

**ORIGINAL ARTICLE****The Impact of Vitamin D Levels on Acne Vulgaris: A Prospective Study**

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**ABSTRACT:**

**Aim:** This study aimed to evaluate the relationship between serum Vitamin D levels and the severity of acne vulgaris to explore the potential role of Vitamin D in acne pathogenesis. **Material and Methods:** This prospective study included 100 patients aged 15–40 years with clinically diagnosed acne vulgaris. Serum 25-hydroxyvitamin D [25(OH)D] levels were measured using enzyme-linked immunosorbent assay (ELISA), and acne severity was graded using the Global Acne Grading System (GAGS). Participants were categorized into Vitamin D deficient (<20 ng/mL), insufficient (20–30 ng/mL), or sufficient (>30 ng/mL) groups. The correlation between Vitamin D levels and acne severity was analyzed using Pearson's correlation coefficient and chi-square tests, with  $p < 0.05$  considered statistically significant. **Results:** The majority of participants (52%) were Vitamin D deficient, and 66% exhibited moderate to severe acne. A significant negative correlation ( $r = -0.48$ ,  $p < 0.001$ ) was observed between serum Vitamin D levels and acne severity. Participants with sufficient Vitamin D levels predominantly had mild or moderate acne, while those with deficient levels had a higher prevalence of severe cases. Additionally, Vitamin D levels were positively correlated with sun exposure ( $r = 0.62$ ,  $p < 0.001$ ) and dietary intake ( $r = 0.40$ ,  $p < 0.01$ ). **Conclusion:** The study demonstrates a significant association between Vitamin D deficiency and increased severity of acne vulgaris. Maintaining adequate Vitamin D levels through lifestyle modifications or supplementation could be a valuable adjunctive strategy in acne management. Further studies are warranted to confirm these findings and evaluate the therapeutic potential of Vitamin D in acne treatment.

**Keywords:** Vitamin D, acne vulgaris, inflammation, serum 25-hydroxyvitamin D, acne severity.

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**INTRODUCTION**

Acne vulgaris is one of the most prevalent dermatological conditions worldwide, affecting individuals across various age groups, with a particular predilection for adolescents and young adults. Characterized by the presence of comedones, papules, pustules, and nodules, acne primarily affects the face, chest, and back. Although not life-threatening, acne can lead to significant psychological distress, diminished self-esteem, and, in some cases, permanent scarring. The pathogenesis of acne is multifactorial, involving hyperkeratinization, increased sebum production, bacterial colonization, and inflammation. However, recent studies have suggested that systemic factors, such as vitamin deficiencies, might also play a crucial role in the development and progression of acne.<sup>1</sup> Vitamin D, a fat-soluble vitamin, is essential for numerous physiological processes in the human body, including calcium homeostasis, bone health, and immune modulation. It is synthesized in the skin through ultraviolet (UV) radiation exposure and can also be obtained from dietary sources and supplements. Beyond its established role in bone metabolism, vitamin D has been implicated in various dermatological conditions due to its anti-inflammatory, antimicrobial, and immune-regulatory properties. These properties make it a potential candidate for influencing the pathogenesis of acne

vulgaris.<sup>2</sup> The role of vitamin D in modulating inflammation is particularly relevant in acne vulgaris, where inflammatory lesions are a hallmark of the disease. Vitamin D influences both innate and adaptive immunity by regulating the production of pro-inflammatory cytokines such as interleukin-6 (IL-6) and tumor necrosis factor-alpha (TNF- $\alpha$ ). It also enhances the production of antimicrobial peptides such as cathelicidins, which help defend the skin against microbial invaders, including *Cutibacterium acnes*, a key bacterium implicated in acne. These functions suggest that sufficient levels of vitamin D might help mitigate the inflammatory and infectious components of acne.<sup>3</sup> Additionally, sebaceous gland activity, a critical factor in acne development, appears to be influenced by vitamin D. The sebaceous glands have vitamin D receptors, and studies indicate that vitamin D can modulate the differentiation and proliferation of sebocytes, the cells responsible for sebum production. Dysregulation of sebum production is a well-known contributing factor to acne, as excessive sebum creates an ideal environment for bacterial growth and inflammation. Therefore, vitamin D might have a role in regulating sebaceous gland activity and, by extension, acne pathogenesis.<sup>4</sup> Despite the biological plausibility, the relationship between vitamin D levels and acne severity remains a topic of debate. Some studies have reported a high prevalence of vitamin D deficiency

among individuals with acne, suggesting that low levels of the vitamin might exacerbate acne severity. Conversely, other studies have not found a significant association, indicating the need for further research to clarify this relationship. This inconsistency in findings might be attributed to differences in study populations, methodological approaches, and definitions of vitamin D deficiency across studies.<sup>5</sup>Lifestyle and environmental factors further complicate the relationship between vitamin D levels and acne. Urbanization, indoor lifestyles, and the use of sunscreen have reduced UV exposure in many populations, leading to a global rise in vitamin D deficiency. Dietary habits also play a role, as modern diets often lack adequate sources of vitamin D, such as fatty fish, egg yolks, and fortified foods. These factors are particularly relevant in individuals with acne, as adolescents and young adults, the demographic most affected by acne, are also at higher risk of vitamin D deficiency due to dietary and lifestyle patterns.<sup>6,7</sup>The psychological burden of acne, coupled with the growing recognition of vitamin D's systemic health benefits, underscores the importance of exploring novel, non-invasive interventions for acne management. Addressing vitamin D deficiency could offer a dual benefit: improving overall health while potentially alleviating acne severity. This approach is particularly appealing given the increasing interest in holistic and lifestyle-based treatments among patients.<sup>8</sup>This study aims to investigate the impact of vitamin D levels on the severity of acne vulgaris, providing insights into the potential role of this essential nutrient in acne pathogenesis. By examining the association between serum vitamin D levels and acne severity, this research seeks to clarify whether vitamin D deficiency contributes to the development or exacerbation of acne lesions. The findings may offer new avenues for integrating vitamin D assessment and supplementation into acne management strategies.

## MATERIAL AND METHODS

This prospective study was conducted to evaluate the relationship between serum Vitamin D levels and the severity of acne vulgaris. A total of 100 patients aged 15–40 years diagnosed with acne vulgaris were recruited from the dermatology outpatient department of dermatology. The study included 100 participants to ensure adequate statistical power for subgroup analyses and correlations between Vitamin D levels and acne severity.

### Inclusion Criteria

Participants were included if they:

1. Had a clinical diagnosis of acne vulgaris.
2. Were within the age range of 15–40 years.
3. Provided written informed consent to participate in the study.

### Exclusion Criteria

Patients were excluded if they:

1. Were pregnant or breastfeeding.
2. Had any other dermatological conditions that could affect the face.
3. Were on systemic or topical acne treatment, Vitamin D supplementation, or any medication affecting Vitamin D metabolism within the last three months.
4. Had a history of chronic illnesses, such as liver disease, renal disease, or endocrinological disorders, which might influence Vitamin D levels.

### Data Collection

The severity of acne vulgaris was graded using the Global Acne Grading System (GAGS). Acne severity was categorized as mild, moderate, severe, or very severe based on lesion counts and their distribution across various facial regions. Fasting blood samples were collected from all participants in the morning. Serum 25-hydroxyvitamin D [25(OH)D] levels were measured using enzyme-linked immunosorbent assay (ELISA). Vitamin D status was classified as follows:

- Deficient: <20 ng/mL
- Insufficient: 20–30 ng/mL
- Sufficient: >30 ng/mL

A structured questionnaire was used to collect information on demographic data, dietary habits, sun exposure, physical activity, and family history of acne.

### Statistical Analysis

Data were analyzed using SPSS version 16.0. Descriptive statistics were used to summarize demographic data and Vitamin D levels. The relationship between Vitamin D levels and acne severity was assessed using Pearson's correlation coefficient and chi-square tests. A p-value of <0.05 was considered statistically significant.

## RESULTS

### Table 1: Demographic Characteristics of Study Participants

The study included 100 participants, with a mean age of 23.5 years, indicating a predominantly young adult population. The sample consisted of slightly more females (56%) than males (44%), reflecting a gender balance often seen in acne research. A family history of acne was reported by 38% of participants, suggesting a significant genetic predisposition in this cohort. While nearly half of the participants (47%) reported regular sun exposure (>30 minutes per day), only 34% had adequate dietary Vitamin D intake. This highlights the potential influence of lifestyle factors, including sun exposure and nutrition, on Vitamin D levels.

**Table 2: Distribution of Acne Severity Based on Global Acne Grading System (GAGS)**

Acne severity was distributed as follows: mild (24%), moderate (38%), severe (28%), and very severe (10%). The majority of participants fell within the moderate to severe categories (66%), indicating that the study population predominantly experienced more clinically significant acne. This distribution underscores the importance of investigating potential underlying factors, such as Vitamin D deficiency, in this group.

**Table 3: Serum Vitamin D Levels Among Participants**

Serum Vitamin D levels revealed a high prevalence of deficiency and insufficiency in the study population. Over half of the participants (52%) had Vitamin D deficiency (<20 ng/mL), while 32% were insufficient (20–30 ng/mL). Only 16% had sufficient Vitamin D levels (>30 ng/mL). These findings suggest that low Vitamin D levels are common among individuals with acne vulgaris, potentially contributing to the disease pathogenesis.

**Table 4: Association Between Serum Vitamin D Levels and Acne Severity**

When stratified by Vitamin D status, acne severity showed a clear trend. Among participants with Vitamin D deficiency, the majority (68%) exhibited moderate to severe acne, and nearly all very severe cases (9 out of 10) were found in this group. In contrast, participants with sufficient Vitamin D levels predominantly had mild or moderate acne, with no cases of very severe acne. This distribution suggests a potential protective effect of adequate Vitamin D levels against severe acne vulgaris.

**Table 5: Correlation Analysis Between Vitamin D Levels and Acne Severity**

A statistically significant negative correlation was observed between serum Vitamin D levels and acne severity ( $r = -0.48, p < 0.001$ ). This indicates that lower Vitamin D levels were associated with higher acne severity scores. Additionally, Vitamin D levels were positively correlated with sun exposure ( $r = 0.62, p < 0.001$ ) and dietary intake ( $r = 0.40, p < 0.01$ ), highlighting the role of lifestyle factors in maintaining optimal Vitamin D levels. The highly significant correlations ( $p < 0.001$ ) further emphasize the potential importance of addressing Vitamin D deficiency in acne management.

**Table 1: Demographic Characteristics of Study Participants (N = 100)**

Characteristic	Number (n)	Percentage (%)
Age (Mean ± SD)	23.5 ± 5.2	-
Gender		
- Male	44	44%
- Female	56	56%
Family history of acne	38	38%
Regular sun exposure (>30 min/day)	47	47%
Dietary Vitamin D intake		
- Adequate	34	34%
- Inadequate	66	66%

**Table 2: Distribution of Acne Severity Based on Global Acne Grading System (GAGS)**

Acne Severity	Number (n)	Percentage (%)
Mild	24	24%
Moderate	38	38%
Severe	28	28%
Very Severe	10	10%

**Table 3: Serum Vitamin D Levels Among Participants**

Vitamin D Status	Range (ng/mL)	Number (n)	Percentage (%)
Deficient	<20	52	52%
Insufficient	20–30	32	32%
Sufficient	>30	16	16%

**Table 4: Association Between Serum Vitamin D Levels and Acne Severity**

Vitamin D Status	Mild (n)	Moderate (n)	Severe (n)	Very Severe (n)	Total (n)
Deficient (<20 ng/mL)	5	20	18	9	52
Insufficient (20–30)	12	13	6	1	32
Sufficient (>30 ng/mL)	7	5	4	0	16
Total	24	38	28	10	100

**Table 5: Correlation Analysis Between Vitamin D Levels and Acne Severity**

Parameter	Correlation Coefficient (r)	p-value
Serum Vitamin D vs. GAGS	-0.48	<0.001**
Sun Exposure vs. Vitamin D	0.62	<0.001**
Dietary Intake vs. Vitamin D	0.40	<0.01*

\*Significant at  $p < 0.05$ , \*\*Highly significant at  $p < 0.001$ .

## DISCUSSION

The current study revealed a significant association between Vitamin D deficiency and the severity of acne vulgaris. These findings align with earlier studies that have investigated the interplay between Vitamin D levels and acne, shedding light on its potential role in the pathogenesis and severity of the condition. The demographic data showed a slight predominance of females (56%) over males, which is consistent with the findings of Darwish et al. (2014), who reported a higher prevalence of acne in females aged 15–24 years. Additionally, the study highlights inadequate dietary Vitamin D intake and low sun exposure among participants, factors that significantly influence Vitamin D levels. Darwish et al. emphasized similar findings, attributing low Vitamin D levels to insufficient sun exposure, particularly in populations with cultural or environmental constraints.<sup>9</sup> The distribution of acne severity in this study, with 66% of participants experiencing moderate to severe acne, is comparable to the findings of Lim et al. (2012), who reported that Vitamin D deficiency was significantly more prevalent in patients with moderate to severe acne than in those with mild forms. The higher prevalence of severe acne in individuals with lower Vitamin D levels may be attributed to the vitamin's anti-inflammatory effects, which are compromised in deficiency states.<sup>10</sup> More than half of the participants in the current study (52%) had Vitamin D deficiency (<20 ng/mL). Similar results were reported by El-Hafez et al. (2014), who observed Vitamin D deficiency in 48% of their acne patients. They suggested that Vitamin D insufficiency might exacerbate sebaceous gland activity, contributing to the development of acne. This overlap emphasizes the need to assess Vitamin D levels as part of the clinical evaluation for acne.<sup>11</sup> The current study demonstrated a significant negative correlation ( $r = -0.48$ ,  $p < 0.001$ ) between Vitamin D levels and acne severity. This finding parallels the results of Chiu et al. (2011), who found that patients with severe acne had significantly lower Vitamin D levels compared to those with milder forms of acne. The anti-inflammatory role of Vitamin D, through modulation of cytokine production and immune response, may explain this inverse relationship.<sup>12</sup> Positive correlations were observed between Vitamin D levels, sun exposure ( $r = 0.62$ ), and dietary intake ( $r = 0.40$ ). These findings are consistent with research by Yıldızgören et al. (2014), who highlighted that reduced sun exposure and inadequate dietary habits were significant contributors to Vitamin D deficiency among acne patients. Their study emphasized the need for lifestyle interventions,

such as increasing safe sun exposure and improving dietary intake of Vitamin D-rich foods.<sup>13</sup> The protective effect of sufficient Vitamin D levels observed in this study aligns with the findings of Agak et al. (2013), who demonstrated that Vitamin D supplementation reduced inflammatory acne lesions in deficient individuals. Their study suggests that correcting Vitamin D levels could be a promising adjunctive strategy in acne treatment. The lack of very severe acne cases among participants with sufficient Vitamin D levels in the current study further supports this therapeutic potential.<sup>14</sup>

## CONCLUSION

This study highlights a significant association between Vitamin D deficiency and the severity of acne vulgaris, suggesting a potential role for Vitamin D in acne pathogenesis. The findings emphasize the importance of maintaining adequate Vitamin D levels to potentially reduce acne severity through its anti-inflammatory and immune-regulatory properties. Given the high prevalence of Vitamin D deficiency in acne patients, routine screening and appropriate supplementation may serve as valuable adjunctive strategies in acne management. Further research is needed to confirm these findings and explore the therapeutic potential of Vitamin D in acne treatment.

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