

Serum zinc level in vitiligo

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Introduction

Vitiligo, a chronic autoimmune skin disorder characterized by loss of melanocytes resulting in depigmentation of skin, mucosa and hair [1,2], poses a significant challenge in the field of dermatology and immunology. The etiology of vitiligo remains complex and multifactorial, involving genetic, immunological, and environmental factors [4,5,6]. While numerous studies have explored the various facets of this enigmatic condition, the exact mechanisms triggering vitiligo's onset and progression remain elusive. One emerging area of interest in the study of vitiligo is the role of trace elements, such as zinc, in the pathogenesis and management of the disease.

Zinc, an essential trace element, plays a pivotal role in various physiological processes, including cell proliferation, immune function, and wound healing. It is an essential cofactor for numerous enzymes involved in DNA repair, antioxidation, and the regulation of inflammatory responses. Given its involvement in critical cellular processes, zinc has been the subject of research in various dermatological conditions, including vitiligo. [10,11,12,13,14,15,21]

The rationale behind investigating serum zinc levels in vitiligo patients stems from the potential interplay between zinc deficiency, the immunological imbalances and oxidative stress observed in these individuals. Zinc deficiency has been associated with compromised immune function, which may contribute to the autoimmune aspects of vitiligo. Furthermore, zinc plays a vital role in melanocyte function and melanin production, raising the question of whether zinc status may influence the depigmentation seen in vitiligo.

Materials and Methods

In this observational comparative study, 100 patients with vitiligo who presented to our dermatology OPD were selected for the study. The control group included 100 age and sex-matched healthy volunteers. The study protocol was approved by our medical ethical committee. Informed consent was obtained from all participants. Factors that might influence serum zinc levels like recent zinc therapy, patients with cirrhosis, malignancies, renal failure, diarrhea, acute infections, alcohol users, under any treatment with zinc in the 1 month prior to diagnosis, malabsorption disorders, physical disability, any neurological disorder, or other physical diseases, which might cause psychological distress. Women-receiving contraceptive pills, and pregnant women were excluded from the study.

The diagnosis of vitiligo was based upon the clinical presence of depigmented patches of the skin and examination with a Wood's lamp. Vitiligo was divided into three subtypes: generalized vitiligo (widespread lesions with almost symmetrical distribution), focal vitiligo (one or few lesions at a single site), and segmental vitiligo. Serum zinc levels were measured in these groups and in controls.

Statistical tests such as student's t-tests or Mann-Whitney U-tests were done to compare serum zinc levels between the vitiligo group, the control group and among different vitiligo groups. $P < 0.05$ was considered statistically significant. The results were expressed as means \pm standard deviations.

Results

Of 100 vitiligo patients, 40 were male and 60 were female. Generalized, focal, segmental and mucosal vitiligo were seen in 70, 18, 1 and 11 of the patients, respectively. Moreover, 30% of the patients had a family history of generalized vitiligo.

The mean serum zinc levels were 82.1 ± 15.12 and 92.7 ± 14.5 mcg/dl in the vitiligo, and the control groups, respectively as shown in table 1. Paired t-test results showed that there is a significant difference between the zinc serum level in patients with vitiligo compared with healthy subjects ($p < 0.05$). Patients with focal vitiligo were similar to the control group in terms of serum zinc level, individuals with generalized vitiligo had significantly lower zinc level in comparison with the control group ($P < 0.05$) as shown in table 2.

Table 1

Study group	Serum zn level (mcg/dl)		P value
	Range.	Mean SD	
Vitiligo group	38.6-120.	82.1 ± 15.12	< 0.05

Control group	60.6-120.	92.7+14.5	
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Table 2 Serum zinc levels in patients with different types of vitiligo

	n	Mean Serum zn level (mcg/dl) with SD	P value
Focal vitiligo	18	90.8+16.1	<0.05
Generalisend vitiligo	70	78.4+14.8	

Significantly lower zinc level in patients with generalized vitiligo were observed than in focal vitiligo (P =0.05).

There was a negative correlation between serum zinc level and age in patients with vitiligo or family history of vitiligo. A positive correlation was observed between serum zinc levels and disease duration in both generalized and focal vitiligo i.e patients with longer duration of the disease had lower zinc level.

Discussion

Vitiligo is an acquired, idiopathic disorder characterized by circumscribed depigmented macules and patches [1,2]. The cosmetic impact of this disease is tremendous and its psychological impact is devastating, particularly in colored races [1]. The etiology of vitiligo remains complex and multifactorial, involving genetic, immunological, and environmental factors intrinsic melanocyte defects, oxidant-antioxidant stress, and neural mechanisms [17,19].

The lower serum zinc levels in vitiligo patients may contribute to immunological imbalances, potentially leading to the autoimmune response seen in the disease. This observation underscores the complex interplay between the immune system and melanocyte destruction in vitiligo. [17]

Apoptosis of melanocytes may be involved in the pathogenesis of vitiligo. Zinc being an anti apoptosis may be a promising agent in the treatment of vitiligo.[3] Zinc and other micronutrients have a key role in the process of melanogenesis. They enhance the formation of eumelanin polymer from monomers. This process is the final stage of eumelanin formation in melanogenesis, so zinc may have an important effect on vitiligo.[13,24]

A number of studies have revealed the effect of zinc on vitiligo. The present study showed significantly lower levels of zinc in serum of patients with vitiligo compared to the control group (p<0.05). Molokhia et al [22] Rostami et al [23] conducted a study to estimate copper and zinc levels in serum and skin of vitiligo patients; they found a significant reduction in serum zinc, while the results of copper analysis in vitiligo neither support a deficiency nor role for copper justify its use in the treatment of that disease.

Majid et al (26) observed in their comparative study of 100 vitiligo patients vs 100 normal healthy persons that serum zn levels significantly lower in vitiligo patients. Similar findings were observed in mina et al (20) who found significantly lower serum zinc level in vitiligo patients with generalised and long standing disease.

Tasaki et al. [25] conducted a study to estimate serum copper (Cu) and zinc (Zn) levels and copper/zinc ratios in 151 cases of various skin diseases. The serum level of Zn was significantly decreased in cases of bullous pemphigoid, decubitus ulcer, and alopecia areata.

In 2014, Zeng et al. [14] conducted a meta-analysis to compare the serum levels of Cu and Zn between vitiligo patients and healthy controls and found significantly lower levels in vitiligo patients.

Zinc- α 2-glycoprotein (ZAG) is a recently identified adipokine, assigned to chromosome 7q22.1. The ZAG plays a role in lipolysis, regulation of metabolism, cell proliferation and differentiation, regulation of melanin synthesis, cell adhesion, immunoregulation, and so forth [25]. Zinc via precipitating the ZAG in site of vitiligo patches may be effective in the treatment of vitiligo [27, 28]. Some studies showed a significant increase in the percentage of apoptosis in peripheral blood mononuclear cells in vitiligo. On the other hand, the accumulation of toxic compounds, altered cellular environment and infection can all contribute to vitiligo. Zinc may have an effect on preventing vitiligo via destructing these probable environmental factors through prevention of these immunity-related cells [3].

Family history of vitiligo was positive in 30% of our patients. Likewise, Shameer et al. reported a positive family history in 33% of patients with vitiligo.[13] Patients with focal and mucosal vitiligo comprised 38% and 2% of the cases, respectively. Similar to Shameer et al.,[13] we found generalized vitiligo to be the most frequent type of vitiligo.

The mean of serum zinc levels were 90.8+16.1, 78.4+14.8 and 92.7+14.5 mcg/dl in focal vitiligo, generalized vitiligo, and the control groups, respectively. Patients with focal vitiligo and the control group had no significant difference in serum zinc levels, but patients with generalized vitiligo had significantly lower zinc levels compared to the control group. These findings are in agreement with those previously reported by Shameer et al.[13] and mina et al (20)

Arora et al. failed to detect any significant difference between serum zinc levels in the case and the control groups [21] while Helmy et al. found higher serum zinc levels in the case group [19]. Yaghoobi et al. reported serum zinc levels to be normal, in most of their vitiligo patients [2]. However, due to the absence of a control group in this study, their

findings are not comparable to ours. Shameer et al. found that low zinc levels were more frequent in patients with disease duration of 2-5 years [13]. In this study, duration of the disease had a strong positive linear relationship with serum zinc levels. In fact, longer durations of the disease were associated with lower zinc levels, a finding consistent with our study.

The limitation of our study was small number of segmental and mucosal vitiligo that disabled us to compare this group with others. Further we did not treat these vitiligo patients with zinc supplement to collaborate our findings.

Conclusion: Serum zinc levels in vitiligo patients represent an intriguing area of research. The consistent observation of lower zinc levels in vitiligo patients, along with their association with clinical parameters, suggests that zinc may contribute to the pathogenesis and clinical course of the disease. While there is promise in exploring zinc as a potential adjunctive therapy, it is important to consider zinc within the broader context of vitiligo's complex etiology and to conduct further research to better understand its role and therapeutic potential. Large-scale studies need to be conducted to confirm these findings and assess the effect of oral zinc supplements in patients with low zinc levels.

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