E-ISSN 2250-0944
ISSN 2250-1150
doi: 10.31838/ijprt/16.02. 294

Research Article

Clinical Spectrum of Pediatric Hypopigmentary Disorders with Special Emphasis on Childhood Vitiligo: A Cross-Sectional Study

Dr. Shantkumar[1], Dr Ranjitha M S[2*], Dr Sachin Halli[3]
[1]Assistant Professor, Department of Radio diagnosis, Mahavir Institute of Medical Sciences, Vikarabad, Telangana – 501101.
[2*]Assistant Professor, Department of Dermatology, Venereology and Leprosy, Mahavir Institute of Medical Sciences, Vikarabad, Telangana – 501101.
[3]Assistant Professor, Department of Dermatology Venereology and Leprosy, Mahavir Institute of Medical Sciences, Vikarabad, Telangana 501101.
Corresponding Author: Dr Ranjitha M S
Assistant Professor, Department of Dermatology, Venereology and Leprosy, Mahavir Institute of Medical Sciences, Vikarabad, Telangana – 501101.
Email: msranjithacta@gmail.com
Received: 10.06.26, Revised: 13.07.26, Accepted: 12.08.26

ABSTRACT
Background: Hypopigmentary disorders constitute the majority of pigmentary dermatoses encountered in pediatric dermatology. Although most are benign, these disorders frequently cause cosmetic concerns, psychological distress, and anxiety among parents. Childhood vitiligo represents one of the most important acquired hypopigmentary disorders because of its chronic course and significant psychosocial impact.
Objective: To evaluate the clinical spectrum of pediatric hypopigmentary disorders with special emphasis on the demographic profile, clinical characteristics, and disease pattern of childhood vitiligo.
Materials and Methods: A hospital-based cross-sectional study was conducted among children aged 0–15 years presenting with hypopigmentary disorders to the Department of Dermatology, Venereology and Leprosy, Vijayanagara Institute of Medical Sciences, Ballari, Karnataka, between January and December 2021. Clinical history, demographic characteristics, lesion morphology, anatomical distribution, associated findings, and relevant investigations were recorded. Data were analyzed using SPSS version 25.0.
Results: Among 200 children with pigmentary disorders, 163 (81.5%) had hypopigmentary disorders. Vitiligo was the most common hypopigmentary disorder (38.7%), followed by pityriasis alba (30.7%), nevus depigmentosus (11.0%), pityriasis versicolor (8.0%), and post-inflammatory hypopigmentation (6.1%). Most hypopigmentary disorders occurred in the 11–15-year age group with a slight female predominance. Among children with vitiligo, the 6–10-year age group was most commonly affected, while mucosal involvement and Koebner phenomenon were observed in a minority of cases.
Conclusion: Hypopigmentary disorders constitute the predominant pigmentary disorders in children, with vitiligo representing the leading diagnosis. Recognition of characteristic clinical patterns facilitates early diagnosis, appropriate treatment, and effective counseling of patients and their caregivers.

Keywords: Hypopigmentary Disorders, Childhood Vitiligo, Pediatric Dermatology, Pityriasis Alba, Nevus Depigmentosus, Cross-Sectional Study.

INTRODUCTION

Hypopigmentary disorders comprise one of the largest groups of pigmentary dermatoses encountered in pediatric dermatology and include a heterogeneous spectrum of congenital and acquired conditions characterized by partial or complete loss of skin pigmentation. These disorders arise due to abnormalities in melanocyte number, melanocyte function, melanin synthesis, or melanosome transfer and may result from genetic, autoimmune, inflammatory, infectious, nutritional, or developmental causes. Although the majority of hypopigmentary disorders are benign, their visible appearance frequently causes considerable cosmetic concern, psychological distress, and anxiety among affected children and their caregivers (1,3).

Normal skin pigmentation depends on the coordinated interaction between melanocytes

and keratinocytes within the epidermal melanin unit. Alterations in melanocyte development, melanosome formation, or melanin production lead to clinically apparent hypopigmented or depigmented lesions. Pediatric hypopigmentary disorders differ from those encountered in adults with respect to their etiological spectrum, age of onset, clinical manifestations, disease progression, and associated systemic abnormalities. Therefore, accurate clinical evaluation is essential to distinguish benign self-limiting conditions from disorders requiring long-term monitoring and treatment (2).

Among pediatric hypopigmentary disorders, vitiligo is one of the most common acquired depigmenting disorders and results from selective destruction of functional melanocytes. Approximately half of all patients with vitiligo develop the disease before 20 years of age, with a substantial proportion presenting during childhood. Childhood vitiligo differs from adult disease in terms of clinical presentation, distribution, disease activity, autoimmune associations, and prognosis. The disease often has a profound psychosocial impact because lesions commonly involve exposed body sites, adversely affecting self-esteem, social interaction, and quality of life (4,5,6).

Another frequently encountered pediatric hypopigmentary disorder is pityriasis alba, a benign inflammatory dermatosis predominantly affecting children and adolescents. It usually presents as ill-defined hypopigmented patches with fine scaling over the face and has been associated with atopy, xerosis, and excessive sun exposure. Although the condition is self-limiting, its resemblance to vitiligo frequently causes significant parental concern and necessitates careful clinical differentiation (4,7).

Other important hypopigmentary disorders encountered in pediatric practice include nevus depigmentosus, post-inflammatory hypopigmentation, pityriasis versicolor, Hansen's disease, albinism, piebaldism, and several rare congenital pigmentary anomalies. These conditions differ considerably in their etiology, clinical course, management strategies, and long-term prognosis. Appropriate diagnosis is therefore essential to avoid unnecessary investigations and to institute suitable treatment and counseling whenever indicated (3,7).

The epidemiology of pediatric hypopigmentary disorders varies across different populations owing to differences in ethnicity, genetic background, climatic conditions, environmental exposure, healthcare accessibility, and referral patterns. Previous Indian studies have reported varying frequencies of vitiligo, pityriasis alba, post-inflammatory hypopigmentation, and congenital pigmentary disorders among children attending tertiary care hospitals (8,9). Such regional variations highlight the importance of institution-specific epidemiological data for improving diagnostic accuracy and guiding clinical management.

Despite the high frequency of hypopigmentary disorders in pediatric dermatology clinics, comprehensive studies focusing exclusively on their clinical spectrum remain relatively limited. A detailed understanding of their demographic characteristics, lesion morphology, anatomical distribution, associated clinical findings, and disease-specific patterns is essential for early diagnosis, appropriate management, and effective parental counseling.

Therefore, the present cross-sectional study was undertaken to evaluate the clinical spectrum of pediatric hypopigmentary disorders with special emphasis on childhood vitiligo among children attending a tertiary care dermatology center. The study aimed to assess the demographic profile, frequency of individual hypopigmentary disorders, clinical characteristics, anatomical distribution, disease activity, associated findings, and the distinctive clinical features of childhood vitiligo.

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 hypopigmentary disorders during the study period were screened for inclusion. Out of 200 pediatric patients with pigmentary disorders, 163 children diagnosed with hypopigmentary disorders constituted the study population for the present analysis.

Inclusion Criteria

- Children aged 0–15 years presenting with one or more hypopigmentary skin disorders.
- Parents or guardians willing to provide written informed consent.

Exclusion Criteria

- Pigmentary abnormalities secondary to trauma or burns.

- Children whose parents or guardians declined participation.

Data Collection

Demographic and clinical information was recorded using a structured proforma. Variables collected included age, sex, duration of disease, age at onset, presenting symptoms, family history of similar lesions, parental consanguinity, and previous treatment history.

A detailed dermatological examination was performed for every participant. Lesions were assessed for anatomical site, morphology, shape, distribution, color, presence of scaling, mucosal involvement, and associated cutaneous abnormalities. Disease-specific findings such as Koebner phenomenon, disease activity, and peripheral nerve involvement were evaluated whenever clinically indicated.

Children diagnosed with vitiligo underwent further clinical assessment to determine the type of vitiligo, anatomical distribution, mucosal involvement, disease activity, and the presence of Koebner phenomenon. Patients with pityriasis alba were additionally evaluated for lesion distribution, scaling, and associated symptoms.

Diagnostic Criteria

The diagnosis of hypopigmentary disorders was established primarily on clinical examination by dermatologists. Ancillary investigations were performed whenever necessary to confirm the diagnosis. These included potassium hydroxide (KOH) mount examination for suspected pityriasis versicolor, Wood's lamp examination, slit-skin smear, skin biopsy with histopathological examination, complete blood count, and other relevant investigations according to the suspected clinical diagnosis.

Outcome Measures

The primary outcome was the clinical spectrum and frequency of pediatric hypopigmentary disorders. Secondary outcome measures included demographic profile, anatomical distribution, lesion morphology, disease duration, family history, associated cutaneous disorders, systemic associations, and detailed clinical characteristics of childhood vitiligo.

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 as frequencies and percentages. Associations between categorical variables were analyzed using the Chi-square test wherever appropriate. A p-value <0.05 was considered statistically significant.

RESULTS

Table 1. Demographic and Clinical Characteristics of Children with Hypopigmentary Disorders (N = 163)

Variable	Frequency	Percentage (%)
Age (years)		
0–5	40	24.5
6–10	60	36.8
11–15	63	38.7
Gender		
Male	79	48.5
Female	84	51.5
Scaling		
Present	47	28.8
Absent	116	71.2

Table 2. Clinical Spectrum of Pediatric Hypopigmentary Disorders (N = 163)

Diagnosis	Number of cases	%
Vitiligo	63	38.7
Pityriasis alba	50	30.7
Nevus depigmentosus	18	11.0
Pityriasis versicolor	13	8.0
Post-inflammatory hypopigmentation	10	6.1
Hansen's disease	4	2.5
Albinism	1	0.6
Piebaldism	1	0.6

Progressive macular hypomelanosis	1	0.6
Shagreen patch	1	0.6
Steroid-induced hypopigmentation	1	0.6

Table 3. Clinical Characteristics of Childhood Vitiligo (N = 63)

Variable	Frequency	Percentage (%)
Age (years)		
0–5	5	7.9
6–10	35	55.6
11–15	23	36.5
Gender		
Male	29	46.0
Female	34	54.0
Mucosal involvement		
Present	11	17.5
Absent	52	82.5
Koebner phenomenon		
Present	10	15.9
Absent	53	84.1
Disease activity		
Stable	4	6.3
Active	59	93.7

Table 4. Clinical Characteristics of Pityriasis Alba (N = 50)

Variable	Frequency	Percentage (%)
Age (years)		
0–5	20	40.0
6–10	16	32.0
11–15	14	28.0
Gender		
Male	27	54.0
Female	23	46.0
Scaling present	33	66.0
Itching present	9	18.0

DISCUSSION

The present study evaluated the clinical spectrum of hypopigmentary disorders among children attending a tertiary care dermatology center and demonstrated that hypopigmentary disorders constituted the predominant category of pediatric pigmentary diseases. Vitiligo was the most common diagnosis, followed by pityriasis alba, nevus depigmentosus, pityriasis versicolor, and post-inflammatory hypopigmentation. The study also provides a detailed description of the demographic characteristics, clinical profile, anatomical distribution, and disease-specific features of childhood vitiligo. These findings emphasize the importance of systematic clinical evaluation in children presenting with hypopigmented lesions because early diagnosis facilitates appropriate management and reduces unnecessary parental anxiety.

Vitiligo accounted for 38.7% of all hypopigmentary disorders in the present study, making it the most frequent diagnosis. This observation is comparable with the findings of Sori et al., who also reported vitiligo among the leading pediatric pigmentary disorders in tertiary care practice (8). However, Babu and Prasad observed pityriasis Alba as the most common hypomelanotic disorder in their study population, indicating that the relative frequency of individual hypopigmentary disorders varies across different geographical regions and healthcare settings (9). Such variation may be attributed to climatic conditions, ethnic differences, referral bias, healthcare accessibility, and regional disease prevalence.

Most children with hypopigmentary disorders in the present study belonged to the 11–15-year age group and showed a slight female predominance. Similar demographic

observations have been reported by previous Indian studies evaluating pediatric pigmentary disorders (8,9). The higher frequency among older children may reflect increased visibility of lesions with advancing age as well as greater parental awareness regarding cosmetic skin disorders during adolescence.

Among children with vitiligo, the majority of patients belonged to the 6–10-year age group, while females were slightly more frequently affected than males. These findings are consistent with the clinicoepidemiological study by Reddy and Arun, who also reported female predominance and early childhood onset of vitiligo (10). Childhood vitiligo has unique clinical characteristics compared with adult-onset disease, including earlier presentation, greater facial involvement, lower frequency of autoimmune disorders, and relatively stable disease course in many patients (4,5).

The present study demonstrated mucosal involvement in 17.5% of children with vitiligo, whereas 15.9% exhibited Koebner phenomenon. Although these findings indicate that both features are relatively uncommon, their identification is clinically important because they may reflect greater disease activity and influence treatment planning. Disease activity assessment revealed that most patients had active vitiligo, highlighting the need for early therapeutic intervention to limit disease progression. Previous studies have similarly emphasized the prognostic significance of disease activity and Koebner phenomenon in childhood vitiligo (10).

Pityriasis alba was the second most common hypopigmentary disorder, accounting for 30.7% of cases. Most affected children were below ten years of age, and facial involvement with fine scaling represented the characteristic clinical presentation. Vinod et al. likewise reported facial predominance, frequent scaling, and occurrence during early childhood in their clinicoepidemiological study of pityriasis alba (11). Because pityriasis alba frequently resembles early vitiligo, careful clinical examination is essential to establish the correct diagnosis and avoid unnecessary investigations or prolonged treatment.

Nevus depigmentosus, pityriasis versicolor, and post-inflammatory hypopigmentation collectively accounted for a substantial proportion of hypopigmentary disorders. Nevus depigmentosus was the third most common diagnosis and typically presented as stable congenital hypopigmented lesions. Pityriasis versicolor remained an important infectious cause of hypopigmentation, particularly in older children. Similar observations have been reported by Snekavalli et al., who described hypopigmented lesions as the predominant clinical presentation of pityriasis versicolor in tropical regions (12). Recognition of these disorders is important because their management differs considerably from autoimmune depigmenting disorders such as vitiligo.

The head and neck region represented the most frequently affected anatomical site among children with hypopigmentary disorders as well as among patients with vitiligo. Facial lesions often prompt earlier medical consultation because of cosmetic concerns expressed by both children and parents. This observation is consistent with previously published pediatric studies, which have similarly reported facial predominance among childhood hypopigmentary disorders (8,10).

The present study has several strengths. It includes a relatively large number of pediatric patients and provides a comprehensive evaluation of the clinical spectrum of hypopigmentary disorders with detailed analysis of childhood vitiligo. However, certain limitations should be acknowledged. The study was conducted at a single tertiary care institution, which may limit the generalizability of the findings. The cross-sectional design did not permit assessment of long-term disease progression, recurrence, treatment response, or quality-of-life outcomes. Future multicenter prospective studies involving larger populations are therefore recommended.

Overall, the findings of the present study indicate that vitiligo and pityriasis alba account for the majority of pediatric hypopigmentary disorders encountered in tertiary care practice. Early recognition of characteristic clinical patterns, supported by appropriate diagnostic evaluation whenever necessary, facilitates accurate diagnosis, timely treatment, and effective counseling of children and their families while minimizing psychological distress associated with these visible skin disorders.

CONCLUSION

The present study demonstrates that hypopigmentary disorders constitute the predominant pigmentary dermatoses encountered in pediatric dermatology, with vitiligo representing the most common diagnosis, followed by pityriasis alba, nevus depigmentosus, pityriasis versicolor, and post-inflammatory hypopigmentation. The majority

of affected children were in the late childhood and early adolescent age group, with a slight female predominance. Facial involvement was the most frequent clinical presentation, emphasizing the cosmetic and psychological impact of these disorders on affected children and their families.

Among the various hypopigmentary disorders, childhood vitiligo exhibited distinct clinical characteristics, including predominant involvement of children aged 6–10 years, frequent affection of the head and neck region, occasional mucosal involvement, and the presence of Koebner phenomenon in a minority of patients. Most children had clinically active disease at presentation, highlighting the importance of early recognition and timely therapeutic intervention.

Pityriasis alba remained the second most common hypopigmentary disorder and predominantly affected younger children with characteristic facial lesions and fine scaling. Other disorders, including nevus depigmentosus, pityriasis versicolor, and post-inflammatory hypopigmentation, collectively contributed substantially to the burden of pediatric hypopigmentary diseases and should be considered in the differential diagnosis of childhood hypopigmented lesions.

Overall, careful clinical examination supported by appropriate laboratory investigations, when indicated, enables accurate diagnosis and differentiation among various hypopigmentary disorders. Early diagnosis, evidence-based management, and effective parental counseling are essential to minimize unnecessary anxiety and improve the overall quality of life of affected children.

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