Section: Dermatology

Original Research Article

CLINICO-EPIDEMIOLOGICAL AND DERMOSCOPIC STUDY OF PAEDIATRIC ALOPECIA IN A TERTIARY CARE CENTRE

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ABSTRACT

Background: The pattern and causes of hair loss in children differ from those in adults and are influenced by hair type and ethnicity. Indian data on paediatric alopecia remain limited. This study aimed to describe the clinico-epidemiological and dermoscopic features of alopecia in the paediatric age group attending a tertiary care centre. **Objectives:** To describe the socio-demographic profile of scalp alopecia in children and to determine the common clinical and dermoscopic patterns of scalp alopecia in this age group.
Materials and Methods: A hospital-based observational study was conducted on 100 children aged 0–18 years presenting with scalp hair loss. After informed consent, a detailed history and cutaneous/systemic examination were performed. Dermoscopy was carried out using a contact polarised Illuco IDS-1100 dermoscope (10× magnification) linked to a smartphone; hair shaft microscopy, KOH mount, complete haemogram, thyroid profile, antinuclear antibody and scalp biopsy were used where indicated. Data were analysed using IBM SPSS v29.0, with the chi-square test applied for categorical associations ($p<0.05$ considered significant).
Results: Of 100 participants, 57% were male and 43% female (M:F 1.3:1), and 45% were aged 6–10 years (mean 8.8 ± 3.9 years). Alopecia areata (AA) was the commonest diagnosis (50%), followed by tinea capitis (33%), trichotillomania and pressure-induced alopecia (4% each). On dermoscopy, AA most frequently showed exclamation hair (100%), yellow dots (71.1%), black dots (54.6%) and broken hair (52.9%), while tinea capitis showed black dots (37.3%) and comma/corkscrew hairs. Diagnosis was significantly associated with age ($\chi^2=47.657$, $p=0.008$), distribution of lesion ($\chi^2=54.875$, $p<0.001$), pattern of hair loss ($\chi^2=52.260$, $p<0.001$), hair-pull test ($\chi^2=69.648$, $p<0.001$) and KOH positivity ($\chi^2=71.335$, $p<0.001$).
Conclusion: Paediatric alopecia is a significant clinical concern, with AA being the leading cause. Early age of onset and a chronic course emerged as poor prognostic indicators. Dermoscopy is a valuable, non-invasive adjunct that aids diagnosis, guides prognosis in AA, and reduces the need for scalp biopsy in most cases.
Keywords: Paediatric alopecia, alopecia areata, tinea capitis, trichoscopy, dermoscopy, children.

INTRODUCTION

Alopecia is a broad term used to describe hair loss. It is a common concern in both adults and children, affecting up to 7.22% of individuals,[1-2] although hair loss patterns and causes in children differ substantially from those seen in adults. Because paediatric alopecia can carry a considerable negative psychological impact during formative years, it warrants focused clinical attention.[3]

Alopecia may be congenital or acquired, and is further classified as non-cicatricial (hair follicles

intact, hair loss potentially reversible) or cicatricial (hair follicles destroyed and replaced by scar tissue, resulting in permanent hair loss); it may also be focal or diffuse.[3] The most common causes of scalp hair loss in children include tinea capitis, alopecia areata and traction alopecia, with telogen effluvium, endocrinopathies, systemic illness, nutritional deficiency and hair shaft abnormalities accounting for a smaller proportion of cases.[2-4]

Dermoscopy (trichoscopy) has emerged as a valuable, non-invasive bedside tool that improves diagnostic accuracy in hair and scalp disorders and can obviate the need for scalp biopsy in many cases. Data on the clinico-epidemiological and dermoscopic profile of paediatric alopecia from India remain limited. This study was therefore undertaken to describe the clinico-epidemiological and dermoscopic features of alopecia among children attending a tertiary care dermatology outpatient department.

Aim

1. To evaluate the clinico-epidemiological and dermoscopic aspects of paediatric scalp alopecia.

Objectives

1. To describe the socio-demographic profile of scalp alopecia in the paediatric age group.
2. To determine the common clinical patterns and dermoscopic findings of scalp alopecia in the paediatric age group.

MATERIALS AND METHODS

This hospital-based observational study was conducted in the Department of Dermatology, Venereology and Leprosy at a tertiary care centre, over a period of one year. Children aged 0 to 18 years presenting with scalp hair loss and/or sparse hair growth to the dermatology outpatient department were enrolled after obtaining informed consent from parents/guardians. Children whose parents/guardians did not consent were excluded.

Based on a reference prevalence of 62.4% for scalp hair loss among school-going children and adolescents,[5] a sample size of 90 was calculated (α=0.05, two-sided; 10% precision) using nMaster v2.0; a sample of 100 children was studied.

A detailed history was obtained regarding the duration, onset and pattern (patchy/diffuse) of hair loss, associated symptoms (itching, pain, scaling, textural change), family and past history of similar complaints or autoimmune disease, physical/emotional triggers, drug intake, atopy, and hair care/grooming practices. Cutaneous and systemic examination included assessment of the pattern of hair loss, scarring versus non-scarring alopecia, hair-pull test, and scalp findings such as erythema, scaling or follicular plugging. Hair colour, texture, fragility and hair root morphology were recorded, and other hair-bearing sites, skin, nails, teeth and mucosae were examined.

Dermoscopy was performed using a contact polarised Illuco IDS-1100 dermoscope with 10-fold magnification, interfaced with a smartphone camera. Wood's lamp examination, scalp scraping/hair mount for KOH and fungal culture, and hair shaft microscopy were performed where indicated. Complete haemogram, thyroid profile, antinuclear antibody testing and scalp biopsy were obtained for confirmation in selected cases.

Data were entered in Microsoft Excel 2016 and analysed using IBM SPSS Statistics for Windows, version 29.0 (IBM Corp., Armonk, NY). Categorical variables were summarised as frequencies and percentages, and continuous variables as mean ± standard deviation. The chi-square test was used to assess association between categorical variables, with $p<0.05$ considered statistically significant.

RESULTS

A total of 100 children with scalp alopecia were evaluated over the study period.

Table 1: Age distribution of study participants

Age group	Frequency	Percentage (%)
Up to 5 years	23	23.0
6–10 years	45	45.0
11–15 years	26	26.0
Above 15 years	6	6.0
Total	100	100.0

Minimum age 2 years, maximum age 18 years; mean age ± SD = 8.8 ± 3.9 years.

Table 2: Gender distribution of study participants

Gender	Frequency	Percentage (%)
Male	57	57.0
Female	43	43.0
Total	100	100.0

Male:female ratio = 1.3:1.

Table 3: Distribution according to socio-economic status

Socio-economic status	Frequency	Percentage (%)
Middle	57	57.0
Lower middle	30	30.0

Lower	13	13.0
Total	100	100.0

Table 4: Distribution according to locality

Locality	Frequency	Percentage (%)
Rural	57	57
Urban	43	43
Total	100	100

Table 5: Distribution of lesions

Distribution	Frequency	Percentage (%)
Localized	80	80.0
Generalized	20	20.0
Total	100	100.0

Table 6: Distribution according to diagnosis

Diagnosis	Frequency	Percentage (%)
Alopecia areata	50	50.0
Tinea capitis	33	33.0
Trichotillomania	4	4.0
Pressure-induced alopecia	4	4.0
Congenital atrichia with papule	2	2.0
Lichen planopilaris	2	2.0
Telogen effluvium	1	1.0
Traction alopecia	1	1.0
Traumatic alopecia	1	1.0
Loose anagen hair syndrome	1	1.0
Trichothiodystrophy	1	1.0
Total	100	100.0

Infectious causes (tinea capitis, 33%) were less common than non-infectious causes (67%). Acquired alopecia accounted for 98% of cases and congenital alopecia for 2%. Among acquired cases, 95% were non-scarring and 5% scarring; 80% showed a patchy and 20% a diffuse pattern of hair loss. Scaly scalp and redness/erythema were each the presenting complaint in 33% of children.

Association of diagnosis with clinical and demographic parameters

On Pearson's chi-square testing, diagnosis showed a statistically significant association with age, distribution of lesion, pattern of involvement, hair-pull test result and KOH positivity, but not with gender, socio-economic status or locality. [Table 7]

Table 7: Association between diagnosis and selected demographic/clinical parameters

Parameter	χ^2 value	p-value	Significance
Age	47.657	0.008	Significant
Gender	15.379	0.081	Not significant
Socio-economic status	28.163	0.060	Not significant
Locality	10.641	0.301	Not significant
Distribution of lesion	54.875	<0.001	Highly significant
Pattern of involvement	52.260	<0.001	Highly significant
Hair-pull test	69.648	<0.001	Highly significant
KOH test	71.335	<0.001	Highly significant

Dermoscopic findings

Dermoscopy was contributory across diagnoses. Follicular, perifollicular, interfollicular and hair-shaft patterns observed across the study population are summarised in Table 8.

Table 8: Overall dermoscopic (trichoscopic) findings among study participants (n=100)

Dermoscopic feature	Number of patients	Percentage (%)
Follicular pattern — Black dots	75	75.0
Follicular pattern — Yellow dots	45	45.0
Follicular pattern — White dots	4	4.0
Follicular pattern — Blue-grey dots	1	1.0
Perifollicular scales	43	43.0
Hair cast	8	8.0
Interfollicular scales	46	46.0
Interfollicular white areas	4	4.0
Vascular network	1	1.0
Hair shaft — Broken hair	87	87.0
Hair shaft — Exclamation-mark hair	46	46.0
Hair shaft — Coudability hair	25	25.0

Hair shaft — Comma hair	23	23.0
Hair shaft — Corkscrew hair	17	17.0
Hair shaft — Vellus hair	12	12.0
Hair shaft — White hair	6	6.0
Hair shaft — Coiled hair	4	4.0
Hair shaft — Flame hair	4	4.0
Hair shaft — Cluster of stars	2	2.0
Hair shaft — Tulip hair / tiger-tail banding	1	1.0

In alopecia areata (n=50), the characteristic dermoscopic triad comprised exclamation-mark hair (100%), yellow dots (71.1%) and black dots (54.6%); broken hair was seen in 52.9% and coudability hair in 50% of AA patients. In tinea capitis (n=33), comma hair (73.9%) and corkscrew hair (94.1% of the corkscrew-hair cases) were characteristic, along with black dots (37.3%) and perifollicular scaling.

Clinical and Dermoscopic Images

Representative clinical photographs with corresponding dermoscopic (trichoscopic) images (Illuco IDS-1100, ×10, contact polarised) for the major diagnostic categories in this study are shown in Figures 1–6.

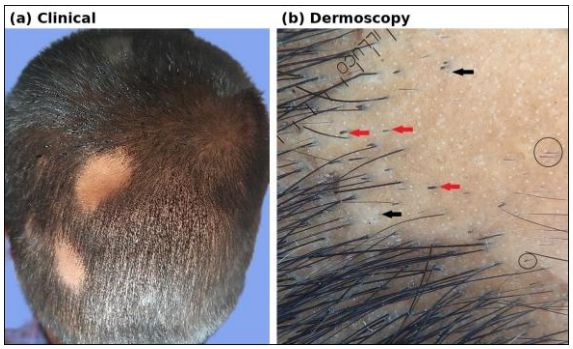

Figure 1: Alopecia areata. (a) Non-scarring patchy alopecia of the occipital scalp. (b) Trichoscopy shows exclamation-mark hair (circled), black dots (black arrows) and broken hair (red arrows).

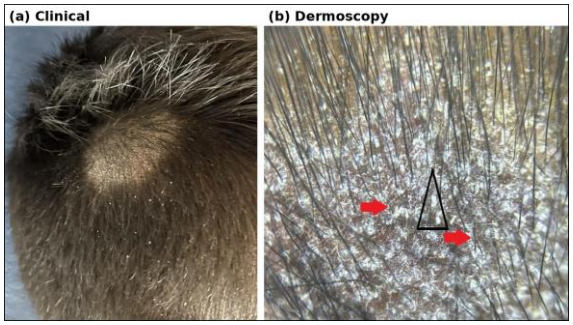

Figure 2: Tinea capitis, grey-patch type. (a) Patchy hair loss with fine scaling over the parietal scalp. (b) Trichoscopy shows broken hair (red arrows) and interfollicular scaling (black triangle).

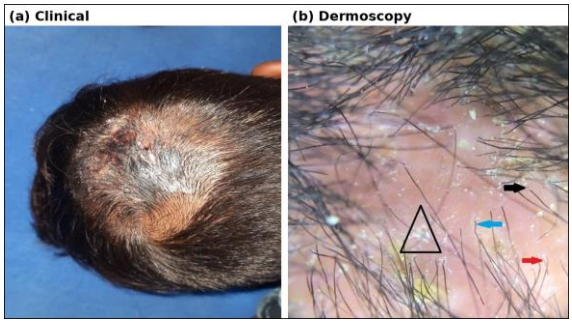

Figure 3: Tinea capitis, kerion variant. (a) Boggy inflammatory swelling with patchy hair loss over the parietal scalp. (b) Trichoscopy shows black dots (black arrow), broken hair (red arrow), corkscrew hair (blue arrow) and interfollicular scaling (black triangle).

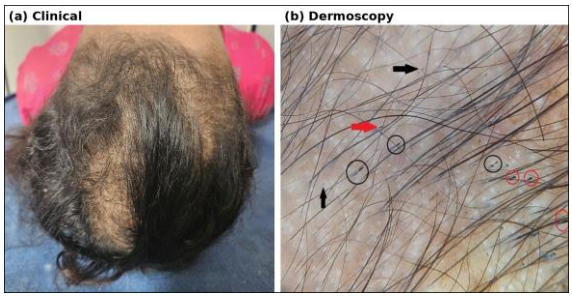

Figure 4: Trichotillomania. (a) Irregular patch of hair loss over the parietal and temporal region. (b) Trichoscopy shows flame hair (circled), v-hair (circled), black dots (black arrow) and broken hair (red arrow).

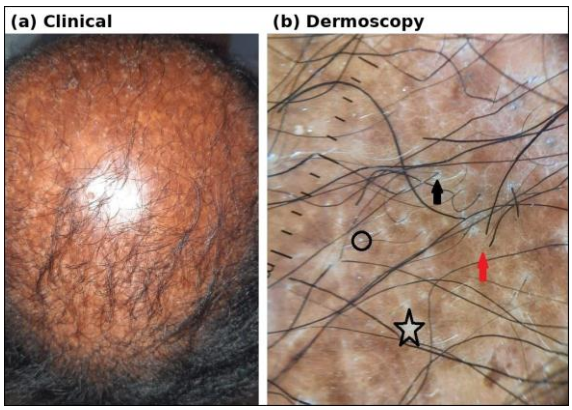

Figure 5: Lichen planopilaris. (a) Scarring alopecia with perifollicular scaling over the parietal scalp. (b) Trichoscopy shows perifollicular cylindrical scales (black arrow), blue-grey dots (red arrow), white dots (circled) and structureless white areas (star), with loss of follicular ostia.

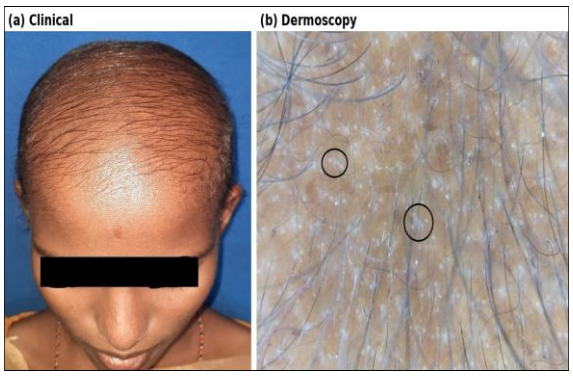

Figure 6: Congenital atrichia with papules. (a) Sparse scalp hair with reduced density and tiny skin-coloured papular lesions. (b) Trichoscopy shows a cluster-of-stars pattern of white dots (circled).

DISCUSSION

This study evaluated 100 clinically diagnosed cases of paediatric alopecia attending the dermatology outpatient department of a tertiary care centre, combining clinical assessment with dermoscopy to characterise the epidemiological and diagnostic profile of hair loss in children.

Demographic profile

Alopecia was most frequent in the 6–10-year age group (45.0%), with a mean age of 8.8 ± 3.9 years, findings comparable to those reported by Mohammed Younis et al,[6] A male preponderance (57%) was noted, consistent with several regional studies, and the majority of children (57%) belonged to rural localities and to the middle socio-economic stratum (57%), which may reflect the referral pattern of the study centre rather than a true epidemiological difference. Diagnosis showed a statistically significant association with age (χ^2=47.657, p=0.008), suggesting that the relative frequency of specific alopecia subtypes varies across childhood age bands — a pattern also observed in comparable Indian cohorts.[7,8]

Pattern and aetiology of hair loss

Acquired, non-scarring, patchy alopecia was the predominant pattern in this cohort (acquired 98%, non-scarring 95%, patchy 80%), and alopecia areata and tinea capitis together accounted for 83% of cases — closely paralleling the findings of Rajashekar et al,[7] Sharma et al,[8] and Shetty et al.[5] (Table 9). Infectious causes (tinea capitis, 33%) were less frequent than non-infectious causes, similar to the report by Sharma et al,[8] though as these represent readily treatable causes, prompt recognition and treatment remain important to prevent irreversible hair loss.

Table 9: Comparison of causes of hair loss with previously published Indian studies

Study (region, year)	n	Leading causes of hair loss
Rajashekar et al.[7] (Karnataka, 2018)	75	Tinea capitis 30.6%; alopecia areata 25.3%; telogen effluvium 9.3%
Sharma et al.[8] (Rajasthan, 2019)	300	Tinea capitis 55.3%; alopecia areata 17.7%; seborrhoeic dermatitis 5.3%
Shetty et al.[5] (Karnataka, 2021)	170	Tinea capitis 38.3%; alopecia areata 30.6%; telogen effluvium 7.1%
Present study	100	Alopecia areata 50.0%; tinea capitis 33.0%; trichotillomania 5.0%

Tinea capitis

Of 33 tinea capitis cases, males (25) outnumbered females (8), possibly reflecting the practice of shorter hair in boys facilitating spread, an observation also made by Rajashekar et al.[7] The grey-patch variant was the commonest morphological type (54.5%), followed by kerion and black-dot patterns, concordant with Rajashekar et a,[7] the favus variant was not observed. KOH mount was positive in 26 of 33 cases, and both the hair-pull test and KOH positivity showed a highly significant association with diagnosis (p<0.001 for each), underscoring their diagnostic utility. On dermoscopy, comma hair and corkscrew hair were the characteristic hair-shaft findings, consistent with the trichoscopic signature of dermatophyte infection described by Mahajan et al.[9]

Alopecia areata

Alopecia areata (AA) was the single commonest diagnosis (50%), more frequent in males, with the youngest affected child aged 2 years. The patchy type predominated (72%), followed by diffuse patterns including alopecia totalis/universalis (16%) and reticular (8%) and ophiasis (4%) patterns — a distribution broadly similar to that reported by Nageswaramma et al.[10] Nail changes (pitting, longitudinal ridging) were noted in 4% of AA cases, lower than the 26.4% reported by Sharma et al,[8] while co-existing autoimmune conditions such as vitiligo and atopic dermatitis were seen in 6%, comparable to Sharma et al,[8] On dermoscopy, exclamation-mark hair (100%), yellow dots (71.1%) and black dots (54.6%) were the dominant features, more frequently observed than in the series reported by Mahajan et al,[9] which may reflect differences in disease duration or activity at presentation. Black dots, reflecting fractured hair shafts at the follicular ostia in early active disease, were interpreted as a marker of earlier disease presentation and, correspondingly, a potentially more favourable prognosis, whereas yellow dots — reflecting sebum- and keratin-filled infundibula in follicles arrested in early anagen/catagen — were comparatively less prominent than typically described in adult AA.

Trichotillomania and other causes

Trichotillomania was identified in 5% of children, predominantly female, similar to the 7% reported by Al-Refu et al,.[4] Congenital causes identified were congenital atrichia with papular lesions and loose anagen hair syndrome. Traction alopecia was seen in only 1% of cases, lower than the rates reported by Al-Refu et al,[4] (20%) and Sharma et al,[8] (2.3%),

while telogen effluvium (1%) was similarly less frequent than reported by Rajashekar et al,[7] (9.3%); most telogen effluvium cases in comparator studies, as in ours, occurred in adolescents.

Role of dermoscopy

Dermoscopy proved to be a useful, non-invasive adjunct across all diagnostic categories in this study, aiding differentiation between alopecia areata and tinea capitis at the bedside and reducing reliance on invasive scalp biopsy. The hair-pull test and KOH positivity were both highly significantly associated with final diagnosis, reinforcing their continued value alongside dermoscopy in a resource-limited outpatient setting.

Overall interpretation

The clinical and dermoscopic profile of paediatric alopecia observed in this study was broadly concordant with previously published Indian data, with some quantitative differences that may be explained by regional variation in environmental exposures, hygiene practices, hair-care customs and healthcare-seeking behaviour, alongside the relatively higher prevalence of infectious causes of hair loss in developing-country settings such as India.

CONCLUSION

Paediatric alopecia is a significant health concern, with alopecia areata being the commonest cause in this cohort, followed closely by tinea capitis. Early age of onset and a chronic disease course emerged as potential poor prognostic markers. Dermoscopy is a valuable, easily performed bedside tool that aids diagnosis, helps determine prognosis in children with alopecia areata, and reduces the need for diagnostic scalp biopsy in most cases — although its interpretation in children requires some experience, since yellow dots are seen less often than in adults. The presence of black dots may indicate a more favourable prognosis, possibly reflecting earlier disease presentation. Given the potential psychological impact of hair loss on children, early recognition and management — supported by dermoscopy — along with community awareness regarding hygienic hair-care practices, may help minimise preventable causes of alopecia and reduce the risk of irreversible, scarring hair loss.

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