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Original Research Article

A Study to Assess the Association of Vitamin D (Serum 25 Hydroxy Vitamin D3) and Vitiligo

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Abstract

Background: An acquired pigmentary abnormality of the skin is vitiligo. Depigmentary white areas on the skin with normal border or surrounding hyperpigmentation are how it presents itself. Vitamin D, or vitD, has been linked to a number of different medical disorders in recent years. Similar to a hormone, it is produced in the skin and plays a significant role in skin pigmentation by increasing the activity of the tyrosinase enzyme, which in turn influences the formation of melanin. It also exhibits a range of immunoregulatory characteristics. In autoimmune disorders such as multiple sclerosis, alopecia areata, DM, RA, and SLE, vitamin D levels have been reported to be lower. The purpose of this study was to look for any connections between vitiligo and serum vitamin D levels.

Methods: Serum 25 hydroxy vitamin D levels were measured in all subjects involved in this case control study (21 patients and 21 age and sex matched healthy individuals) once they met the inclusion and exclusion criteria. The relationship between vitamin D level and the vitiligo disease activity index (VIDA), affected body surface area (BSA), lesion site, patient age, and length of vitiligo was assessed.

Results: In all, 42 people were included in our study: 21 vitiligo sufferers and 21 control subjects. In comparison to the control group, the mean serum level of vitamin D was considerably lower in the patient group (17.3 ng/ml ± 5.3 vs. 25.8 ng/ml ±7.9, P = 0.006). Age, the length of vitiligo, and the affected body surface area did not significantly correlate with vitamin D level (P>0.05), although there was a significant variation in 25(OH)D levels between the different grades of VIDA.

Conclusion: This study findings that patients with vitiligo had a significant 25(OH) D shortage raise the possibility that vitamin D deficiency contributes to the pathophysiology of vitiligo.

Keywords: Vitiligo, Etiopathogenesis, Vitamin D, Autoimmune diseases.

Introduction

Known to be caused by the death of skin melanocytes, vitiligo is an autoimmune condition that is characterized by depigmented macules of various sizes.1 Equal predeliction occurs in both genders, and systemic autoimmune illnesses such lupus erythematosus, scleroderma, autoimmune thyroiditis, and alopecia areata may also be linked to them.2 Many autoimmune illnesses, such as systemic lupus erythematosus, diabetes mellitus, alopecia areata, multiple sclerosis, and rheumatoid arthritis, are associated with reduced serum levels of vitamin D. [1, 3, 4]

It has recently been discovered that vitamin D, which was once linked to rickets and osteomalacia, may also play a part in a number of other medical and dermatological conditions. The active form of vitamin D, or vitamin D3, functions as a hormone and is essential for controlling the metabolism of calcium and phosphorus. It is also discovered that this active form regulates cell division and serves specific immunoregulatory functions.

The majority of the body's cells, including the skin, contain vitamin D receptors and the enzymatic reaction and machinery necessary to convert the body's current 25-hydroxy vitamin D [25(OH)D] to its active form, vitamin D3 [1,25(OH)D]. Vitamin D has been discovered to have additional functions in the skin, including immunomodulatory and anti-apoptotic properties. This suggests that it may be used to treat infections and atopic dermatitis.

VitD may influence the innate and adaptive immune systems through receptors on B and T lymphocytes, as well as partially through receptors on dendritic cells and macrophages.5 Furthermore, it is known that vitamin D3 increases the enzymatic activity of tyrosinase in melanocytes by activating the vitamin D receptor (VDR), a nuclear hormone receptor. [1,6]

Numerous epidemiological studies have examined the relationship between vitamin D and autoimmune illnesses, such as vitiligo, among other conditions, but their findings have been contradictory and uneven.

Material and Methods

The study included 50 diagnosed vitiligo patients attending dermatology OPD at Radha Devi Jageshwari Memorial Medical College and Hospital, Turki, Muzaffarpur, Bihar from June 2023 to August 2023. Following the necessary matching based on demographics (age & sex) and skin phototype, 50 healthy controls were also recruited.

The skilled dermatologist confirmed or denied the diagnosis of vitiligo based on the patient's clinical history, physical examination, and woodlands lamp examination. For confirmation, no biopsy was necessary for any of the patients. Patient information was documented, including (but not restricted to) age, sex, skin type, and use of sunscreen. A thorough medical history was acquired, along with family medical records.

The exclusion criteria encompassed individuals with liver or kidney disorders, thyroid disorders, metabolic bone disorders, inflammatory diseases, and even those on medication (including Ca++ or vitD). Additionally, those who had received any form of treatment for vitiligo (topical, oral, or otherwise) within the previous thirty days were also excluded. The control population (evaluated by the aforementioned dermatologist) was recruited from relatives or spouses of patients who are not suffering from vitiligo in order to reduce any potential bias in the study caused by dietary consumption of vitD.

After gaining informed consent from every study participant (test and control), we started our investigation.

Following a minimum eight-hour fast the previous night, samples were taken in the morning to assess vitamin D. Anti-thyroglobulin antibodies, anti-thyroid peroxidase antibodies, serum free T3, free T4, TSH, fasting blood sugar, and vitamin B12 levels were among the other assays that were examined.

All group comparisons were carried out using SPSS Statistics for Windows, Version 20.0, with a Chi-square test for categorical variables and a Student's t-test for continuous data. Chicago: The statistical analysis was performed using SPSS Inc.

Results

In all, 42 people were included in our study: 21 vitiligo sufferers and 21 control subjects. With a mean age of 30.8 ± 19.1 years and a mean diagnostic duration of 9.3 ± 6.9 years, the patient group consisted of 10 male and 11 female individuals. In the control group, there were 21 participants with a mean age of 30.6 ±13.2 years, 10 of whom were male and 11 of whom were female.

Table 1 demonstrated that there was no statistically significant difference in age, sex, smoking status, diabetes mellitus, or hypertension between the case and control groups.

Table 1 : Comparing socio-demographic characteristics and chronic diseases between case and control groups

Variable	**Cases Mean±SD (Range)**		**Controls Mean±SD (Range)**		**Test**	**p-value**
Age (in years)	30.8±19.1 (11-68)		30.6±13.2 (4-54)		**Mann-Witenney U test** 0.03	0.9
Variable	**No. of cases (21)**	**Percentage**	**No. of control (21)**	**Percentage**	**Chi-square Test**	**p-value**
Gender						
• Male	10	47.6%	10	47.6%	0	1
• Female	11	52.4%	11	52.4%		
Smoking					**Fischer Exact test**	0.3
• No	18	85.7%	16	76.2%		
• Yes	3	14.3%	5	23.8%		
Diabetes Mellitus					**Fischer Exact test**	1
• No	21	100.0%	20	95.2%		
• Yes	0	0.0%	1	4.8%		
Hypertension					**Fischer Exact test**	0.2
• No	21	100.0%	18	85.7%		
• Yes	0	0.0%	3	14.3%		

Table (2) demonstrated that there was a statistically significant difference between the case and control groups' serum 25(OH) D levels. Table (3) revealed that whereas it was 9.5% for the control group,

33.3% of the case group had 25(OH) D Deficient <10ng/ml. Additionally, 25(OH) D Insufficient 10–30 ng/ml was present in both the case group and the control group (61.9%), whereas the case group (4.8%) and the control group (28.6%) had Sufficient >30 ng/ml. with a difference of statistical significance.

Table 2 : Comparing serum 25 hydroxy vitamin D level between case and control groups

Variable	Cases Mean±SD (Range)	Controls Mean±SD (Range)	Test	p-value
25(OH) D	17.3±5.3 (8.1-33.4)	25.8±7.9 (10.4-56.8)	t-test 2.8	0.006*

*Statistically significant difference (P≤ 0.05)

Table 3 : Comparing serum 25-hydroxy vitamin D sufficiency between case and control groups

25(OH) D	No. of cases (21)	Percentage	No. of control (21)	Percentage	Chi-square Test	p-value
Deficient <10ng/ml	7	33.3%	2	9.5%	6.3	0.02
Insufficient 10-30ng/ml	13	61.9%	13	61.9%		
Sufficient >30 ng/ml	1	4.8%	6	28.6%		

Table (4) displayed the lesions' location, the case group's vitiligo disease activity index, and the vitiligo-affected body surface area.

Table 4 : Site of lesions, vitiligo disease activity index and affected body surface area of vitiligo in the case groups

Variable	No. of patients (21)	Percentage
Site of lesions		
• Focal	2	9.5%
• Segmental	2	9.5%
• Acro-facial	6	28.5%
• Generalized	11	52.4%
VIDA		
• 0	3	14.3%
• 1	2	9.5%
• 2	2	9.5%
• 3	6	28.6%
• 4	8	38.1%
Affected (BSA) of vitiligo		
• 3-15%	3	14.2%
• 15-28%	7	33.3%
• 28-40%	11	52.4%

According to the vitiligo disease activity (VIDA) score, Table (5) demonstrated that there was a statistically significant difference in 25 hydroxy vitamin D levels between the case and control groups.

Table 5 : Comparing serum 25 hydroxy vitamin D according to vitiligo disease activity (VIDA) index, in case groups

VIDA score	No. of patients (21)	25(OH)D Mean±SD (Range)	Kruskal Wallis Test	p-value
0	3	29.6±3.5 (26.3-33.4)	9.5	0.02
+1	2	19.1±5.4 (15.2±22.9)		
+2	2	17.4±8.3 (11.5-23.3)		
+3	6	15.5±7.1 (8.3-25.5)		
+4	8	14.2±7.4 (8.1-33.4)		

Table (6) demonstrated that when comparing 25 hydroxy vitamin D to the afflicted body surface area of vitiligo in the case group, there was no statistically significant difference between the case and control groups.

Table 6 : Comparing serum 25 hydroxy vitamin D according to affected body surface area (BSA) of vitiligo in case groups

BSA	No. of patients (21)	25(OH)D Mean±SD (Range)	Kruskal Wallis Test	p-value
3-15%	3	28.9±3.7 (26.3-32.4)	4.5	0.6
15-28%	7	18.3±7.3 (11.5-25.3)		
28-40%	11	14.6±6.4 (8.1-34.3)		

Discussion

The case group in the current case control study had a mean age of 30.8 ±19.1 varied from (11-68) years, with 52.4 % of them being female. The control group had a mean age of 30.6 ±13.2 ranged from (4-54) years, with 52.4 % of them being female.

Other research revealed varying mean ages, 31.3 years and 28.11 years, respectively, for Nunes and Esser [7] and Nejad et al [8] Yet, the average age of the cohort under study was 36.7 years in Bouayad et al. [9] These findings supported the theory that vitiligo can strike people of any age.

According to our research, patients' mean blood levels of 25-(OH) D were significantly lower than those of age- and gender-matched healthy controls, at 17.3 ng/ml (P = 0.006). According to Beheshti et al. [10], who included 100 patients with vitiligo in their cross-sectional investigation, the mean serum 25(OH) D level was 42 nmol/L, significantly different from a normal level (P = 0.042). This finding is consistent with our research.

Additionally, Saleh et al. [11] discovered that 39 patients (97.5%) versus 5 controls (12.5%) had deficient 25(OH) D levels, with patients' serum 25(OH)D levels being considerably lower than those of controls in their case control research involving 40 vitiligo patients and 40 healthy, age, and gender matched controls. Patients' serum 25(OH)D levels were statistically significantly lower than controls' (P = 0.0001).

Concurrently, Shalaby and Ibrahim[12] found a high link between patients with vitiligo and 25(OH) D deficiency in their case control research, which comprised 40 vitiligo patients and 40 age- and sex-matched healthy persons.

However, Xu et al. [13] did not find a significant difference in serum 25(OH) D between vitiligo patients and controls in their case control study of 280 Chinese patients with vitiligo, supporting the idea that vitamin D is not involved in the pathophysiology of vitiligo.

However, our research showed a statistically significant inverse relationship (p = 0.003) between the patients' serum 25 (OH) D level and the VIDA index, which measures disease activity.

However, a cross-sectional investigation by Singla et al.[14] on 75 vitiligo patients and 75 controls revealed no significant connection (P value = 0.518) between serum 25(HO)D and VIDA score.

Conversely, Doss et al. [15] found no correlation between the amount of 25(HO)D and the disease activity measured by VIDA score in their case control research, which comprised 30 vitiligo patients and 30 age- and gender-matched healthy controls.

Age, sex, affected body surface area, duration, and family history of vitiligo were not significantly correlated with the 25 (HO)D level in the case group in the current investigation.

In addition, Saleh et al. [11] discovered no significant associations between serum 25(OH)D and age, vitiligo duration, vitiligo in the family, or affected body surface area in the case group.

In line with our findings, a cross-sectional study conducted by Ustun et al. [16] with a total of 25 patients and 41 controls revealed no relationship between age, the affected body surface area, or the length of the condition in vitiligo patients.

Additionally, singla et al. cross-sectional investigation[14] revealed no discernible relationship between patients' age, sex, afflicted body surface area, or length of illness with serum 25 (OH)D.

Doss et al.'s findings [15] contradict our findings by demonstrating that patients with 25(OH) D levels above 30 ng/ml had a larger impacted body surface area than patients with levels below 30 ng/ml. This suggests that vitamin D levels may have an impact on the severity of the condition.

Conclusion

We can infer from the current study's results that vitamin D shortage is prevalent in vitiligo patients, indicating that vitamin D deficiency may be involved in the vitiligo pathogenesis.

Further research involving a larger patient population is required to validate this theory. Thus, it appears that screening for vitamin D insufficiency is beneficial for patients with vitiligo.

The increasing interest in vitamin D supplementation in autoimmune diseases further highlights the necessity of promptly and comprehensively testing this hypothesis on a sizable patient population with vitiligo in order to evaluate the effectiveness of oral vitamin D supplementation in managing long-term disease activity and the potential to prevent disease onset in vulnerable family members of vitiligo patients.

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