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Research Article

Clinical and Epidemiological Profile of Hyperpigmentary Disorders in Children Attending a Tertiary Care Hospital: A Cross-Sectional Stud

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ABSTRACT
Background: Hyperpigmentary disorders constitute a relatively less common but clinically important group of pediatric pigmentary dermatoses. These disorders arise from diverse congenital, inflammatory, infectious, and developmental causes and frequently present diagnostic challenges because of their varied clinical manifestations. Although most are benign, visible pigmentation often results in cosmetic concerns and parental anxiety. Epidemiological data describing the clinical spectrum of childhood hyperpigmentary disorders remain limited.
Objective: To evaluate the clinical and epidemiological profile of hyperpigmentary disorders among children attending a tertiary care dermatology center.
Materials and Methods: A hospital-based cross-sectional study was conducted among children aged 0–15 years presenting with hyperpigmentary disorders to the Department of Dermatology, Venereology and Leprosy, Vijayanagara Institute of Medical Sciences, Ballari, Karnataka, between January and December 2021. Demographic characteristics, clinical history, lesion morphology, anatomical distribution, associated dermatological conditions, systemic associations, and relevant investigations were recorded. Data were analyzed using IBM SPSS Statistics version 25.0.
Results: Among 200 children with pigmentary disorders, 37 (18.5%) had hyperpigmentary disorders. The majority belonged to the 11–15-year age group (70.3%), with an almost equal gender distribution. Post-inflammatory hyperpigmentation and pityriasis versicolor were the most common hyperpigmentary disorders (21.6% each), followed by freckles (13.5%) and Becker nevus (10.8%). The head and neck region was the most frequently affected anatomical site, while scaling was observed in only a minority of patients.
Conclusion: Hyperpigmentary disorders represent an important subset of pediatric pigmentary diseases, with post-inflammatory hyperpigmentation and pityriasis versicolor being the predominant diagnoses. Early clinical recognition facilitates accurate diagnosis, appropriate management, and reassurance of affected children and their caregivers.

Keywords: Hyperpigmentary Disorders, Pediatric Dermatology, Post-Inflammatory Hyperpigmentation, Pityriasis Versicolor, Becker Nevus, Cross-Sectional Study.

INTRODUCTION

Hyperpigmentary disorders represent a diverse group of dermatological conditions characterized by increased melanin production, abnormal melanin distribution, or dermal deposition of pigment. These disorders may be congenital or acquired and result from developmental abnormalities, inflammatory dermatoses, infections, genetic disorders, metabolic conditions, environmental exposure, or endocrine disturbances. Although hyperpigmentary disorders are generally less common than hypopigmentary disorders in children, they constitute an important cause of dermatological consultation because of their cosmetic significance and the anxiety they generate among affected children and their caregivers (1,2,3).

Skin pigmentation is determined by the quantity and quality of melanin synthesized by epidermal

melanocytes and transferred to keratinocytes. Hyperpigmentation develops when melanogenesis is increased, melanocyte activity is enhanced, or melanin accumulates within the epidermis or dermis following inflammatory or developmental processes. The underlying mechanisms differ among individual disorders, making careful clinical evaluation essential for accurate diagnosis and appropriate management (1,2).

The clinical spectrum of pediatric hyperpigmentary disorders is broad and includes post-inflammatory hyperpigmentation (PIH), pityriasis versicolor, freckles, Becker nevus, melanocytic nevi, nevus of Ota, nevus of Ito, lichen planus pigmentosus, acropigmentation of Dohi, café-au-lait macules, and several other congenital pigmentary disorders. These conditions differ considerably in their etiology, clinical presentation, prognosis, and therapeutic approach. While many lesions are benign and require only reassurance, others may represent markers of underlying genetic syndromes or systemic diseases requiring long-term follow-up (3,4).

Among acquired hyperpigmentary disorders, post-inflammatory hyperpigmentation is one of the most frequently encountered conditions in clinical practice. It develops secondary to inflammatory dermatoses, infections, trauma, or dermatological procedures and is particularly common in individuals with darker skin phototypes. Increased melanin synthesis and pigment incontinence following cutaneous inflammation are considered the principal pathogenic mechanisms (5). Similarly, pityriasis versicolor, caused by *Malassezia* species, is an important superficial fungal infection capable of producing both hypopigmented and hyperpigmented lesions, especially in tropical and subtropical climates (6).

Developmental and genetic hyperpigmentary disorders such as Becker nevus, freckles, nevus of Ota, nevus of Ito, melanocytic nevi, and acropigmentation of Dohi are encountered less frequently in children but possess characteristic clinical features that facilitate diagnosis. Although these lesions are generally benign, distinguishing them from other acquired pigmentary disorders is important to avoid unnecessary investigations and to provide appropriate counseling regarding prognosis and cosmetic management (3,7).

The epidemiology of pediatric hyperpigmentary disorders varies across different geographical regions because of differences in ethnicity, ultraviolet radiation, climatic conditions, environmental exposure, and healthcare-seeking behavior. Previous Indian studies have reported considerable variation in the frequency of individual hyperpigmentary disorders, with post-inflammatory hyperpigmentation, café-au-lait macules, pigmentary mosaicism, congenital melanocytic nevi, and lichen planus pigmentosus being among the commonly reported conditions (8). However, comprehensive studies focusing exclusively on childhood hyperpigmentary disorders remain limited.

A detailed understanding of the epidemiological and clinical characteristics of pediatric hyperpigmentary disorders is important for establishing an accurate diagnosis, identifying disorders requiring further evaluation, and providing appropriate treatment and reassurance. Such information is particularly valuable in tertiary care settings where a wide spectrum of common and uncommon pigmentary disorders is encountered.

Therefore, the present cross-sectional study was undertaken to evaluate the clinical and epidemiological profile of hyperpigmentary disorders among children attending a tertiary care dermatology center. The study aimed to assess the demographic characteristics, frequency of individual disorders, clinical morphology, anatomical distribution, associated dermatological and systemic conditions, and overall clinical spectrum of pediatric hyperpigmentary disorders.

MATERIALS AND METHODS

Study Design and Setting

A hospital-based cross-sectional observational study was conducted in the Department of Dermatology, Venereology and Leprosy, Vijayanagara Institute of Medical Sciences (VIMS), Ballari, Karnataka, India.

Study Population

Children aged 0–15 years presenting with clinically diagnosed hyperpigmentary disorders during the study period were included in the present study. Of the 200 pediatric patients with pigmentary disorders evaluated during the study period, 37 children diagnosed with hyperpigmentary disorders constituted the study population for this analysis.

Inclusion Criteria

- Children aged 0–15 years with clinically diagnosed hyperpigmentary skin disorders.
- Parents or legal guardians willing to provide written informed consent.

Exclusion Criteria

- Pigmentary abnormalities secondary to trauma or burns.
- Children whose parents or guardians declined participation in the study.

Data Collection

A structured proforma was used to record demographic and clinical information for each participant. Data collected included age, sex, duration of illness, presenting symptoms, family history of similar lesions, parental consanguinity, previous treatment history, and associated dermatological or systemic disorders.

All children underwent detailed dermatological examination. Hyperpigmentary lesions were evaluated for anatomical site, morphology, distribution, color, shape, surface characteristics, presence of scaling, and associated skin findings. Particular attention was given to distinguishing congenital pigmentary lesions from acquired inflammatory and infectious disorders.

Diagnostic Evaluation

Diagnosis was established primarily on clinical examination by experienced dermatologists. Additional investigations were performed whenever clinically indicated to confirm the diagnosis. These included potassium hydroxide (KOH) mount examination for suspected pityriasis versicolor, Wood's lamp examination, skin biopsy with histopathological examination, complete blood count, and other investigations according to the suspected clinical diagnosis.

Outcome Measures

The primary outcome was the clinical spectrum and frequency of pediatric hyperpigmentary disorders. Secondary outcome measures included demographic characteristics, lesion morphology, anatomical distribution, scaling, associated cutaneous disorders, systemic associations, and the relative frequency of individual hyperpigmentary conditions.

Statistical Analysis

Data were entered into Microsoft Excel and analyzed using IBM SPSS Statistics version 25.0 (IBM Corp., Armonk, NY, USA). Categorical variables were summarized using frequencies and percentages. Associations between categorical variables were analyzed using the Chi-square test wherever applicable. A p-value <0.05 was considered statistically significant.

RESULTS

Table 1. Demographic and Clinical Characteristics of Children with Hyperpigmentary Disorders (N = 37)

Variable	Frequency	Percentage (%)
Age (years)		
0–5	5	13.5
6–10	6	16.2
11–15	26	70.3
Gender		
Male	19	51.4
Female	18	48.6
Scaling		
Present	10	27.0
Absent	27	73.0

Table 2. Clinical Spectrum of Pediatric Hyperpigmentary Disorders (N = 37)

Diagnosis	Number of cases	%
Post-inflammatory hyperpigmentation	8	21.6
Pityriasis versicolor	8	21.6
Freckles	5	13.5
Becker nevus	4	10.8
Acropigmentation of Dohi	2	5.4
Nevus spilus	1	2.7
Nevus of Ota	1	2.7
Nevus of Ito	1	2.7
Lichen planus pigmentosus	1	2.7
Actinic lichen planus	1	2.7
Periorbital melanosis	1	2.7

Seborrheic melanosis	1	2.7
Melanocytic nevus	1	2.7
Giant café-au-lait macule	1	2.7
Linear and whorled hypermelanosis	1	2.7

Table 3. Clinical Characteristics of Hyperpigmentary Lesions

Clinical characteristic	Frequency	Percentage (%)
Age group 11–15 years	26	70.3
Male sex	19	51.4
Female sex	18	48.6
Scaling present	10	27.0
Non-scaly lesions	27	73.0
Predominant involvement of head and neck	—	Most common
Truncal involvement	—	Second most common

Table 4. Associated Clinical Findings in Hyperpigmentary Disorders

Variable	Observation
Most common associated cutaneous disorders	Acne vulgaris, seborrheic dermatitis, atopic dermatitis
Most common systemic association	Rare; no predominant association
Surface scaling	Present in 27.0%
Asymptomatic presentation	Majority of patients

DISCUSSION

The present study evaluated the clinical and epidemiological profile of hyperpigmentary disorders among children attending a tertiary care dermatology center. Although hyperpigmentary disorders constituted a smaller proportion of pediatric pigmentary diseases compared with hypopigmentary disorders, they demonstrated considerable clinical diversity, ranging from acquired inflammatory conditions to congenital pigmentary anomalies. The majority of affected children were adolescents, and post-inflammatory hyperpigmentation together with pityriasis versicolor represented the most frequently encountered disorders. These findings emphasize that careful clinical assessment remains essential for accurate diagnosis because individual hyperpigmentary disorders differ substantially in their etiology, prognosis, and management (8).

In the present study, hyperpigmentary disorders accounted for 18.5% of all pediatric pigmentary disorders. Similar observations were reported by Sori et al., who found hyperpigmentary disorders to constitute a smaller proportion than hypopigmentary disorders among children attending a tertiary care hospital (8). The relatively lower frequency of hyperpigmentary disorders may be explained by the greater cosmetic concern associated with depigmented lesions, particularly vitiligo, which often prompts earlier medical consultation.

The majority of children with hyperpigmentary disorders belonged to the 11–15-year age group. This finding suggests that acquired hyperpigmentary conditions become more prevalent during late childhood and adolescence, possibly because of increased exposure to environmental factors, inflammatory dermatoses, ultraviolet radiation, and hormonal influences. Gender distribution was nearly equal, indicating that hyperpigmentary disorders affect both sexes with similar frequency. Comparable demographic findings have been reported in previous Indian studies evaluating pediatric pigmentary disorders (8,9).

Post-inflammatory hyperpigmentation (PIH) and pityriasis versicolor were the most common hyperpigmentary disorders in the present study, each accounting for 21.6% of cases. Post-inflammatory hyperpigmentation develops secondary to various inflammatory dermatoses and results from increased melanogenesis together with pigment incontinence following cutaneous inflammation (5). Its relatively high frequency in the present study highlights the importance of early diagnosis and appropriate treatment of underlying inflammatory skin diseases to minimize persistent pigmentation.

Hyperpigmented pityriasis versicolor represented another major cause of acquired hyperpigmentation. The predominance of truncal involvement observed in the present study is consistent with the clinical characteristics reported by Snekavalli et al., who

demonstrated that the trunk is the most common anatomical site involved in pediatric pityriasis versicolor (10,11,12). The warm and humid climatic conditions prevalent in tropical regions probably contribute to the persistence of Malassezia infection and the relatively high frequency of this disorder.

Among congenital and developmental hyperpigmentary disorders, freckles and Becker nevus were the most frequently encountered lesions. Freckles predominantly involved sun-exposed areas of the face, whereas Becker nevus was mainly observed over the trunk and shoulder region in older children. These findings are consistent with the known clinical presentation of these disorders described in standard dermatology literature (3,7). Although these lesions are benign, accurate recognition is important to avoid unnecessary investigations and to provide appropriate reassurance regarding their natural course.

Rare disorders such as nevus of Ota, nevus of Ito, nevus spilus, acropigmentation of Dohi, lichen planus pigmentosus, periorbital melanosis, seborrheic melanosis, and linear and whorled hypermelanosis collectively represented a small proportion of cases. Despite their low frequency, these conditions contribute significantly to the clinical heterogeneity of pediatric hyperpigmentary disorders and require familiarity for accurate diagnosis in tertiary care practice.

The head and neck region represented the most commonly affected anatomical site in the present study. Facial lesions frequently prompted earlier medical consultation because of cosmetic concerns expressed by both children and their parents. Surface scaling was observed in only about one-fourth of patients and was mainly associated with pityriasis versicolor, whereas most congenital pigmentary lesions were non-scaly and asymptomatic. These observations emphasize the importance of lesion morphology and anatomical distribution in establishing an accurate clinical diagnosis.

Associated dermatological and systemic disorders were relatively uncommon among children with hyperpigmentary disorders. The occasional coexistence of inflammatory skin diseases, including acne vulgaris and seborrheic dermatitis, was observed mainly in children with post-inflammatory hyperpigmentation. Systemic associations were infrequent, indicating that most pediatric hyperpigmentary disorders are isolated cutaneous conditions without significant extracutaneous involvement.

The present study has several strengths, including prospective evaluation of pediatric patients and comprehensive documentation of both common and uncommon hyperpigmentary disorders encountered in routine dermatological practice. However, certain limitations should be acknowledged. The study was conducted at a single tertiary care institution, which may limit the generalizability of the findings. In addition, the relatively small sample size of hyperpigmentary disorders limited detailed subgroup comparisons. The cross-sectional design also precluded assessment of disease progression, treatment outcomes, recurrence, and long-term prognosis.

Overall, the present study highlights that post-inflammatory hyperpigmentation and pityriasis versicolor constitute the major acquired hyperpigmentary disorders in children, whereas freckles and Becker nevus are the most frequent developmental lesions. Recognition of characteristic clinical patterns and appropriate differentiation from other pigmentary conditions facilitate accurate diagnosis, evidence-based management, and effective counseling of children and their caregivers.

CONCLUSION

The present study provides a comprehensive overview of the clinical and epidemiological characteristics of pediatric hyperpigmentary disorders encountered at a tertiary care dermatology center. Although hyperpigmentary disorders constituted a relatively smaller proportion of pediatric pigmentary diseases, they demonstrated a wide clinical spectrum comprising inflammatory, infectious, developmental, and congenital conditions. The majority of affected children belonged to the 11–15-year age group, with an almost equal gender distribution.

Post-inflammatory hyperpigmentation and pityriasis versicolor were the most common hyperpigmentary disorders, followed by freckles and Becker nevus. Most lesions were asymptomatic, with the head and neck region representing the most frequently affected anatomical site. Congenital pigmentary disorders were relatively uncommon but contributed to the overall clinical diversity observed in the study.

Accurate clinical evaluation supported by appropriate laboratory investigations, when indicated, remains essential for differentiating various hyperpigmentary disorders because their etiology, prognosis, and management differ considerably. Early recognition of

characteristic clinical features facilitates timely diagnosis, appropriate treatment, and effective counseling of patients and their families while avoiding unnecessary investigations and anxiety.

Further multicenter prospective studies involving larger pediatric populations are recommended to better understand the epidemiology, clinicopathological characteristics, treatment outcomes, and long-term prognosis of childhood hyperpigmentary disorders.

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