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Original Research Article

Association of Premature Canities with Vitamin D Deficiency: A Study from a Tertiary Care Centre in Eastern Bihar

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Conflict of interest: Nil

Abstract

Background: Greying of hair is a regular feature of chronological aging that occurs in all regions and races. This study aims at finding any association between vitamin D deficiency levels as well as its clinical profile in premature graying of hair (PGH).

Materials & Methods: A detailed history was taken, including age of onset of graying, family history, lifestyle habits, and any medical history. Each participant then underwent a complete clinical examination. Blood samples were collected to measure their serum Vitamin D levels. All the collected information was studied to find out if low Vitamin D could be a reason for early white hair.

Results: In the study group of 74 individuals with premature graying, 45 participants (60.8%) were found to have Vitamin D deficiency, showing that more than half of them had low levels. In contrast, among the 74 people in the control group, only 21 individuals (28.3%) showed low Vitamin D levels. This means that Vitamin D deficiency was more than twice as common in patients with premature canities compared to those without graying.

Conclusion: The study findings show that Vitamin D deficiency was much more common in individuals with premature graying compared to those without. This significant association suggests that low Vitamin D levels may play an important role in the early loss of hair pigment. Timely correction of low Vitamin D levels may help in reducing progression and potentially preventing premature graying.

Keywords: Hair, Vitamin D, Premature Canities, Premature Graying of Hair (PGH), Bihar.

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Introduction

Hair is one of the defining characteristics of mammals that has immense importance in contributing to people's physical appearance and self-perception. Hair color in humans ranges from black, brown, and blonde-to-red [1]. Hair color is derived from the hair follicle pigmentary unit which functions maximally during post-adolescence and early adulthood [2]. The diversity of hair color is attributed to the quantity and ratio of black-brown eumelanin and reddish-brown pheomelanin [3, 4].

Graying of hair or premature graying of hair (PGH), also called canities or achromotrichia occurs with normal aging. However, the age at which it occurs varies in different races. PGH is defined as graying of hair before the age of 20 years in Caucasians and before 30 years in Blacks [1]. Definition of PGH with respect to the Asian population is lacking. The average age of the onset of graying in Caucasians is 34 ± 9.6 years, and in Blacks, it is 43.9 ± 10.3 years [1]. A large population-based study reported that 6%–23% of people have 50% gray hair by 50 years of age [2].

Hair goes grey (Canities) with chronological aging [5] regardless of gender or race. Aging of hair is comprised of two important components, namely weathering of hair shaft and aging of hair follicle. In weathering, there is degeneration of hair fiber that progresses from the root to the tip and in aging of hair follicle, there is reduced melanocyte

function and decreased hair production [5, 6]. Greying is believed to have a multifactorial etiology which includes genetic component, environmental factors, nutritional factors, oxidative stresses etc.

The primary cause of premature hair greying (PHG) is considered to be genetic and other causes include autoimmune disorders such as vitiligo, pernicious anemia and autoimmune thyroid disorders. It is also known to have syndromic associations (e.g. Werner syndrome). Environmental factors such as ultraviolet light and climate, smoking, drugs, deficiencies of trace elements and nutritional deficiencies also play a role in occurrence of PHG[7].

It is also considered that photodamage which plays a major role in skin aging does not hasten greying of hair [6]. But the exact cause or pathogenesis has not been detected yet [5].

Bhat et al. reported that serum calcium levels and Vitamin D3 levels were significantly lower in patients with PHG [7]. Premature hair graying has also been linked to decreased bone mineral density. Calcium has also been involved in some steps of melanogenesis [7, 8]. Among these, Vitamin D has gained special attention because it helps in the growth and proper functioning of melanocytes, the cells responsible for producing melanin, the pigment that gives hair its color. When Vitamin D levels are low, melanocyte activity may reduce, which can lead to early loss of pigment in hair [2].

Objectives: To assess the association between serum Vitamin D levels and premature canities by comparing Vitamin D status among patients with premature canities and age- and sex-matched healthy individuals.

Materials and Methods

This study was a cross-sectional analytical study carried out for one year in the Department of Department of Dermatology, Venereology, and Leprosy**,** Mata Gujri Memorial Medical College & Lion's Seva Kendra Hospital, Kishanganj, Bihar after getting Institutional Ethics Committee approval.

We included 74 patients who had premature graying of hair and 74 healthy individuals of the same age and sex without early graying. These healthy individuals served as the control group.

All participants who met the inclusion and exclusion criteria were selected for the study. Written informed consent was taken from each participant.

Inclusion Criteria of Cases

- More than 5 grey hairs
- Age of onset before 25 years
- Patients who have given consent for study

Inclusion Criteria of Controls

- Age, Sex matched healthy controls are taken for study
- Controls who have given consent for study

Exclusion Criteria of Cases

- Patients having a history of vitiligo
- Patients having history of topical application or systemic drug/ supplement intake and use of hair dye in the past 6 months
- Patients who had taken chloroquine, epidermal growth factor receptor inhibitors and interferon-alpha (IFN-a) in the last six months.

Exclusion Criteria of Controls

- Patients having any systemic/chronic illness or on vitamin D supplement

A detailed history was taken, including age of onset of graying, family history, lifestyle habits, and any medical history. Each participant then underwent a complete clinical examination. Blood samples were collected to measure their serum Vitamin D levels.

All the collected information was studied to find out if low Vitamin D could be a reason for early white hair.

Results

Patient 1 **Patient 2** **Patient 3** **Patient 4**

Figure 1 [Patients 1-4]: Patients of Canities

In the study group of 74 individuals with premature graying [Fig 1], 45 participants (60.8%) were found to have Vitamin D deficiency, showing that more than half of them had low levels. In contrast, among the 74 people in the control group, only 21 individuals (28.3%) showed low Vitamin D levels. This means that Vitamin D deficiency was more than twice as common in patients with premature canities compared to those without graying [Fig. 2].

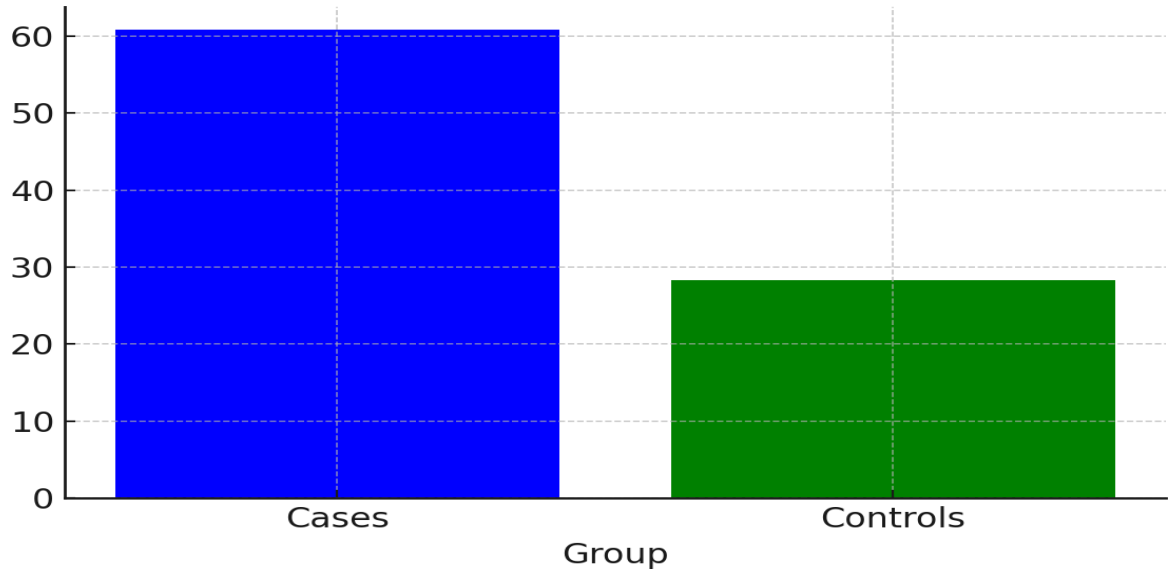

Figure 2: Comparison of Vitamin D deficiency in Cases & controls (in percentage)

Discussion

The appearance of hair plays an important role in people overall physical appearance and self-perception. Premature graying of hair with unclear etiology is a common cause of referral to dermatologists. Premature graying occurs more commonly without any underlying pathology but is said to be inherited in autosomal dominant way. Hair pigmentation is one of the most conspicuous phenotype in humans ranging from black, brown, blonde to red [3]. This diversity of hair arises mostly from the quantity and ratio of black-brown melanin and reddish brown pheomelanin. It has been found to be associated with a wide range of syndrome like Werners syndrome and many AI disorders such as vitiligo, pernicious anemia, AI thyroiditis. The genetic basis for this diversity has recently attracted much attention among dermatologists, geneticists and pigment researchers, leading to the conclusion that interaction of several pigment genes play a major role in determining human hair color [7, 9, 10, 11].

The study shows a markedly higher prevalence of Vitamin D deficiency in individuals with premature canities compared to the controls. The noticeable difference between the two groups suggests a possible link between low Vitamin D and early graying of hair. This significant difference suggests that inadequate Vitamin D may contribute to early hair depigmentation. With the help of Chi square test, p value calculation was done and p value came = 0.0001 which is less than 0.05 So it is statistically significant. Statistical analysis confirmed that this difference was not by chance, making the association meaningful. Bhat RM et al study [2013] [7] has noted that serum calcium and vitamin D3 levels were significantly lower in patients with premature graying of hair. Vitamin D3 levels were either deficient or insufficient in all the individuals of case group indicating probably an important role in pigmentation of the hair. We could not find any studies related to the role of vitamin D3 in premature graying of hair [7].

Many studies investigated the hair metal ions contents in different hair colors with controversial results. There are only a few studies assessing the level of trace elements in the body [12-14]. Naieni et al. in their study observed that low serum copper concentrations but not effect on S. Iron and zinc levels [12]. Premature hair graying has also been linked to decreased bone mineral density. Calcium has also been involved in some steps of melanogenesis [8]. This prompted us to investigate the levels of vitamin D3 and calcium in this study.

Chouhan V et al study, 2025 [15] has revealed that the mean age of participants was 21.47±5.94 years, with the highest prevalence in the 15–20 age group. A positive family history of PHG was found in 57.14% of cases, and 40% reported stress as a contributing factor. Notably, serum vitamin B12 (mean 212.34±179.00 pg/mL; r=-0.61; p=0.01) and vitamin D levels (mean 18.41±15.39 ng/mL; r=-0.52; p=0.01) showed a statistically significant inverse correlation with PHG severity. Hemoglobin, ferritin, and calcium levels did not show a significant association. Vitamin B12 and

vitamin D deficiencies are significantly associated with the severity of premature canities. Early nutritional assessment and supplementation may serve as effective strategies for managing PHG [15]. This dose–response pattern supports a causal link: vitamin B12 deficiency impairs melanocyte DNA synthesis and melanin production [4, 15], while vitamin D receptor signaling governs keratinocyte differentiation and melanogenesis [16, 17]. Although various vitamins and minerals such as biotin, calcium pantothenate, zinc, copper, and selenium are being prescribed, the results have not been promising. Calcium pantothenate is a commonly prescribed agent for PGH. Pasricha reported the cases of successful treatment of PGH in two adolescent girls treated with 200 mg of calcium pantothenate daily. They further investigated on 39 patients and concluded that high doses (200 mg/day) were beneficial for PGH. In addition, when combined with gray hair avulsion therapy, it yielded better results. Not all gray hair that were avulsed grew back as gray hair [4, 18].

Conclusion

The study findings show that Vitamin D deficiency was much more common in individuals with premature graying compared to those without. This significant association suggests that low Vitamin D levels may play an important role in the early loss of hair pigment. Timely correction of low Vitamin D levels may help in reducing progression and potentially preventing premature graying.

References

1. Tobin DJ, Paus R. Graying: Gerontobiology of the hair follicle pigmentary unit. Exp Gerontol. 2001;36:29–54.
2. Panhard S, Lozano I, Loussouarn G. Greying of the human hair: A worldwide survey, revisiting the ‘50’ rule of thumb. Br J Dermatol. 2012;167:865–73.
3. Ito S, Wakamatsu K. Diversity of human hair pigmentation as studied by chemical analysis of eumelanin and pheomelanin. J Eur Acad Dermatol Venereol. 2011;25:1369–80.
4. Kumar AB, Shamim H, Nagaraju U. Premature Graying of Hair: Review with Updates. Int J Trichology. 2018 Sep-Oct;10(5):198-203. doi: 10.4103/ijt.ijt_47_18. PMID: 30607038; PMCID: PMC6290285.
5. Chandran S, Simon SA, George AE. A Clinical Study of Premature Canities and Its Association with Hemoglobin, Ferritin and Calcium Levels. Indian J Dermatol. 2022 May-Jun;67(3):216-221. doi: 10.4103/ijd.IJD_642_20. PMID: 36386090; PMCID: PMC9644779.
6. Tobin DJ. Aging of the hair follicle pigmentation system. Int J Trichology. 2009 Jul;1(2):83-93. doi: 10.4103/0974-7753.58550. PMID: 20927229; PMCID: PMC2938584.
7. Bhat RM, Sharma R, Pinto AC, Dandekeri S, Martis J. Epidemiological and investigative study of premature graying of hair in higher secondary and pre-university school children. Int J Trichology. 2013 Jan;5(1):17-21. doi: 10.4103/0974-7753.114706. PMID: 23960391; PMCID: PMC3746220.
8. Orr-Walker BJ, Evans MC, Ames RW, Clearwater JM, Reid IR. Premature hair graying and bone mineral density. J Clin End ocrinol Metab. 1997 Nov;82(11):3580-3. doi: 10.1210/jcem.82.11.4338. PMID: 936051 0.
9. Gerstenblith MR, Shi J, Landi MT. Genome-wide association studies of pigmentation and skin cancer: A review and meta-analysis. Pigm ent Cell Melanoma Res. 2010;23:587–606
10. Valenzuela RK, Henderson MS, Walsh MH, Garrison NA, Kelch JT, Cohen-Barak O, et al. Predicting phenotype from genotype: Normal pigmentation. J Forensic Sci. 2010;55:315–22.
11. Branicki W, Liu F, van Duijn K, Draus-Barini J, Pośpiech E, Walsh S, et al. Model-based prediction of human hair color using DNA variants. Hum Genet. 2011;129:443–54.
12. Fatemi Naieni F, Ebrahimi B, Vakilian HR, Shahmoradi Z. Serum iron, zinc, and copper concentration in premature graying of hair. Biol Trace Elem Res. 2012;146:30–4.
13. Heath ML, Sidbury R. Cutaneous manifestations of nutritional deficiency. Curr Opin Pediatr. 2006;18:417–22.
14. Bertazzo A, Costa C, Biasiolo M, Allegri G, Cirrincione G, Presti G. Determination of copper and zinc levels in human hair: Influence of sex, age, and hair pigmentation. Biol Trace Elem Res. 1996;52:37–53.
15. Chouhan V, Saxena N, Padhiyar V, Sharma H. Clinical Study of Premature Canities and Its Association with Hemoglobin, Serum Calcium, Vitamin B12, Vitamin D and Ferritin Levels. SSR Inst Int J Life Sci., 2025; 11(2): 7265-7270.
16. Nigam P, Nigam P. Premature greying of hair (premature canities): a concern for parent and child. J Pigment Disord., 2017; 4(1): 1–6.
17. Dawber RP, Gummer CL. The colour of the hair. In: Dawber R, editor. Diseases of the Hair and Scalp. 3rd ed. Oxford: Blackwell Science; 1997; pp. 397–416.
18. Pasricha JS. Effect of grey hair evulsion on the response to calcium pantothenate in premature grey hairs. Indian J Dermatol Venereol Leprol. 1986;52:77–80.