

Assessment of serum cholecalciferol levels in hypopigmentary disorders: A case control study

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ABSTRACT

Introduction: Disorders of pigmentation pose a significant challenge to dermatologists, as they can greatly impact the physical and psychological well-being of affected individuals. Vitamin D plays a critical role in dermatological health because it influences numerous cellular processes. The present study aims at assessment of serum vitamin D levels among patients with hypopigmentary disorders.

Methodology: A case control study was conducted in tertiary care hospital of Amritsar from August 2023 to February 2025 including 300 participants, divided equally into two groups (cases and controls). Serum vitamin D levels were assessed for all study participants and compared among groups.

Results: The mean vitamin D levels were significantly lower in patients with hypopigmentary disorders (24.08) as compared to controls (34.1) [p-value <0.05]. Insufficiency level was higher among cases (46.7%) as compared to controls (28.7%).

Conclusion: The study concluded that vitamin D may have significant role in the pathogenesis of vitiligo, pityriasis alba and pityriasis versicolor. Further investigations are required to establish the relationship between the severity of these hypopigmentary disorders and vitamin D status and to evaluate the potential for use of vitamin D in the treatment of these hypopigmentary disorders.

KEYWORDS: Hypopigmentary disorders, Serum cholecalciferol, Vitiligo, India, Vitamin D supplementation, Microphthalmia associated transcription factor (MITF)

INTRODUCTION

Pigmentation of skin is influenced by array of factors including hormones, nutritional factors, inflammation, injury, heredity, sun exposure and drugs. Disorders of pigmentation pose a significant challenge to dermatologists, as they can greatly impact the physical and psychological well-being of affected individuals.¹ Vitamin D plays a critical role in dermatological health because it influences numerous cellular processes.²

Vitamin D influences melanogenesis by binding to receptors on melanocytes, affecting their growth and function. UVB exposure increases both melanin and vitamin D production, though independently. Vitamin D regulate melanogenesis by inhibiting tyrosinase and affecting MITF activity. Its antioxidant and anti-inflammatory properties help protect melanocytes from stress and may play a role in pigmentary disorders like vitiligo. While not directly causing mela-

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nin production, vitamin D modulates the process through multiple mechanisms at the cellular level. There is empirical evidence from research that connects vitamin D deficiency with several skin diseases, ranging from inflammatory to pigmentary disorders. As both hypopigmented disorders and vitamin D deficiency are extremely common in India, it becomes important to investigate their possible correlation. While there has been extensive research on the immune-modulating function of vitamin D and its importance in the skin's health, few studies have investigated its levels in hypopigmentation patients. Such a correlation would provide us with an understanding of the therapeutic implications, including the application of vitamin D as an adjunctive treatment in some of the hypopigmented disorders. The present study was planned with an aim to assess serum cholecalciferol levels in hypopigmented disorders.

METHODOLOGY

A case control study was conducted in tertiary care hospital of Amritsar from August 2023 to February 2025. A total of 300 study participants aged 2-60 years were included in study, divided into cases and controls. Cases were composed of patients diagnosed with hypopigmented disorders and controls were constituted by age and gender matched healthy population. All patients diagnosed with hypopigmentary disorders were included in study. Patients having hypopigmented disorders due to malignancies, had phototherapy treatment or had taken Cholecalciferol supplementation within last 6 months were excluded from the study. After ethics approval and informed consent, blood samples of all the study participants were collected for assessment

of serum cholecalciferol level following due procedure. The information regarding demographic data was collected using semi structured interview schedule. The data was collected and compiled in MS Excel sheet and analysed using SPSS v23. The quantitative data was presented as mean + SD and categorical data was presented as frequency and percentage. Independent sample t test was used to compare the mean between cases and control. The p-value of <0.05 was considered as statistically significant.

RESULTS

Amongst cases, females (52%) outnumbered males (48%), whereas opposite was seen in controls with males constituting 52.7%. The mean age of participants among cases was 26.32 ± 16.71 years and among controls was 27.15 ± 12.51 years. Age in the groups were comparable with no significant difference (p-value >0.05) [Table 1]. In the present study, vitiligo was most common diagnosis (58%) among patients, followed by Pityriasis Alba (18%) and idiopathic guttate hypomelanosis was the least common diagnosis (0.66%). The mean value of Vitamin D levels was significantly higher in control group (34.1) as compared to case group (24.08).

The study observed that most of the patients (46.7%) with hypopigmentary disorder had insufficient level of vitamin D, whereas maximum number of study participants (60%) in control group had sufficient level of vitamin D. This association between group and vitamin D status was highly significant (p-value <0.001), with higher insufficiency level among patients. Face was observed as the single most common site of lesion (48.7%), followed by hand (10%). In patients with multiple site involvement, face and

neck involvement was most common (2.7%) presentation (Table 4).

Table 1 Group wise distribution of sociodemographic variables

Socio-demographic variable	Cases n(%)	Control n(%)	p-value
Gender			
Female	78 (52)	71 (47.3)	0.419
Male	72 (48)	79 (52.7)	
Age	26.32 ± 16.71	25.15 ± 12.51	0.279
Alcoholic	29 (19.3)	-	
Smoker	6 (4)	-	
H/o Thyroid disorders	6 (4)	-	
H/o Hypertension	38 (25.3)	-	
Diabetes mellitus	22 (14.7)	-	

Table 2 Diagnosis wise distribution of cases

Diagnosis	No. of Cases (n)	Percentage (%)
Idiopathic guttate hypomelanosis	1	0.66
Leukoderma	4	2.66
Lichen striatus	2	1.33
Nevus anemicus	3	2
Nevus depigmentosus	2	1.33
Pityriasis Alba	27	18
Pityriasis versicolor	24	16
Vitiligo	87	58
Total	150	100

Table 3 Comparison of serum vitamin D levels between cases and controls according to vitamin D status

Vitamin D level	Cases n (%)	Control n (%)	p-value
Deficient	51 (34)	16 (10.7)	<0.001
Insufficient	70 (46.7)	43 (28.7)	
Sufficient	29 (19.3)	90 (60)	
Toxicity	0 (0)	1 (0.7)	
Mean Vitamin D levels	24.08 ± 9.9	34.1 ± 12.77	<0.001

Table 4 Distribution of cases as per site of lesion

Site	No. of Cases	Percentage
Arm	11	7.3
Face	73	48.7
Face + Arm	1	0.7
Face + Neck	4	2.7
Face + shoulder + Neck	1	0.7
Forearm	14	9.3
Forearm + hand	2	1.3
Forearm + Neck	2	1.3
Hand	15	10
Hand + face	1	0.7
Leg	11	7.3
Neck	5	3.3
Neck + Hand	2	1.3
Shoulder	5	3.3
Shoulder + Forearm	1	0.7
Shoulder + Neck	2	1.3

DISCUSSION

The age and gender distribution of the patients in the present study were comparable to studies conducted by Omidian M *et al.*,³ Aly *et al.*,⁴ Beheshti *et al.*,⁵ Farag *et al.*⁶ and Khodair *et al.*,⁷ where also higher number of females were present in case group i.e., 60%, 70%, 58%, 64% and

80% respectively. In our study 19.3% of cases were alcoholic and 4% were smoker. This was similar to study conducted by Singh S *et al.*,⁸ where also 5% were smoker. In the present study 4% of patients had history of thyroid disorders. This was in line with findings reported by Saha D R *et al.*,⁹ where 8% of patients had thyroid disorders. Most common diagnosis in our study was vitiligo in 58% of patients, followed by Pityriasis Alba (18%), which was similar to findings reported by Neelam Sudheer *et al.*,¹⁰ where also vitiligo was most common diagnosis. Similar frequencies in pityriasis versicolor have also been recorded in studies by Khater M *et al.*¹¹ (17.9%), Kumar U *et al.*¹² (22%), and Tharakan SJ *et al.*¹³ (20%). The present study observed the lower levels of vitamin D among cases as compared to controls with higher insufficiency levels among cases as compared to controls. The finding was similar to earlier studies conducted by Takci Z *et al.*,¹⁴ Kattoof KM *et al.* (Iraq)¹⁵ and Salah H *et al.* (Egypt),¹⁶ where also significantly lower levels of vitamin D was observed among patients with hypopigmentary disorders as compared to healthy controls. In the present study face was single most common site of lesion for hypopigmentary disorders (48.7%). This was consistent with findings reported by study conducted by Saha DR *et al.*,⁹ where 32% had facial lesions. Similar patterns of predominance of facial and upper limb involvement have also been reported internationally, such as by Al-Mutairi *et al.*¹⁷ and Ezzedine *et al.*,¹⁸ in vitiligo and other pigmentary disorders. These have been attributed to sun exposure, Koebner phenomenon, and melanocyte density at various body sites. These findings are in agreement with most Indian and international studies, lending credence to the potential con-

tributory role of vitamin D in the etiopathogenesis of such diseases. Due to its immunomodulatory and melanogenic effects, vitamin D should receive greater attention in research and clinical practice for hypopigmented dermatoses.

CONCLUSION

Previously conducted studies and researches have found lower levels of vitamin D to be associated with different hypopigmented disorders separately but our study is unique in the matter that all hypopigmentary disorders have been studied together in single research.

In the present study, a positive correlation was found between hypopigmentary disorders and lower vitamin D levels. The serum cholecalciferol levels were significantly lower in patients with hypopigmentary disorders and it is suggested that the vitamin D supplementation should be a part of the management of these hypopigmentary disorders.

Limitation of this study is the relatively small sample size; therefore, further research involving larger populations is required.

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Conflict of Interest: None

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