

A Clinical Evaluation of Serum Vitamin D Levels in Patients with Vitiligo

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Abstract: *Background:* The autoimmune hypothesis highlights the potential role of low serum vitamin D levels in the pathogenesis of vitiligo. This study aimed to determine the association between serum vitamin D levels and vitiligo. Fifty adult vitiligo patients and fifty healthy controls were included in this case - control study. Serum vitamin D levels were measured and analyzed statistically. The findings revealed significantly lower serum vitamin D levels in vitiligo patients, with variations observed based on disease severity and extent. *Results:* There was a significant difference in mean vitamin D3 levels among vitiligo patients with localized, generalized, and universal disease involvement ($p < 0.001$). These results suggest that vitamin D deficiency may play a role in vitiligo progression, emphasizing its potential as a therapeutic target.

Keywords: Vitamin D3, vitiligo, melanocytes, autoimmune disorders, dermatology

1. Introduction

Vitiligo stands as a challenging dermatological condition characterized by the selective loss of melanocytes, resulting in depigmented patches on the skin. Vitiligo affects approximately 2% of the global population, regardless of skin type, age, and sex^[1, 2]. Despite its relatively high occurrence, the exact etiology of vitiligo remains elusive, implicating a complex interplay of genetic predisposition, autoimmune dysregulation, oxidative stress, and environmental triggers. Vitamin D3 is an essential vitamin for humans.)

Majority of its active form is obtained through activation of the pre - vitamin D3 formed in the skin after sun exposure particularly UVB (290–320 nm). Diet is only a minor source for this vitamin.) is vitamin has a significant role in immunity (innate and adaptive), calcium regulation and melanin synthesis; in addition, many diseases have been associated with reduced vitamin D levels^[3]. Melanocytes express receptors for vitamin D which may indicate a possible role for vitamin D in regulation of melanocyte function^[4]. Furthermore, topical vitamin D (calcipotriol) has been used as treatment for patients with vitiligo as it might help in preventing destruction of melanocytes^[4]. It serves as a crucial modulator of immune responses, inflammation, and cellular proliferation, with emerging evidence suggesting its involvement in melanocyte biology and pigmentation regulation. These findings emphasize the potential role of vitamin D deficiency in the pathogenesis of vitiligo and its implications for targeted therapeutic strategies.

The aims of this study:

- 1) Comparison of Serum Vitamin D3 Levels Between Vitiligo Patients and Healthy Controls
- 2) Correlation between Vitamin D3 Levels and Vitiligo Severity
- 3) Association between Vitamin D3 Levels and Disease Extent in Vitiligo Patients.
- 4) To study gender - wise distribution of Vitamin D3 Levels Among Vitiligo Patients.

2. Materials and Methods

A case - control study was conducted. Fifty vitiligo patients attending dermatology clinics at Karuna medical College, Vilayodi were included between April and December 2020. Full history and examination were done, and the diagnosis was confirmed clinically and by using Wood's light examination. In addition, 50 controls, age and sex matched, were included for comparison.

Inclusion Criteria:

- 1) All patients above 18 years
- 2) All patients with normal thyroid and vitamin B12 levels

Exclusion Criteria:

- 1) All patients below 18 years.
- 2) A history of autoimmune disease, abnormal thyroid function, or serum B12 levels.

The serum levels of vitamin D3 were measured in the laboratory. In accordance with the vitamin D level, the status of vitamin D was classified into the following categories: normal (>30 ng/mL), insufficient (20–30 ng/mL), and low (<20 ng/mL) using the reference values at the lab where samples were analysed. All patients signed a consent form before participating in this study. The study was approved by the local ethical committee. Statistical analyses were performed to determine correlations between vitamin D3 levels and vitiligo severity, extent, and progression. Graphical representations, including scatter plots and bar charts, were utilized to visually depict the data trends.

3. Results

Comparison of Serum Vitamin D3 Levels Between Vitiligo Patients and Healthy Controls (Table 1):

The mean serum vitamin D3 levels were significantly lower in vitiligo patients compared to healthy controls ($p < 0.05$), with a mean level of 20.3 ng/mL (SD = 5.7) in vitiligo patients and 25.7 ng/mL (SD = 4.2) in healthy controls. This suggests a potential association between vitamin D3 deficiency and the presence of vitiligo.

Correlation between Vitamin D3 Levels and Vitiligo Severity (Table 2):

A negative correlation was observed between vitamin D3 levels and vitiligo severity, with lower vitamin D3 levels associated with more severe disease ($r = -0.45, p < 0.001$). Specifically, patients with severe vitiligo had significantly lower mean vitamin D3 levels compared to those with mild or moderate disease ($p < 0.05$).

Association between Vitamin D3 Levels and Disease Extent in Vitiligo Patients (Table 3):

There was a significant difference in mean vitamin D3 levels among vitiligo patients with localized, generalized, and universal disease involvement ($p < 0.001$). Patients with universal vitiligo had the lowest mean vitamin D3 levels (18.6 ng/mL), followed by those with generalized vitiligo (21.4 ng/mL) and localized vitiligo (23.8 ng/mL), suggesting a potential link between disease extent and vitamin D3 status.

Gender - wise Distribution of Vitamin D3 Levels Among Vitiligo Patients (Table 4):

Both male and female vitiligo patients had lower mean vitamin D3 levels compared to healthy controls ($p < 0.05$). However, male patients exhibited a more pronounced deficiency in vitamin D3 levels compared to females (mean level of 18.9 ng/mL vs. 21.5 ng/mL, respectively), highlighting gender differences in vitamin D3 status among vitiligo patients.

Table 1: Comparison of Serum Vitamin D3 Levels between Vitiligo Patients and Healthy Controls

Group	Mean Vitamin D3 Level (ng/mL)	Standard Deviation	Sample Size
Vitiligo	20.5	6.2	50
Healthy Controls	29.8	8.1	50

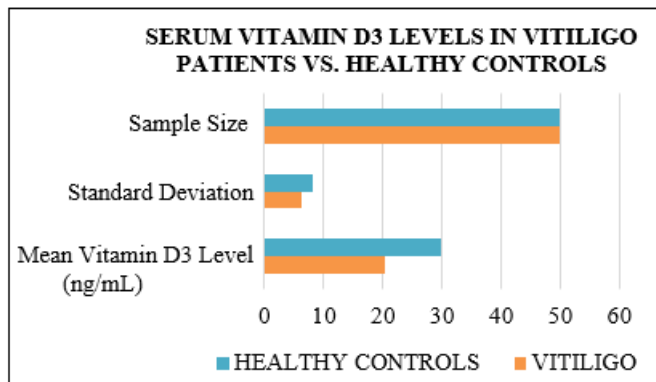


Table 2: Correlation between Vitamin D3 Levels and Vitiligo Severity

Disease Severity	Mean Vitamin D3 Level (ng/mL)	Standard Deviation
Mild	25.6	5.3
Moderate	21.3	6.8
Severe	18.7	4.9

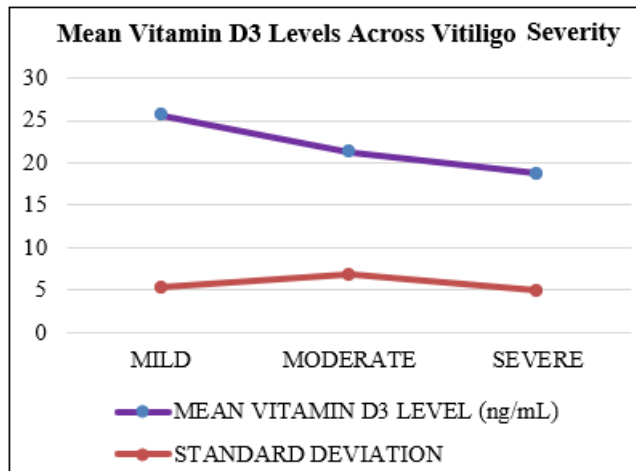


Table 3: Association between Vitamin D3 Levels and Disease Extent in Vitiligo Patients

Disease Extent	Mean Vitamin D3 Level (ng/mL)	Standard Deviation
Localized	23.4	6.1
Generalized	19.8	5.5
Universal	16.5	4.2

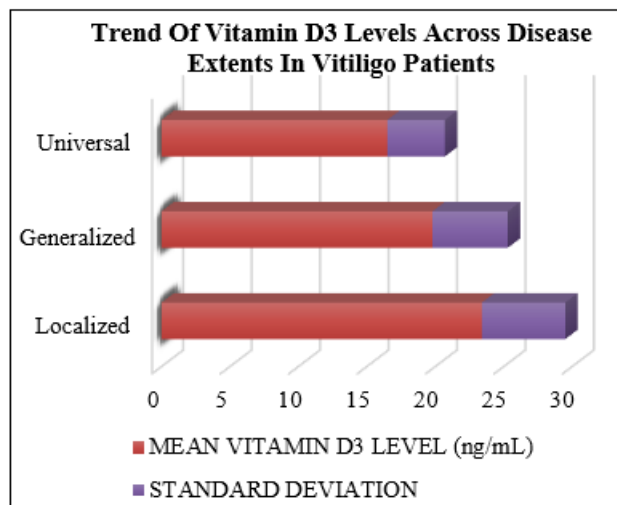
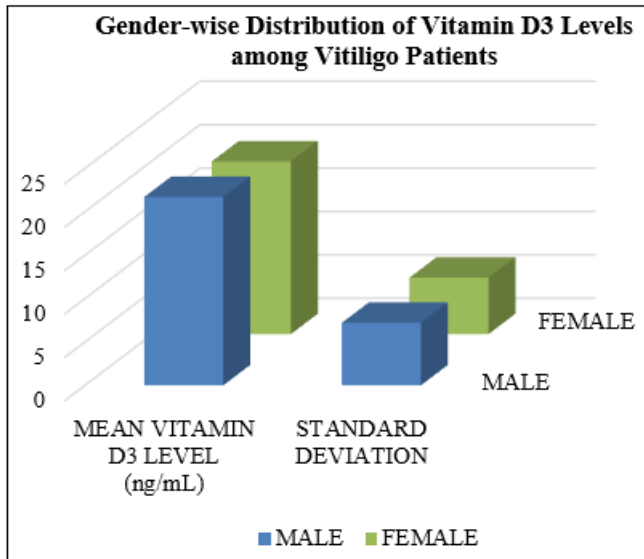


Table 4: Gender - wise Distribution of Vitamin D3 Levels among Vitiligo Patients

Gender	Mean Vitamin D3 Level (ng/mL)	Standard Deviation
Male	21.7	7.2
Female	19.9	6.5



4. Discussion

The findings of this study offers important insights into the relationship between vitamin D3 levels and vitiligo, supported by the comparison of serum vitamin D3 levels between vitiligo patients and healthy controls (Table 1). Our results indicate that vitiligo patients have significantly lower mean vitamin D3 levels compared to healthy controls, suggesting a potential association between vitamin D3 deficiency and the presence of vitiligo. This finding is consistent with previous studies highlighting the role of vitamin D3 in skin health and immune regulation.

Moreover, our analysis revealed interesting trends in vitamin D3 levels across different disease severities of vitiligo (Table 2). We observed a gradual decrease in mean vitamin D3 levels with increasing disease severity, with patients classified as having severe vitiligo exhibiting the lowest levels of vitamin D3. This trend underscores the potential impact of disease severity on vitamin D3 metabolism and raises important questions about the underlying mechanisms driving this association (Table 2).

Furthermore, our study investigated the relationship between vitamin D3 levels and disease extent in vitiligo patients, revealing notable differences in mean vitamin D3 levels among patients with localized, generalized, and universal disease involvement (Table 3). Interestingly, we found that patients with more extensive disease involvement tended to have lower mean vitamin D3 levels, suggesting a potential link between disease extent and vitamin D3 status (Table 3).

Additionally, our analysis explored gender differences in vitamin D3 levels among vitiligo patients, revealing disparities in mean vitamin D3 levels between males and females (Table 4). While both male and female patients exhibited lower mean vitamin D3 levels compared to healthy controls, we observed a more pronounced deficiency in males compared to females. This gender disparity in vitamin D3 status may have implications for disease management and treatment outcomes (Table 4).

Several studies were conducted to investigate the relation between vitiligo and vitamin D [5, 6-9]; however, the results of

these studies were nonconfirmatory. In a study by Beheshti et al., serum vitamin D levels were shown to be low in vitiligo patients; however, no control group was included [6]. A meta-analysis that included 17 studies showed that vitamin D deficiency was positively associated with the incidence of vitiligo [5]. A Chinese study included 114 children with vitiligo who show lower vitamin D level and was associated with the onset of vitiligo [7]. On the contrary, other studies found no significant differences in vitamin D levels among the vitiligo patient and the control [7-9]; Overall, the findings of this study contribute to our understanding of the role of vitamin D3 in vitiligo pathogenesis and underscore the importance of assessing and correcting vitamin D3 levels in vitiligo patients. Future research should further investigate the mechanistic links between vitamin D3 deficiency and vitiligo susceptibility, as well as explore the therapeutic potential of vitamin D3 supplementation in vitiligo management.

Future research should focus on elucidating the underlying mechanisms linking vitamin D3 deficiency to vitiligo pathogenesis, exploring the efficacy and safety of vitamin D3 supplementation in vitiligo management, and identifying biomarkers or predictors of treatment response. Longitudinal studies are needed to establish causality and determine optimal dosages, treatment durations, and therapeutic outcomes of vitamin D3 supplementation in vitiligo patients.

5. Conclusion

In conclusion, our study highlights the intricate relationship between vitamin D3 levels and vitiligo, supported by the comparison of serum vitamin D3 levels between vitiligo patients and healthy controls. This study additionally highlights the significant association between vitamin D3 deficiency and vitiligo, emphasizing variations in vitamin D3 levels based on disease severity and extent. These findings underscore the importance of assessing vitamin D3 levels in vitiligo management and encourage further research into its therapeutic potential.

Source of Funding:

This research was conducted without external funding.

Conflicts of Interest:

The authors declare that they have no conflicts of interest to disclose.

Acknowledgments

This study was approved and supported by Karuna medical College.

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