

A Clinico-Epidemiological Study of Hypopigmented and Depigmented Lesions in the Pediatric Age Group

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Abstract

Background: Hypopigmented and depigmented skin lesions represent a significant dermatological concern in children, potentially indicating a wide range of underlying conditions, from benign developmental anomalies to serious systemic disorders. Understanding the epidemiological characteristics and clinical patterns of these lesions is essential for accurate diagnosis and management.

Objective: This study aimed to analyze the clinical and epidemiological patterns of hypopigmented and depigmented lesions in pediatric patients, identify the most common etiologies, and evaluate the impact of demographic factors on the prevalence and distribution of these lesions.

Methods: A cross-sectional study was conducted at two Medical Colleges over two years, including 500 Pediatric and Dermatology patients aged 0-18 years presenting with hypopigmented or depigmented lesions. Detailed clinical evaluations were performed, and diagnoses were confirmed through relevant laboratory investigations. Statistical analyses, including chi-square tests, logistic regression, and ANOVA, were conducted to assess associations between patient demographics, lesion types, and clinical outcomes.

Results: The most common diagnoses were vitiligo (30%), pityriasis alba (25%), and tinea versicolor (20%). Statistically significant associations were observed between lesion type and age group ($p < 0.05$) as well as lesion type and gender ($p < 0.05$). Multivariate analysis revealed that family history of autoimmune diseases significantly increased the likelihood of developing vitiligo (OR: 3.2, 95% CI: 1.8-5.7).

Conclusion: Hypopigmented and depigmented lesions are common in the pediatric population, with distinct epidemiological patterns that vary by age and gender. Early identification and management are crucial in minimizing psychological impact and preventing complications.

Keywords: Hypopigmented, Pediatric, Etiologies, Pityriasis Alba, Vitiligo.

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Introduction

Hypopigmented and depigmented lesions are common presentations in pediatric dermatology. These lesions range from benign self-limiting conditions like pityriasis Alba to chronic diseases such as vitiligo, which carry significant psychosocial and cosmetic implications for the patient and family. Depigmentation or loss of skin color results from the absence or reduction of melanin production by melanocytes, leading to visually distinct lesions that can vary in size, shape, and distribution [1, 2].

Vitiligo, the most widely recognized depigmenting disorder, affects approximately 0.5-2% of the global population, with onset typically occurring during childhood in nearly half of all cases [3]. The etiology of vitiligo is multifactorial, involving genetic, autoimmune, and environmental factors. Hypopigmented lesions, such as pityriasis Alba and

post-inflammatory hypopigmentation, are less severe but common in pediatric populations, often linked to skin dryness, atopy, and infections. Other less frequent causes of hypopigmentation include tuberous sclerosis and idiopathic guttate hypomelanosis [4].

The clinical presentation of these lesions varies widely, from small, localized spots to widespread areas of hypopigmentation. Early diagnosis is critical to prevent the potential spread of these lesions and their associated psychological burden, particularly in visible areas like the face and hands [5, 6]. Given the heterogeneity of hypopigmented and depigmented lesions, this study aims to comprehensively analyze the clinical and epidemiological characteristics of these lesions in the pediatric age group, focusing on identifying the most prevalent conditions and their correlation with

demographic factors such as age, gender, and family history.

Methodology

Study Design: This was a hospital-based cross-sectional study conducted in the Department of Dermatology and paediatrics in two Medical colleges over two years (January 2021 - December 2022). The study was designed and reported following the STROBE (Strengthening the Reporting of Observational Studies in Epidemiology) guidelines for observational studies.

Study Population: The study included 500 pediatric patients aged 0-18 years who presented with hypopigmented or depigmented lesions. Patients were recruited from both outpatient and inpatient departments. Exclusion criteria included patients with known systemic conditions causing secondary hypopigmentation (e.g., albinism, genetic syndromes) and those with incomplete medical records.

Inclusion Criteria

- Children aged 0-18 years presenting with hypopigmented or depigmented skin lesions.
- Patients whose diagnoses were confirmed through clinical evaluation, dermoscopy, or relevant laboratory investigations (e.g., Wood's lamp examination, skin biopsy, or fungal cultures).

Exclusion Criteria

- Patients with systemic diseases known to affect skin pigmentation (e.g., albinism).
- Patients on prior treatment for dermatological conditions.

Data Collection: Data were collected through structured interviews, physical examinations, and reviews of medical records. Information on age, gender, socioeconomic status, family history of

skin or autoimmune diseases, and the duration and location of lesions was recorded. Lesion characteristics were classified based on size, distribution, and type (hypopigmented vs. depigmented). Photographic documentation was obtained with parental consent.

Diagnostic Protocol: Clinical diagnoses were supported by Wood's lamp examination to differentiate hypopigmented lesions from depigmented lesions. Fungal infections were confirmed through potassium hydroxide (KOH) preparation and fungal cultures. Skin biopsies were performed when required to differentiate between inflammatory and autoimmune causes of hypopigmentation.

Statistical Analysis: Data were analyzed using SPSS version 25. Descriptive statistics, including means, frequencies, and percentages, were used to summarize demographic data. Chi-square tests were employed to assess the association between categorical variables, such as lesion type and demographic characteristics (age, gender, socioeconomic status). Logistic regression analysis was conducted to identify significant predictors of specific lesion types, and odds ratios (ORs) with 95% confidence intervals (CIs) were calculated. Analysis of variance (ANOVA) was used to evaluate differences in lesion size and duration across various age groups and diagnoses. Statistical significance was set at $p < 0.05$.

Results

Demographic Characteristics: The study population included 500 children, with a slight male predominance (55%, $n=275$) compared to females (45%, $n=225$). The mean age was 8.6 years (range 0-18 years), with the highest prevalence of cases seen in the 6-10 year age group (40%). Table 1 presents the demographic characteristics of the study population.

Table 1: Demographic Characteristics of Study Population (n=500)

Characteristic	n (%)
Male	275 (55%)
Female	225 (45%)
Age (years)	
0-2	85 (17%)
3-5	115 (23%)
6-10	200 (40%)
11-18	100 (20%)

Distribution of Diagnoses

The most common clinical diagnoses were vitiligo (30%, $n=150$), pityriasis alba (25%, $n=125$), and tinea versicolor (20%, $n=100$). Other less common conditions included post-inflammatory hypopigmentation (10%, $n=50$), idiopathic guttate hypomelanosis (5%, $n=25$), and tuberous sclerosis (1%, $n=5$). Table 2 presents the frequency of different diagnoses.

Table 2: Distribution of Diagnoses in Pediatric Patients (n=500)

Diagnosis	n (%)
Vitiligo	150 (30%)
Pityriasis Alba	125 (25%)
Tinea Versicolor	100 (20%)
Post-Inflammatory Hypopigmentation	50 (10%)
Idiopathic Guttate Hypomelanosis	25 (5%)
Tuberous Sclerosis	5 (1%)

Lesion Distribution and Size

Lesions were primarily located on the face and upper limbs (65%, n=325), followed by the lower limbs and trunk (35%, n=175). Lesion sizes varied significantly between conditions, with vitiligo lesions averaging 2.8 cm in diameter, while pityriasis alba lesions were smaller, averaging 1.5 cm in diameter ($p < 0.05$). Table 3 compares lesion size and distribution across different conditions.

Table 3: Comparison of Lesion Size and Distribution

Condition	Lesion Size (Mean cm \pm SD)
Vitiligo	2.8 \pm 0.5
Pityriasis Alba	1.5 \pm 0.4
Tinea Versicolor	2.0 \pm 0.6
Post-Inflammatory Hypopigmentation	1.8 \pm 0.5

Association with Demographic Factors

Chi-square analysis revealed significant associations between the type of lesion and age group ($p < 0.05$), with hypopigmented lesions more common in younger age groups (0-5 years), while depigmented lesions (e.g., vitiligo) were more frequent in older children (6-18 years). Gender differences were observed, with boys more commonly presenting with pityriasis Alba and girls with vitiligo ($p < 0.05$). Table 4 provides a summary of the associations between lesion types and demographic factors.

Table 4: Association of Lesion Types with Demographic Factors

Factor	p-value
Age Group	0.01*
Gender	0.03*
Socioeconomic Status	0.12
(*Statistically significant)	

Discussion

The results of this clinico-epidemiological study demonstrate the wide spectrum of hypopigmented and depigmented lesions seen in pediatric patients, with a predominance of vitiligo and pityriasis Alba. The findings align with existing literature, which suggests that vitiligo and pityriasis alba are among the most common causes of skin depigmentation in children [7-9].

The gender differences observed in this study, with boys being more affected by pityriasis Alba and girls more by vitiligo, reflect potential hormonal and genetic influences on these conditions. The significant association between vitiligo and family history of autoimmune diseases further supports the role of genetics in the development of depigmented lesions [10, 11]. The variation in lesion distribution and size across different conditions highlights the importance of early recognition and tailored management strategies. While some conditions [12], such as pityriasis Alba, are benign and self-

limiting, others, like vitiligo, require long-term management due to their chronic and progressive nature. Early intervention is crucial in preventing the spread of lesions and addressing the psychological impact of visible skin changes, particularly in older children and adolescents.

Conclusion

Hypopigmented and depigmented lesions in pediatric populations are common and can be caused by a variety of dermatological conditions. This study highlights the need for early diagnosis and management, especially for conditions like vitiligo that can have a significant impact on quality of life. Future research should focus on genetic and environmental factors contributing to these lesions to improve preventive and therapeutic strategies.

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