concentrations in the oldest-old. *J Clin Endocrinol Metab* 2000;85:2260-2265.
27. Afridi HI, Kazi TG, Kazi N, Kandhro GA, Baig JA, Shah AQ, et al. Evaluation of Cadmium, Chromium, Nickel, and Zinc in Biological Samples of Psoriasis Patients Living in Pakistani Cement Factory Area. *Biol Trace Elem Res* 2010;142 (3): 284-301.
28. Basavaraj KH, Darshan MS, Shanmugavelu P, Rashmi R, Yuti Mhatre A, Dhanabal SP, et al. Study on the levels of trace elements in mild and severe psoriasis. *Clinica Chimica Acta* 2009;405 (1-2): 66-70.
29. Bhatnagar M, Bapna A, Khare AK. Serum proteins. trace metals and phosphatases in psoriasis. *IJDVL* 1994;60:18-21.
30. Donadini A, Fiora C, Regazzini R, Perini D, Minoia C. Selenium plasma levels in psoriasis. *Clin Exper Dermatol* 1992;17 (3): 214-216.