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Research Article

Serum Zinc, Selenium and Vitamin D Levels in Seborrheic Dermatitis: A Case-Control Study

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Abstract

Aim: Chronic inflammation of the skin is a hallmark of seborrheic dermatitis (SD) with relapsing episodes and unknown etiology, which affects the patients' quality of life. Studies suggest that a lack of vitamins and minerals could influence the course of the disease. In this case-control study, serum vitamin D, selenium, and zinc levels of patients with SD were compared with those of a healthy control group.

Material and Methods: The study included 152 patients with SD and 129 healthy controls, from whom demographic data and blood samples were collected. Disease severity was assessed using the SEDASI scoring system. Serum vitamin D and zinc levels were measured using ELISA and photometric methods, while selenium levels were also determined. Statistical analyses were performed using SPSS version 27 and JAMOVİ software, and chi-square tests were also conducted. Statistical significance was defined as $p < 0.05$ for all tests.

Results: No significant difference in zinc levels was observed between the groups (p=0.750). However, selenium (p<0.001) and The patient group exhibited statistically significantly lower vitamin D levels (p=0.036) than the control group. Furthermore, A statistically significant negative correlation was observed between selenium levels and disease severity

Conclusion: In the study, The patient and control groups showed significant differences regarding selenium and vitamin D levels. Additionally, Disease severity and selenium levels were negatively correlated. These findings highlight the need for further research regarding the potential therapeutic role of nutritional supplementation in the management of SD.

Keywords: Seborrheic dermatitis, selenium, vitamin D, zinc

INTRODUCTION

Seborrheic Dermatitis (SD), also known as cradle cap in infants, Characterized by lesions that predominantly appear on the scalp, face, and chest, this skin disease is common, chronic, inflammatory, and tends to relapse. It manifests with symptoms such as redness, scaling, and itching, significantly impacting individuals' quality of life and their mental well-being.Although its exact cause remains unclear, evidence suggests the involvement of genetic, environmental, and immunological factors in its development. Despite its ability to occur across the lifespan, Infants and young adults are the most common age groups affected by this condition.Hormonal fluctuations, neurological conditions, environmental factors, and the yeast species Malassezia is believed to have a part in how it develops and the resulting inflammation (1, 2).

Ongoing studies have focused on the potential role of vitamin D and various other trace elements, including zinc, iron, copper, iodine, fluorine, chromium, selenium, manganese, and molybdenum, as essential micronutrients in SD. It is suggested that deficiencies or imbalances in these nutrients might influence the onset or severity of dermatological and immunological disorders. Vitamin D, for instance, is a vital immunomodulatory and anti-inflammatory molecule crucial for skin health and immune function. Similarly, zinc is involved in numerous biological processes essential for skin integrity and immune responses. Furthermore, selenium is necessary for proper thyroid function and antioxidant defense. Therefore, deficiencies in these nutrients might compromise local skin immunity and systemic immunological responses. The

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link between nutritional deficiencies and seborrheic dermatitis (SD) has been examined in numerous studies, yielding inconsistent findings. While some studies propose a potential association between certain nutrient deficiencies and SD, others have shown no significant differences in serum levels of vitamin D, zinc, selenium, and other nutrients between individuals with and without SD. These conflicting results underscore the complex interplay between nutrition and the immune system in SD and emphasize the need for further research (3-14). Consequently, the diverse etiological factors and individual health conditions in SD necessitate a comprehensive approach that considers various factors. Ultimately, a better understanding of these underlying mechanisms is crucial for developing more effective treatment and management methods focused on improving how patients fare and their overall well-being (15, 16). In this study, serum vitamin D, zinc, and selenium levels in individuals with SD were compared with a healthy control group to investigate if a lack of these nutrients plays a role in he pathogenesis or severity of SD.

MATERIAL AND METHODS

This study was conducted between 2022 and 2024 at the ŞBÜ Gazi Yaşargil Training and Research Hospital outpatient clinic and included 152 patients with SD and 129 healthy controls. Local ethics committee approval was obtained (protocol number: 170/2024). All participants provided written informed consent before taking part. The study followed the ethical guidelines of the Declaration of Helsinki.

Inclusion and Exclusion Criteria

Participants diagnosed with SD by a physician, who provided consent, were able to could communicate well and did not have any psychiatric disorders were included.

The patient and control groups were excluded if they had malabsorption, chronic bone disease, autoimmune disease, kidney disease (KBY), chronic liver disease (KC), a history of cancer and/or chemotherapy, pregnancy, anticonvulsant drug use, phototherapy history, immunosuppressant use, oral contraceptive use, or calcium, zinc, or multivitamin usage within the past 3 months, or if they had any other surgical conditions.

Biochemical Analysis

For serum vitamin D, zinc, and selenium levels, 5 ml of blood samples were taken from all participants in the case and control groups under aseptic conditions. Following centrifugation, These samples were kept at -80°C until they were analyzed. Using an ELISA kit, serum vitamin D levels were classified as deficient (< 20 ng/dL), insufficient (21-29 ng/dL), or sufficient (≥ 30 ng/dL). Zinc and selenium levels were measured with a photometric kit and an autoanalyzer, with zinc levels below 70 µg/dL considered deficient.Selenium reference values were determined as 46-143 µg/L.

Statistical Analysis

SPSS version 27 and JAMOVİ software were used for statistical analyses. Categorical variables were described using numbers and percentages, with continuous variables shown as mean ± standard deviation, minimum, maximum, and median values. Group comparisons were also made. For categorical variables (such as gender and disease severity), the Chi-square test was used. The Shapiro-Wilk test was employed to assess whether the continuous variables (age, height, weight, zinc, selenium, vitamin D levels) were normally distributed within the groups. Continuous variables that did not exhibit a normal distribution were analyzed using the Mann-Whitney U test,while Student's t-test was used for those that were normally distributed. The Kruskal-Wallis test was used to analyze whether vitamin and mineral levels differed between groups when disease severity was classified categorically. The relationship between continuous variables was evaluated using Spearman Correlation Analysis was conducted. For all statistical tests, the significance level was set at $p < 0.05$.

RESULTS

A total of 281 individuals participated in the study, including 152 patients and 129 controls. In the patient group, 57% were male (n=86), compared to 55% (n=71) in the control group. Women constituted 43% (n=66) of the patient group and 45% (n=58) of the control group. No statistically significant difference in gender was found between the two groups (p=0.796). The mean age of the patient group was 27.3±8.41 years, and the control group's mean age was 27.4±8.56 years, indicating similar average ages (p=0.936). The patient group had a mean height of 171±8.59 cm, while the control group's average height was 170±9.4 cm. The mean heights of both groups were similar (p=0.802). The mean weight of the patient group was 70.6±15.0 kg, and the control group's mean weight was 70.0±14.9 kg.Both groups had similar mean weights (p=0.701) (Table 1). According to the SEDASI disease severity scale, patients were categorized into four groups: mild, moderate, severe, and very severe. In the patient group, 50% (n=79) had moderate, 32% (n=50) had severe, 10% (n=15) had mild, and 8% (n=13) had very severe disease (Table 2).

The patient group's mean zinc level was 117±38.2 µg/dL, compared to 112±26.7 µg/dL in the control group, a difference that was not statistically significant (p=0.750). The mean selenium level was 85.6±17 µg/L in the patient group and 94.6±19.4 µg/L in the control group, and this difference was statistically significant (p<0.001). The patient group's mean vitamin D level was 15.6±7.73 ng/dL, while the control group's was 17.3±7.55 ng/dL, a statistically significant difference (p=0.036). Additionally, the mean Both groups had vitamin D levels below the normal range (Table 1).

A statistically significant relationship was found between patients' selenium levels and the severity of their disease (p=0.013). Specifically, lower selenium levels correlated with greater disease severity. On the other hand, no significant relationships were observed between disease severity and zinc levels (p=0.239) or vitamin D levels (p=0.823). (Table 3).

Table 1. Demographic and Biochemical Data of Case and Control Groups

Variable / Measurement	Case Group	Control Group	p Value
Gender (Male)	%57 (n=86)	%55 (n=71)	0.796
Gender (Female)	%43 (n=66)	%45 (n=58)	0.796
Age (years)	27.3 ± 8.41	27.4 ± 8.56	0.936
Height (cm)	171 ± 8.59	170 ± 9.4	0.802
Weight (kg)	70.6 ± 15.0	70.0 ± 14.9	0.701
Zinc (µg/dL)	117 ± 38.2	112 ± 36.7	0.750
Selenium (µg/L)	85.5 ± 17.1	94.6 ± 19.4	<0.001
Vitamin D (ng/mL)	15.6 ± 7.73	17.3 ± 7.55	0.036

Table 2. Distribution of Patients in the Case Group According to Disease Severity

Disease Severity Group	Number of Patients (n)	Percentage (%)
Mild (0.0–0.4)	15	%10
Moderate (0.5–1.0)	79	%50
Severe (1.1–1.5)	50	%23
Very Severe (1.6–2.0)	13	%8

Table 3. Correlation Analysis Between Disease Severity and Biochemical Parameters

Variable	Spearman Correlation (ρ)	p Value
Disease Severity & Zinc	-0.094	0.239
Disease Severity & Selenium	-0.198	0.013
Disease Severity & Vitamin D	0.018	0.823

DISCUSSION

By comparing serum vitamin D, zinc, and selenium levels in individuals with seborrheic dermatitis (SD) to those in a healthy control group, our study aimed to explore their potential roles in the development of SD. The results showed significantly lower selenium and vitamin D levels in the patient group. Furthermore, we found a significant negative correlation between disease severity and selenium levels. However, zinc levels did not differ significantly between the groups.

Seborrheic dermatitis is a chronic, recurring inflammatory skin condition that typically affects areas with a high density of sebaceous glands (17). While its exact cause is still unknown, factors such as Malassezia yeasts, sex hormones, sebum levels on the skin surface, immune response, neurological conditions like Parkinson's disease, seasonal changes (worsening in winter), and Psychological stress might be a major factor in how it develops (18). Trace elements like zinc and selenium are used in various skincare products and for therapeutic purposes in dermatology, playing a role in widespread physiological processes. Vitamin D plays a role in many chemical events, affecting keratinocyte function, immune response, and is an important vitamin (7, 20).

In line with existing literature, our study found that In the case group, 57% of the patients were male, and their mean age was 28.14 years. Consistent with our findings, previous studies have also indicated the highest prevalence of the disease in the third and fourth decades of life (12, 18, 20).

Selenium, being a naturally occurring trace element, is a vital nutrient with significant biological effects. The selenium-containing protein selenoprotein P (SELENOP), synthesized in the liver, is the primary form of selenium in circulation and delivers selenium to peripheral tissues (e.g., endocrine glands and immune receptor-expressing cells). Adequate selenium supply is crucial for the synthesis of selenocysteine, selenomethionine, selenoprotein P, and other selenium-containing proteins and enzymes. Selenium exhibits a wide range of pleiotropic effects, including antioxidant and anti-inflammatory actions, suggesting that selenium deficiency might be a major factor in how various skin diseases develop (21-26).

Akinboro et al., in their study on the effect of selenium on dermatological diseases, reported significantly lower serum selenium levels in patients with dermatological problems compared to healthy individuals (19). Another case-control study by Javanbakht et al. evaluated serum selenium, zinc, and copper levels in patients with early-stage Pemphigus Vulgaris and Pemphigus Foliaceus and The patient group showed significantly lower serum selenium levels than the healthy control group (27). Koohkan et al., in their case-control study, investigated serum and hair selenium levels in children with atopic dermatitis. They compared 46 pediatric patients with atopic dermatitis to 46 healthy children and the patient group had significantly lower serum selenium levels than the control group (28). Contrary to these findings, Hajheydari et al.'s study on SD patients reported higher selenium levels in the patient group (12). In our study, we found significantly lower selenium levels in the patient group. Furthermore, a significant negative correlation was observed between disease severity and selenium levels. As disease severity increased, selenium levels tended to decrease.

Zinc, an essential element, plays a vital role in protein synthesis, gene expression, and transcription. It is also a trace element component in over 250 metalloenzymes. Zinc deficiency leads to growth retardation, immune deficiency, anorexia, dermatitis, diarrhea, and allergic dermatitis. Studies have reported that patients with acrodermatitis enteropathica and acrodermatitis-like conditions, zinc deficiency can cause seborrheic dermatitis-like eruptions. Furthermore, Zinc is important for the normal function of both skin and hair and there is a connection between serum zinc levels and the presence of diseases such as acne vulgaris, wound healing, and pustular psoriasis (29-33).

Several studies on patients with SD have reported significantly lower serum zinc levels in the patient group (34-37). Similarly, a study in our country also found significantly lower zinc levels in the patient group (11). However, studies in Germany by Kreft et al. (38) and in Iran by Hajheydari (12) and colleagues did not find a significant difference in zinc levels between the groups. In our study, we also did not observe a significant difference in zinc levels between the two groups. The mean zinc levels in both groups were within the normal range, which may be related to the region's nutritional habits

As a secosteroid with diverse biological activities, vitamin D is crucial in regulating keratinocyte function and immune responses in inflammatory skin diseases. The two main forms of vitamin D, D2 and D3, are obtained through diet or produced by the body when exposed to sunlight, and they mediate many biological activities (39). The vitamin D receptor (VDR) is present in keratinocytes, and 1,25-dihydroxycholecalciferol acts via VDR to control cell proliferation in the basal layer of the epidermis and then induce the differentiation of keratinocytes that make up the upper layers of the epidermis (40, 41).

According to Sobhan et al. (42) and Dimitrova et al. (43), the link between vitamin D and SD may be influenced by factors like polymorphisms in genes related to vitamin D and receptor density. Dimitrova et al. (43) specifically noted low vitamin D levels in individuals with SD. Rahimi et al.'s study also found significantly lower vitamin D levels in the patient group (44). However, Kashiri et al.'s study reported normal serum vitamin D levels in both groups (37). Our study aligns with the findings of lower vitamin D in SD patients, showing significantly lower levels in our patient group compared to the control group. Moreover, the average vitamin D levels in both groups were below the normal range. These differing results underscore the inconsistencies in findings about vitamin D and SD across various populations, suggesting a need for further investigation to understand its role in SD (45, 46).

The inconsistent findings across studies emphasize the complex interplay between nutrients and seborrheic dermatitis (SD). This suggests a need for more in-depth research to better understand these relationships. Factors such as genetic variations, vitamin and mineral metabolism, and enzyme polymorphisms, observed both in our study and in the serum levels reported in the literature and their effect on the disease, are variable. Investigating these genetic factors could lead to more personalized treatment strategies for SD, where nutritional supplementation is tailored to individual genetic profiles (47, 48).

The results of our study bring up questions regarding the possible interaction of zinc, selenium, and vitamin D in the development of SD. The combined effects of these nutrients on immune function and skin health, along with their individual links to SD, might lead to new treatment approaches. Considering these findings, a comprehensive approach that includes not only topical and drug treatments but also nutritional interventions could be beneficial in managing SD. However, we believe that any such intervention should be approached with caution, taking into account optimal dosages and potential side effects, and that further research is necessary to establish evidence-based guidelines.

Limitations and Future Directions

There are several limitations to our study. For example, although we had an adequate number of participants, it may not have been enough to fully understand how SD varies in different populations. Furthermore, we could not investigate the genetic factors that might affect how vitamin D is processed or the specific roles of zinc and selenium in the development of SD. Future research should try to fill these gaps by examining the genetic basis of vitamin D, zinc, and selenium metabolism and their interactions in relation to SD. Our findings highlight important questions about the interplay between zinc, selenium, and vitamin D in influencing SD. A better understanding of these interactions could lead to new ways to treat SD

CONCLUSION

The current study has revealed several findings regarding the association between SD and serum vitamin D, zinc, and selenium levels in patients and healthy controls. While zinc levels were not significantly different between the groups, we observed significantly lower vitamin D and selenium levels in the patient group. This finding underscores the importance for clinicians to consider vitamin D and selenium levels during the evaluation and management of patients with SD. We propose that future, more extensive studies are needed to examine the relationship between nutritional balance and SD

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Conflict of Interest Statement

The authors declare that there is no conflict of interest related to the publication of this article.

Author Contibutions

All authors contributed to the study. HA,MSC,YY and SÖ collected the data and performed the analysis. HA wrote the manuscript, and the authors reviewed and approved the final version of the paper.

Ethical Approval

This study was approved by the Ethics Committee of Gazi Yaşargil Education and Research Hospital, University of Health Sciences (protocol number: 170/2024).). The study was conducted in accordance with the Helsinki Principles. Informed oral and written consent was obtained from the participants.

Data Availability

All data supporting the findings of this study are included in the article. For further questions, please contact the corresponding author.

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