Serum Zinc Levels in Cutaneous Disorders

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Abstract

Serum zinc levels were studied in 75 patients of different cutaneous disorders and 24 healthy controls. It was found to be significantly lower in acne vulgaris (71.5 ±21.5μgm/100ml), leprosy(85.9 ± 26.9μgm/100ml) and psoriasis (93.3 ± 25.9μgm/100ml) as compared to healthy controls (105.3 ± 30.1μgm/100ml). No significant correlation was found in other cutaneous disorders studied i.e. vitiligo and aphthous ulcers where serum zinc levels *were* found to be 97.3 ± 26.6 μgm/100ml and 105.2 ± 23.5 μgm/100ml respectively.

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Key Words : Acne vulgaris; Aphthous ulcers; Leprosy; Psoriasis; Vitiligo; Zinc

Introduction

Zinc is one of the important trace elements related to health and disease. It is present in all cells and is indispensable for the normal functions of cells, tissues and organs of the body [1]. It is an integral part of a number of metalloenzymes necessary for normal protein, carbohydrate, lipid and nucleic acid metabolism. Decreased serum zinc levels have been reported in number of cutaneous disorders by some investigators [2], while others have refuted these findings [3,4]. There are not many studies of serum zinc levels in cutaneous disorders, from India, which prompted us to carry this study.

Material and Methods

The study was carried out at the Dermatology Department of a large hospital from September 1993 to February 1995. The material for the study consisted of randomly selected 75 cases of different cutaneous disorders i.e. 15 each of psoriasis, acne vulgaris, leprosy, vitiligo and aphthous ulcers and 24 healthy controls. A detailed history was recorded in all cases. Each case and control underwent a thorough general, physical, systemic and dermatological examination and relevant laboratory investigations. For estimation of serum zinc levels, fasting venous blood samples were collected in the morning and serum separated frqm clotted blood. All precautions were taken to minimize the possibility of zinc contamination from external sources. Zinc concentration was carried out on Thermo Jarral Ash atomic absorption emission spectrophotometer. Mean of three readings was taken as concentration of zinc present in the serum. The results were compiled and data analysed.

Results

Out of 75 patients, 51 (68%) were males and 24 (32%) females. 12 (16%) were in second decade of life, 21 (28%) in third decade, 21(28%) in fourth decade, 11 (14.7%) in fifth decade and 10 (13.3%) above 50 years of age. 24 healthy controls belonged to same socio economic status and in whom cutaneous/systemic disease processes were carefully excluded clinically and by relevant laboratory investigations. Serum zinc levels in controls ranged from 58 to 147 μgm/100ml with a mean value of 105.3 μgm/100ml (± 30.1μgm/100ml).

Out of 15 cases of psoriasis, 11 were males and 4 females in the age group of 20 to 60 years. 3 patients had body surface area involvement of less than 10%, 4 had 11 to 20%, 5 had 21 to 30% and 3 had involvement of 31 to 40 %. Serum zinc levels in psoriatic patients ranged from 35 to 139 μgm/100ml (mean 93.3 ± 25.9 μgm/100ml) (Table 1) which was statistically significantly lower ($p < 0.05$) than that in controls (mean 105.3 ± 30.1 μgm/100ml). There was no correlation between age or extent of body surface area involvement and serum zinc levels (Table 2).

Table 1

Serum zinc levels in cutaneous disorders

Cutaneous disorder	No of cases	Serum zinc levels (μgm/100 ml) Minimum	Maximum	Mean with SD	'p' value
Controls	24	58	147	105.3 ± 30.1	—
Psoriasis	15	35	139	93.3 ± 25.9	< 0.05
Acne vulgaris	15	26	102	71.5 ± 21.5	< 0.001
Leprosy	15	58	168	86.9 ± 26.9	< 0.001
Vitiligo	15	37	143	91.3 ± 26.6	0.10
Aphthous ulcer	15	78	163	105.2 ± 23.5	—

Out of 15 cases of acne vulgaris 1 was of grade I, 9 of grade II, 4 of grade III and 1 of grade IV. Serum zinc levels in these patients ranged from 26 to 102 μgm/100ml (mean 71.5± 21.5 μgm/100ml). This was significantly lower than that in controls ($p < 0.001$). No correlation was noted between serum zinc levels and age of patients or *severity* of acne lesions (Table 3).

Of the leprosy cases, 14 were of borderline leprosy and 1 of lepromatous leprosy (LL). All these were fresh untreated cases and had no evidence of lepra reaction. The mean

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Table 2

Serum zinc levels in cases of psoriasis

Percentage of skin surface involved by psoriasis	No of cases	Mean serum zinc level (µgm/100 ml)
< 10	2	113
11-20	3	108
21-20	5	82
31-40	3	93
> 40	2	79

Table 3

Serum zinc levels in cases of a acne vulgaris

Grades of acne	No of cases	Mean serum zmc level (µgm/100 ml)
I	I	94
II	9	72
III	4	61
IV	1	86

serum zinc level was found in these cases to be 85.9 ± 26.9 µgm/100ml and ranged from 58 to 168 µgm/100ml. This was significantly lower as compared to controls ($p < 0.001$).

Among vitiligo cases, 4 were focal type, 8 segmental and 3 of generalised type. Serum zinc levels, in these cases, ranged from 37 to 143 µgm/100ml (mean 97.3 ± 26.6 µgm/100ml). It was lower than that in controls but was not statistically significant.

In aphthous ulcer cases serum zinc levels ranged from 78 to 163 µgm/100ml (mean 105.2 ± 23.5µgm/100ml) and showed no significant difference from controls (mean 105.3 ± 30.1 µgm/100ml).

Discussion

Zinc is categorised as trace element as it constitutes less than 0.005% of total body weight. Normal serum zinc level ranges from 70 to 180 µgm/100ml with the mean value of 120 ± 22 µgm/100ml. No statistically significant difference in the mean values of serum zinc levels was observed in relation to sex, age, race, food habits and diurnal variation. Zinc is an integral part of as many as 40 metalloenzymes [1]. It takes part in virtually all body functions from spermatogenesis to growth to abstract thought processes. Decreased serum zinc levels have been reported in systemic diseases like tuberculosis, alcoholism, cirrhosis, pernicious anaemia etc. [5].

Zinc deficiency characteristically causes the cutaneous disorder of acrodermatitis enteropathica manifesting as acral and periorificial skin eruptions, alopecia, diarrhoea and growth retardation [6]. Some zinc investigators have also reported low serum zinc levels in cutaneous disorders like acne vulgaris, psoriasis, lichen planus, leprosy, ichthyosis, urticaria, chronic venous leg ulcers etc., while others have not found the same [6]. Some authors have found abnormalities of serum zinc levels in cutaneous disorders like psoriasis and lichen planus.

In the present study, a significant reduction in serum zinc level was found in psoriasis patients as compared to healthy controls. This is in agreement with the findings of Greaves and Boyde [7] and Morgan et al [8], although other workers [9,10] found no such difference. McMillan and Row [11] reported decreasing levels of zinc in serum with increase in body surface area involvement. However, the same was not observed in the present study. Voorhees et al [12] found oral zinc therapy in psoriasis no better than placebo though it did increase zinc concentration in psoriatic scales, uninvolved skin and urine.

Serum zinc levels in acne patients were also found to be significantly decreased, in the present study. Several workers [13-15] have observed similar findings. The precise role of zinc in the development of acne is not known. Zinc and vitamin A are essential for normal epithelial development. A decreased serum zinc level could also lead to increased androgenic production, which influences the activity of sebaceous glands. Zinc administration possibly reduces the severity of acne by maintaining structural activity of the cells.

Low serum zinc levels in leprosy have been reported by several workers [16-18] which was also found in the present study. Some workers have reported gradual fall in serum zinc levels from Tuberculoid leprosy to LL pole [17-19]. This is probably due to consumption of body zinc by lepra bacilli. Zinc deficiency could be one of the many factors involved in non specific suppression of cell mediated immunity in lepromatous leprosy.

No significant alteration in serum zinc levels were found in cases of vitiligo and aphthous ulcers. This possibly supports the autoimmune theory of vitiligo. No significant change in serum zinc levels in aphthous ulcer also suggests that in acute infection of short duration serum concentration of zinc is not altered.

To conclude, serum zinc levels were found to be significantly lowered in patients of psoriasis, acne vulgaris and leprosy, as compared to healthy controls, in the present study. No significant difference was found in serum zinc levels in disorders of vitiligo and aphthous ulcers.

References

1. Halstead JA, Smith JC. Plasma zinc in health and disease. Lancet 1970;1:322-4.
2. Tasake M, Hanada K, Hashimoto I. Analysis of serum copper and zinc levels and copper/zinc ratio in skin diseases. J Der-

matol 1993;20(1):21-4.

3. Kreft B, Wohlrab J, Fischer M, Uhlig H, Skolziger R, Marsch WC. Analysis of serum zinc levels in patients with atopic dermatitis, psoriasis vulgaris and probands with healthy skin. Hautarzt 2000;51(21):931-4.
4. Ozturh G, Erbas D, Gelir E, Gulekon A, Imir T. Natural killer cells activity, serum immunoglobulins, complement protein and zinc level in patient with psoriasis vulgaris. Immunol Invest 2001;30(3):181-90.
5. Falchuk KH. Disturbance in Trace elements metabolism. In : Braunwald E, Eisselbacher KJ, Petersdorf RG, Wisson JD, Martin JB, Fauci AS, editors. Harrison's Principles of Internal Medicine. 1 1th ed. New York: McGraw Hills Book Co 1987;419-20.
6. Gawdirodger DJ, Seymour CA, Weismannk. Metabolic and Nutritional disorders In : Champion RH, Burton JL, Ebling FJG, editors. Textbook of Dermatology. 5th ed. Oxford:Blackwell Scientific Publication 1992;4:2372-7.
7. Greaves M, Boyde TR. Pattern of plasma zinc concentrations in patients with psoriasis other dermatoses and various leg ulceration. Lancet 1967;2: 1019-20.
8. Morgen MEI, Hughes MA, McMillan EM. Plasma zinc in psoriatic inpatients treated with local zinc application. Br J Derm 1980;102:579-83.
9. Hinks IJ, Youngs, Clayton B. Trace elements state in eczema and psoriasis. Clin Exp Derm 1987;12:93-7.
10. Molokhiam M, Portony B. Neutron activation analysis of trace elements in skin. Br J Derm 1970;83:376-8 1.
11. McMillan EM, Rowe D. Plasma zinc in psoriasis in relation to surface area involvement. Br J Derm 1983;100;1301-5.
12. Voorhees JJ, Chakraborty SG, Fernando BML. *Zinc* therapy and distribution in psoriasis. Arch Der 1969;100:669-73.
13. Michanson G, Vahquist A, Julilin L. Serum zinc and retinal binding protein in acne. Br J Derm 1977;96:283-6.
14. Ghorpade A, Reddy BSN, Rizvisna. Plasma zinc levels and the effect of oral zinc in acne vulgaris. Indian J Dermatol Venerol Leprol 1982;48:129-37.
15. Madadi AJ, Sethi NC, Bhandari *S. Zinc,* copper, magnesium, proteins and superoxide dismutase in acne. Indian J Dermatol Venereol Leprol 1993;59:53-6.
16. Shankar A, Gupta SB, Sharma JN. A study of serum and skin zinc in leprosy. Indian J Dermatol 1976;42:259-60.
17. Mathur NK, Sharma M, Mangal HN. Serum zinc levels in subtypes of leprosy. Indian J Lep 1984;62:327-30.
18. Saxena N, Sharma RP, Singh VS. Study of serum zinc levels in leprosy. Int J Lep 1988;60:556-61.
19. George J, Bhatia VN, Balakrishanan S, Ramu G. Serum zinc/copper ratio in subtypes of leprosy and effect of oral zinc therapy on reactional states. Int J Lepr Other Myco Dis 1991;59(1):20-4.