

# Comparative Study of Micronutrient Deficiency in Prepubertal & Post-pubertal Patients of Premature Canities

Prashant Kumar Mishra<sup>1</sup>, Anil Kumar Gupta<sup>2</sup>, Rajkumar<sup>3</sup>

<sup>1</sup> Junior Resident, Department of Dermatology Venereology & Leprology Baba Raghav Das Medical College, Gorakhpur, Uttar Pradesh, India

<sup>2</sup> Professor, Department of Dermatology Venereology & Leprology Baba Raghav Das Medical College, Gorakhpur, Uttar Pradesh, India

<sup>3</sup> Associate Professor, <sup>3</sup> Department of Dermatology Venereology & Leprology Baba Raghav Das Medical College, Gorakhpur, Uttar Pradesh, India

Corresponding Author: Prashant Kumar Mishra

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## ABSTRACT

**Background:** Premature canities is a very common problem. Patients with premature canities seek medical care for cosmetic concern but sometimes it may be associated with some underlying disease or deficiency state.

**Aim:** Comparison of prevalence of certain micronutrient deficiency in prepubertal and post-pubertal patients of premature canities.

**Material and Method:** An observational study was done on 40 self-reported cases of premature canities. Each patient was assessed for serum level of haemoglobin, ferritin, vitamin D3 and vitamin B12. Patients were divided into two groups, prepubertal patients were included in group-A and post-pubertal patients were included in group-B.

**Result:** Haemoglobin deficiency was present in 75% patients of group-A and 25% patients of group-B. Ferritin deficiency was present in 62.5% patients of group-A and 37.5% patients of group-B. Vitamin D3 deficiency was present in 95.84% patients of group-A and 75% patients of group-B. Vitamin B12 deficiency was present in 83.34% patients of group-A and 43.75% patients of group-B. There was statistically significant difference between deficiency of haemoglobin and vitamin B12 in group-A and group-B, p value being 0.0018 and 0.0883 respectively.

**Conclusion:** Prepubertal cases of premature canities are more prone to have underlying micronutrient deficiency.

**Keywords:** premature canities, micronutrient deficiency, prepubertal, post-pubertal

## INTRODUCTION

Hair has served many functions during evolution of mammals into mankind. Main role of hair in humans is to serve as cosmetic tool. Hair is divided into hair shaft and hair follicle. Each hair follicle goes into repeated cycle of hair production and hair shedding. Hair cycle consists of three phases: anagen, catagen and telogen. Similarly melanogenesis in hair follicle is also cyclical

in nature.<sup>(3)</sup> Melanocyte reservoir in hair follicle is present in outer root sheath. Transfer of melanocytes from outer root sheath to hair bulb forms the hair bulb melanocytes. Melanogenesis occurs in hair bulb melanocytes, it starts in early anagen phase and stops in catagen phase only to start again in next anagen phase. There occurs transfer of melanin from hair bulb melanocytes to keratinocytes of hair cortex

which provides colour to hair.<sup>(1,3)</sup> Production of more eumelanin gives darker colour while more pheomelanin gives lighter colour to hair. Canities or hair greying occurs in all people as a result of aging. Canities is said to be premature if it occurs before the age of 20 years in white people, before 25 years in people of Asians origin and before 30 years in black people.<sup>(2,3)</sup> Etiopathogenesis of premature canities is not completely known. There are certain genetic factors and some premature aging syndromes which are established causes of premature canities. Atopic diathesis and autoimmune disorders like pernicious anaemia and hypothyroidism are proved to be associated with premature canities.<sup>(1,3,4)</sup> Apart from that stress, smoking and various micronutrient deficiencies have been found to be associated with premature greying of hair.<sup>(3,4)</sup> Haemoglobin, vitamin D3, vitamin B12 and ferritin were found to be deficient in many patients of premature canities. Patients usually seek treatment just for the cosmetically unacceptable grey hair but these deficiencies might have deleterious effect on overall health of patients. So we seek to know if there is a relationship between age of onset of canities and deficiency of these elements.

## MATERIAL & METHOD

An observational study was done in department of Dermatology Venereology & Leprology at Baba Raghav Das Medical College Gorakhpur over a period of one year from august 2022 to July 2023. Study was carried out on total 40 patients with diffuse greying of hair who were below 25 years of age when their greying started. Informed written consent of each patient or their guardian(in case of minor) was taken and approval of college ethical committee was taken prior to study. Patients with family history of premature canities and patients with history of atopy or thyroid dysfunction were excluded from study. Patients who smoke or were taking nutritional supplements within last three month of study

were not included in study. Patients having any acute illness, any chronic inflammatory disease or malabsorption were also excluded from study. Patients were divided in two groups based on age of onset of canities. Patients with age of onset of canities before 13 years were included in group-A(prepubertal) and those after 13 years were included in Group-B(post-pubertal). There were 24 patients in group-A and 16 patients in group-B. Venous blood of each patient was taken under aseptic precautions and sent to laboratory for evaluation of serum level of haemoglobin, ferritin, vitamin D3 and vitamin B12. Statistical analysis of the obtained data was done and p value was calculated. Following cut-off value was used as measure of deficiency-

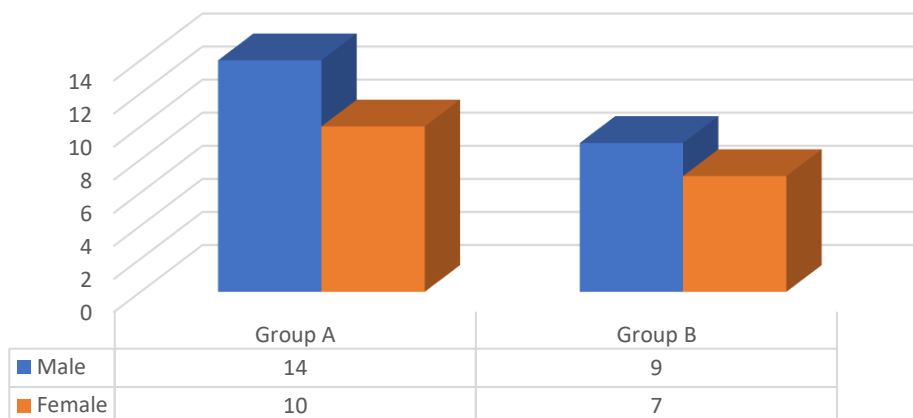
Table 1: cut-off value for deficiency state of parameters used in study

Deficiency state	Laboratory value
Haemoglobin	< 10mg/dL
Ferritin < 15 years age	<7ng/mL
>15 years male	<22ng/mL
>15 years female	<10ng/mL
Vitamin D3	<25mmol/L
Vitamin B12	<25pmol/L

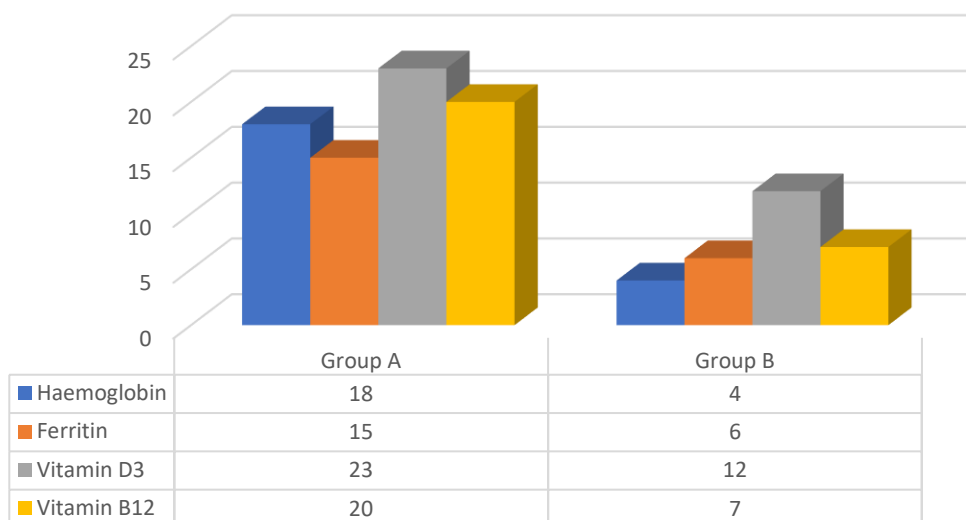
## RESULT

In our study group-A had 14(58.34%) male and 10(41.67%) female patients while group-B had 9(56.25%) male and 7(43.75%) female patients. Mean age of onset of canities in group-A was 11.3 years and in group-B was 15.2 years. Deficiency of vitamin D3 was most common finding in both groups, it was present in 23(95.84%) patients of group-A and 12(75%) patients of group-B. Deficiency of vitamin B12 was present in 20(83.34%) patients of group-A and 7(43.75%) patients of group-B. Haemoglobin deficiency was present in 18(75%) patients of group-A and 4(25%) patients of group-B. Ferritin deficiency was present in 15(62.5%) patients of group-A and 6(37.5%) patients of group-B. There was statistically significant difference between deficiency of haemoglobin and vitamin B12 in group-A and group-B, p value being 0.0018 and 0.0883 respectively.

**Chart 1 : Comparision of sex distribution between group A (prepubertal) and group B(post-pubertal) cases of premature canities**



**Chart 2: Comparision of deficiencies between prepubertal(group A) & post pubertal (group B) cases of premature canities**



**Table 2: comparison of deficiencies between prepubertal(group-A) & post-pubertal (group-B) patients of premature canities**

	Group-A	Group-B	p value
Haemoglobin deficiency	18(75%) patients	4(25%) patients	0.0018
Ferritin deficiency	15(62.5%) patients	6(37.5%) patients	0.1208
Vitamin D3 deficiency	23(95.84%) patients	12(75%) patients	0.1376
Vitamin B12 deficiency	20(83.34%) patients	7(43.75%) patients	0.0883

## DISCUSSION

Hair as a protective ectodermal appendage is characteristic feature of all mammals. Hair is part of pilosebaceous unit which includes hair follicle, hair bulb, shaft of the hair,

sebaceous gland and arrector pili muscle.<sup>(11,12)</sup> Development of hair occurs from epidermis during initial 3-4 months of embryonic life.<sup>(11)</sup> Apart from protective function hair primarily serves as means of

social expression and cosmetic appearance. Hair in good colour texture and density is regarded as measure of beauty. Eventually everyone has to face greying of their hairs as they age but greying prior to some particular age can be emotionally disturbing to patients. There is no specific cut-off age for premature greying in Indian patients. Some authors consider 20 years while others consider 25 years as the cut-off age for premature canities in Indian patients. There are multiple factors that can lead to premature canities but exact etiopathogenesis is still not known.

Previous studies on premature canities had done comparison between cases and healthy controls. We found no comparative study between prepubertal and post-pubertal cases of premature canities. Studies done by B.K. Brar et.al. showed significant deficiency of ferritin, vitamin D and vitamin B12 in cases of premature canities as compared to healthy controls.<sup>(8)</sup> Study done by Pavani P et. al. showed presence of anaemia in 34% cases of premature canities.<sup>(6)</sup> According to study done by Yadav D et.al. there was significant difference between deficiency of vitamin B12 in cases and controls.<sup>(5)</sup>

In our study we did not use healthy control for comparison of deficiencies. We compared age of onset of canities to deficiency of haemoglobin, ferritin, vitamin D3 and vitamin B12. We found in our study that patients in both group were deficient in haemoglobin, ferritin, vitamin d3 and vitamin B12 but deficiency of haemoglobin and vitamin B12 was significantly more common in prepubertal cases of premature canities.

## CONCLUSION

Premature canities is not just a cosmetic problem. Many patients of premature canities have underlying deficiency of vitamin B12, vitamin D3, haemoglobin and ferritin. These deficiencies are more common in prepubertal patients of premature canities. Each patient of premature canities should be screened for these deficiencies.

## Declaration by Authors

**Ethical Approval:** ethical approval from college ethics committee was taken prior to start of study.

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**Conflict of Interest:** The authors declare no conflict of interest.

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