

Research

## Zinc Levels in Patients with Acne Vulgaris

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**Key Words:** acne treatment, inflammatory acne, serum zinc level, zinc deficiency

### Abstract

**Objectives:** Zinc is a trace element required for the growing and developing organism and is found in quite high levels in the epidermis of the skin. Zinc deficiency is one of the most common mineral deficiencies encountered in our country where 70-80% of the daily calorie requirement is obtained from grains and grain products.

The aim of our study was to determine the effect of zinc deficiency on the development of acne in students who were unable to follow an adequate and stable diet at the university through measuring the serum zinc levels in students presenting with a complaint of acne.

**Methods:** The study included 47 patients with acne vulgaris and 40 healthy control subjects. The zinc levels were measured in the serum obtained from the acne patients and control subjects.

**Results:** The acne patients had low zinc levels at a rate of 54.1% while only four cases (10.0%) in the control group had low zinc levels. When serum zinc levels of the acne patients and the control group were compared, the zinc level was statistically significantly lower in the acne group. Correlation studies showed no relation between the zinc level and the degree of acne or disease duration.

**Conclusion:** We believe that determining serum zinc levels in acne patients is necessary and an easy method, and that prescribing zinc supplement treatments for patients with low serum zinc levels may help increasing the success rate of acne treatment.

### Introduction

Zinc is a trace element found in the structure of many metalloenzymes that play a role in important functions such as protein synthesis, DNA and RNA replication and cell division. Zinc is therefore required for growth and development [1]. It plays a role in delayed type hypersensitivity reactions, regulation of inflammation, normal keratinogenesis, cell membrane stabilization and many enzymatic reactions. Zinc is also a structural component of many hormones

such as growth hormone, insulin, sex hormones and thymulin and influences the activity of these hormones [2, 3].

Meat and fish products are the best sources of nutrition for zinc content and bioavailability. The zinc in food of animal origin is absorbed better than zinc in food of grain origin [4]. The phytates present in grains bind zinc and decrease its absorption. Zinc deficiency is a common mineral deficiency in our country where 70-80% of the daily calorie requirement is derived from grains and grain products [3].

Zinc deficiency can be due to genetic or acquired causes. Genetic zinc deficiency leads to “acrodermatitis enteropathica”, characterized by red, patchy and scaly dermatitis involving the face, periorificial and anogenital regions, papulopustular, psoriasiform or vesiculobullous eruptions of the acral regions, and alopecia. Acquired zinc deficiency can be associated with alcoholism, chronic diseases, malabsorption due to jejunoileal bypass and consumption of food with a high phytate content such as some high-fiber vegetable and grains [5].

The acne-like papulopustular lesions in zinc deficiency and their rapid improvement with zinc supplementation have led some investigators to assess the relationship between serum zinc levels and acne. These studies are few in number but have shown that patients with acne have low serum zinc levels although these levels do not correlate with the severity of disease [6]. Some authors have therefore combined zinc to inflammatory acne treatment, and it is still used with varying rates of success [7, 8, 9].

The aim of the study was to determine the serum zinc levels in university students with acne.

**Materials and Methods**

A total of 47 patients presenting to our outpatient department with acne vulgaris and 40 volunteers with no acne or abnormal dermatological or systemic findings were included the study. The acne and control groups were matched for mean age and gender. None of the women in patient and control groups was using oral contraceptives, and none was pregnant. The age, gender and disease duration were noted for patients with acne and acne grading was assessed ac-

ording to the International Consensus Conference on Acne Classification system [10] with the following categories: *mild*; few to several comedones, papules, and pustules, no nodules, *moderate*; several comedones, papules, pustules, few to several nodules, and *severe*; numerous comedones, papules, and pustules, many nodules. The face, chest, neck, and back of all acne patients were examined at a close distance under bright lighting. After grading, fasting venous blood samples were obtained from a forearm vein with needle technique for zinc. Serum zinc levels were determined by colorimetric test using a Cobas-Mira (Wartenberg, Germany) autoanalyzer with Randox kits. The normal value of zinc in adults was accepted as 46-150 mg/dl. The zinc levels of acne and control groups were compared statistically with the “Student t test” and p<0.05 was accepted as significant.

**Results**

The patient group with acne consisted of 31 females (66.0%) and 16 males (34.0%) with ages between 16 and 25 (mean 20.36) and a disease duration of one months to 10 years (mean 46.6 months). The control group consisted of 20 females (50.0%) and 20 males (50.0%) with ages between 17 and 25 (mean 21.13).

The severity of acne was mild in 12 patients (25.5%) and moderate in 35 (74.5%). The zinc level was low in 54.1% of acne patients while only four control group subjects (10.0%) had zinc levels lower than normal. Statistical comparison of acne and control groups revealed that patients with acne had significantly lower serum zinc levels (p<0.05) There was no significant difference between the serum zinc levels of two groups, according to sex, acne grade and disease duration (Table 1).

**Table 1.** Descriptive Characteristics of the Study Groups

		Acne Group (n=47)	Control Group (n=40)
<b>Age (Years)</b>	Mean (SD)	20.36 (1.98)	21.13 (2.13)
	Range	16 - 25	17 - 25
<b>Gender</b>	Female	66.0 % (31)	50.0 % (20)
	Male	34.0 % (16)	50.0 % (20)
<b>Acne grade</b>	Mild	25.5 % (12)	
	Moderate	74.5 % (35)	
<b>Acne duration (Months)</b>	Mean (SD)	46.62 (33.18)	
	Range	1 - 120	

## Discussion

Zinc is a trace element that is necessary for epithelial differentiation and normal pubertal growth. It exists in high amounts within the skin and especially the epidermis [5]. Its importance for human metabolism has been noted by the dramatic improvement of acrodermatitis enteropathica following zinc supplementation. A case of acrodermatitis enteropathica was reported, where severe acne also completely resolved with zinc treatment [9].

There are few studies regarding the relationship between zinc deficiency and acne. *Michaelson* et al. studied zinc levels in the serum, epidermis and dermis of 73 patients with inflammatory acne, aged 15-28, with an acne degree of 3-4 and disease duration of 1-10 years. The dermal and epidermal zinc levels of male patients were significantly lower than the control group, while the serum zinc levels were similar. There was also no association between the serum levels and epidermal and dermal zinc levels [8]. *Amer* et al. have compared the serum zinc levels in 50 patients with acne vulgaris (31 males, 19 females) and 38 control subjects (20 males, 18 females) and found statistically significantly lower zinc levels in grade III and IV acne patients compared to the control group. The zinc levels of grade I and II female acne patients were also lower than control females and the levels in the affected males were lower than the control males [11]. The present study involved acne patients who had inflammatory mild and moderate acne. Supporting the previous studies, our study revealed statistically significantly lower serum zinc levels in patients with acne, as compared with the control group. We believe that the zinc deficiency among the university students participating in this study may be related to inadequate and unbalanced nutrition. Since patients with severe acne is not included in the study, the power of our results to document the relationship between the serum zinc levels and the severity of acne is limited.

The zinc deficiency in acne patients has been associated with nutritional deficiency, dieting patients, decreased absorption, and increased excretion with sweat or feces. The inflammatory reaction in acne patients is another factor decreasing serum zinc levels

[9]. However, how zinc deficiency in the epidermis causes acne or its importance in the course of inflammatory acne is not known. The probable association between zinc and acne may be due to the anti-inflammatory action of zinc together with its effects on androgen metabolism and vitamin A metabolism [12].

The effect of zinc on inflammatory cells and especially on granulocytes is the most important mechanism relevant to acne [7]. Zinc plays a regulatory role in the control of bactericidal activity and phagocytosis, stabilizes macromolecules and lysosomes, increases the speed of neutrophil chemotaxis and complement activation and has an anti-inflammatory effect [12, 13]. Studies with laboratory animals have shown that zinc inhibits histamine secretion from mast cells and prevents inflammatory phenomena [14].

Another mechanism binding zinc deficiency and acne development involves the "retinol binding protein" (RBP). RBP enables the transport of vitamin A to the tissues and its serum level reflects the levels of vitamin A in target organs. Zinc is essential for RBP synthesis and secretion in the liver [15]. Zinc is thought to influence vitamin A transport and utilization directly or indirectly through some enzymes and prevent keratinization and follicular obstruction [16]. *Michaelson* et al. have found significantly lower RBP levels in patients with severe acne, in their study of 173 acne patients (97 males, 76 females) aged 15 or over [9].

Damage to the zinc-dependent enzyme systems in androgen synthesis is thought to be another mechanism explaining zinc deficiency and development of acne vulgaris. It has been shown that testosterone converts mostly into DHT with the reductase enzyme and that zinc inhibits the reductase enzyme [17].

Zinc tablets are used with various success rates in the treatment of patients with inflammatory acne [7, 11, 12]. Reports recommend 400-600 mg zinc sulphate/citrate effervescent tablets or the zinc sulphate tablet form for acne treatment [18]. Topical formulations have also been developed and their efficacy was evaluated in patients with acne [19, 20].

There are only a few studies on the serum levels of zinc in acne patients. We found significantly lower levels of serum zinc in patients with acne, compared to control group. The zinc deficiency in these patients may be due to inadequate nutritional intake and may be one of the mechanisms that trigger acne. We believe that serum zinc levels should be determined in patients with acne and that zinc supplementation in patients with low serum zinc levels will increase the success rate of treatment.

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