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Clinical Features And Mycology Of Tinea Capitis Among Children In Lucknow

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ABSTRACT

Tinea capitis an infection caused by dermatophyte fungi is one of the commonest superficial mycosis infection in children having a strong link with poor personal hygiene, overcrowding and low socioeconomic status. This study was undertaken to describe the demographic, clinical and microbiological profile of Tinea capitis among children in district Lucknow, India. A total of 128 consecutive paediatric (0–14 years old) patients with clinical diagnosis of Tinea capitis were enrolled. Their nutritional status was assessed as per WHO–gender specific z–scores for weight for age criteria, and exposure to risk factors was also assessed. All the children underwent KOH examination and culture evaluation. Majority of children were aged 6–10 years (60.2%), boys (66.4%), and rural residents (56.3%), belonged to lower socioeconomic strata (72.7%), had poor hygiene (59.4%), were symptomatic (73.4%) and undernourished (66.9%). Itching (94.5%) and scaling (73.4%) were most common complaints, black dot type (57%) was the most common clinical type, majority had 2–5 patches (74.2%). KOH positivity rate was 66.4%. Nearly 68% were culture positive with *T. mentagrophytes* (n=44; 34.4%) and *T. rubrum* (n=15; 11.7%) being the most common isolates. Secondary prevention is necessary to prevent its spread in the community.

Key words: T. capitis, Dermatophytes, Clinical Profile, Demographic Profile, Mycological Spectrum.

INTRODUCTION

Dermatophytes are group of filamentous fungi that require keratin for growth. Owing to this keratinophilic behaviour they inhabit the humans and animals in keratin rich tissues such as nail, hair and superficial layers of the skin.^[1–3] Fungal infections are common in humans worldwide. The prevalence of various types of fungal infections varies according to the geographical situations of

the habitat and a number of host factors. Hot and humid weather conditions in the tropical countries like India make humans very susceptible to fungal infections. *Tinea capitis* is a common dermatophytic fungal infection. It mainly affects the scalp and hair shafts. Sometimes it is also called as ringworm of the head. It most commonly affects the children aged between 3 and 14 years. It involves both the skin surface and hair. It is characterized clinically by loss of hair (alopecia) and scaling of the affected skin.^[4,5] Factors affecting disease transmission are personal hygiene, overcrowding and low socioeconomic status. Organisms responsible for *T. capitis* have been cultured from fomites such as combs, caps, pillowcases, toys and theatre seats. Even after shedding, hairs may harbour infectious agents for more than one year. Asymptomatic carriers are common, making *Tinea capitis* difficult to eradicate.^[6]

The clinical manifestation might be dependent on the severity of disease. In the mild subclinical stages it is manifested as a small erythema along with some patches of scaly skin with hairs broken at the skin line (black dots) and crusting.^[5] In more severe forms, it has highly inflammatory reaction with folliculitis. Subsequently, there could be kerion formation, the areas of scarring and alopecia might enlarge. In some cases, there could be systemic manifestations like fever, malaise, and regional lymphadenopathy.^[4]

The mycological profile of *Tinea capitis* is highly diversified including both *Trichophyton* and *Microsporum* genera.^[5,7,8] There is extreme variability in mycological profile of *T. capitis* in different geographical, climatic and time-zone regions. Moreover, within same geographical regions, variation in dominant species and clinic demographic profile is quite common.

In the present study, we describe the demographic, clinical and microbiological profiles of *T. capitis* among children in district Lucknow, Uttar Pradesh.

MATERIALS and METHODS

This cross-sectional study was carried out at Department of Dermatology, Venereology & Leprosy, in collaboration with Department of Microbiology, Era's Lucknow Medical College & Hospital, Lucknow.

Inclusion Criteria

- Patients with a clinical diagnosis of *T. capitis* aged ≤ 14 years.
- Accompanied by their legal guardians/parents.

Exclusion Criteria

- Critically ill children.
- Children receiving antifungal therapy.
- Those unwilling to participate.

Sample Size Estimation: The projections for sample size were based on a study by Grover *et al.*^[10] Sample size was calculated using the following formula:-

$$n = \frac{z_{\alpha}^2 p(1-p)}{L^2}$$

Where $p = 41.5\%$,

Type I error $L = 10\%$ absolute

$n = 80 + 30\%$ loss to follow up = 104

Although the minimum required sample size at targeted prevalence among suspected subjects is 104. However, all the 128 patients falling in sampling frame during the study period (January 2014 to June 2015) were enrolled in the study.

Methodology

Approval for the study was obtained from Institutional Ethics Committee void Letter No. ELMC/EC/R. Cell/2013; dated 22 Nov.2013. At enrolment, the parents were explained about the study purpose and procedures involved and were invited to participate in the study. An informed consent was obtained from the parents. Assent of the children was also obtained for those aged >12 years.

On enrolment, demographic information was obtained from all the children/parents, history of schooling, presence of any pet in family, family/pal/mate/schoolmate history, number of contacts with positive signs and symptoms was noted. If the child was symptomatic then chief complaints were noted. From symptomatic patients, information regarding duration of symptoms was also obtained.

All the patients underwent a general and clinical examination; details regarding height and body weight were noted and compared against WHO gender specific 'z'-scores for height/weight in order to assess the nutritional status of the children. Each child underwent cutaneous examination. Clinical typing was done through Wood's lamp examination - colour, pattern, inflammation and numbers of patches were noted. This was followed by direct microscopy that was performed by making KOH 20% wet mount preparation. A portion of sample was placed on a clean glass slide and a drop of 10% potassium hydroxide and dimethyl sulfoxide solution was placed over it. A cover slip was put over the material, and slide was heated gently and pressed against the slide so that material gets flattened and spread uniformly. The excess fluid was wiped using a filter paper, the slide was kept for 15 to 20 minutes depending on the thickness of scales. The prepared slide was examined under the low power (10X or 40X) microscope with reduced light for the presence of hyphae and spores.

Culture and isolation of fungus

Identification of fungal isolates was done according to standard techniques. The sample was inoculated into Sabourauds Dextrose Agar slope (SDA) with chloramphenicol (0.5 mg/ml) and cycloheximide (0.5 mg/ml). The inoculation was with a sterile L' shaped loop in the centre of the slope. The culture was done in two sets. The culture bottles were labelled and then incubated at 25°C in Biochemical Oxygen Demand (BOD) incubator & 37°C at room temperature. The culture bottles were examined everyday for evidence of any growth. They were discarded if there was no growth after 4 weeks of incubation. LCB mounts were prepared from growth on Sabourauds Dextrose Agar culture bottle and observed under low power microscope (10X and 40X). Further speciation was done by microslide culture techniques. The identified fungal genus and species was noted.

Data Analysis: This was a descriptive study. Tabulation of data was done using Statistical Package for Social Sciences version 21.0. No hypothesis testing was done. Data has been displayed as number and percentages and mean±standard deviation.

RESULTS

There was a dominance of patients aged between 6–10 years (60.2%), males (66.4%), rural residents (56.3%) and lower socioeconomic class (72.7%). Majority of children had poor personal

hygiene (59.4%). Only 29 (22.7%) had good personal hygiene and 23 (18%) had fair personal hygiene. As many as 94 (73.4%) children were symptomatic while 34 (26.6%) were asymptomatic and were diagnosed of the disease during routine health check-up. Mean duration of symptoms was 2.33 ± 1.90 months. Maximum time gap between onset of symptoms and diagnosis was 9 months. History of pet/cattle contact was reported by 40 (31.3%) patients. Majority of children were undernourished (66.9%) though a total of 6 (4.7%) were in overweight/obese category too (Table 1).

Table 1: General profiles of paediatric *Tinea capitis* patients in Lucknow (n=128)

SN	Characteristic	Number	Percentage
1.	Age		
	0–5 Years	10	7.8
	6–10 Years	77	60.2
	11–14 Years	41	32.0
2.	Sex		
	Male	85	66.4
	Female	43	33.6
3.	Place of residence		
	Rural	72	56.3
	Urban	56	43.7
4.	Socioeconomic status		
	Lower	93	72.7
	Middle	35	27.3
	Upper	0	0
5.	Personal hygiene status		
	Poor	76	59.4
	Fair	23	18.0
	Good	29	22.7
6.	Symptom status		
	Asymptomatic	34	26.6
	Symptomatic	94	73.4
7.	Mean duration of symptoms SD (Range) in months	2.33±1.90 (0–9 months)	
8.	Pet/Cattle contact history	40	31.3
9.	Nutritional status		
	Under nutrition	78	66.9
	Normal	44	34.4
	Overweight/Obese	6	4.7

Clinically, black dot type (57%) was the most common clinical type followed by grey patch (38.3%) and inflammatory type (4.7%) respectively. Solitary lesions were seen in 14 (10.9%) cases only. Majority (74.2%) had 2–5 patches and 19 (14.8%) had >5 patches. Itching (94.5%) and scaling (73.4%) were the major presenting complaints seen in 94.5% and 73.4% patients respectively. There were 52 (40.6%) cases reporting hair loss and 6 (5.7%) reported of discharging lesion with erythema. A total of 85 (66.4%) specimen were KOH positive for fungal strains. On culture, 87 (68%) specimen were culture positive. *T. mentagrophytes* (n=44; 34.4%) was the most common mycological pathogen followed by *T. rubrum* (n=15; 11.7%), *T. rubrum* (n=11; 8.6%), *T. verrucosum* (n=8; 6.3%), *M. audouinii* (n=5; 3.9%) and *M. canis* (n=4; 3.1%) respectively (Table 2; Fig. 1).

Table 2: Clinical Profiles of Patients

SN	Characteristic	Number of patients	Percentage
1.	Clinical Type		
	Black dot type	73	57.0
	Grey patch	49	38.3
	Inflammatory type	6	4.7
2.	No. of patches		
	Only 1 patch	14	10.9
	2-5 patches	95	74.2
	>5 patches	19	14.8
3.	Complaints		
	Itching	121	94.5
	Scaling	94	73.4
	Hair loss	52	40.6
	Lesions with discharge and erythema	6	4.7
4.	KOH Positivity	85	66.4
5.	Culture positivity	87	68.0
	<i>T. mentagrophytes</i>	44	34.4
	<i>T. rubrum</i>	15	11.7
	<i>T. tonsurans</i>	11	8.6
	<i>T. verrucosum</i>	8	6.3
	<i>M. audouinii</i>	5	3.9
	<i>M. canis</i>	4	3.1

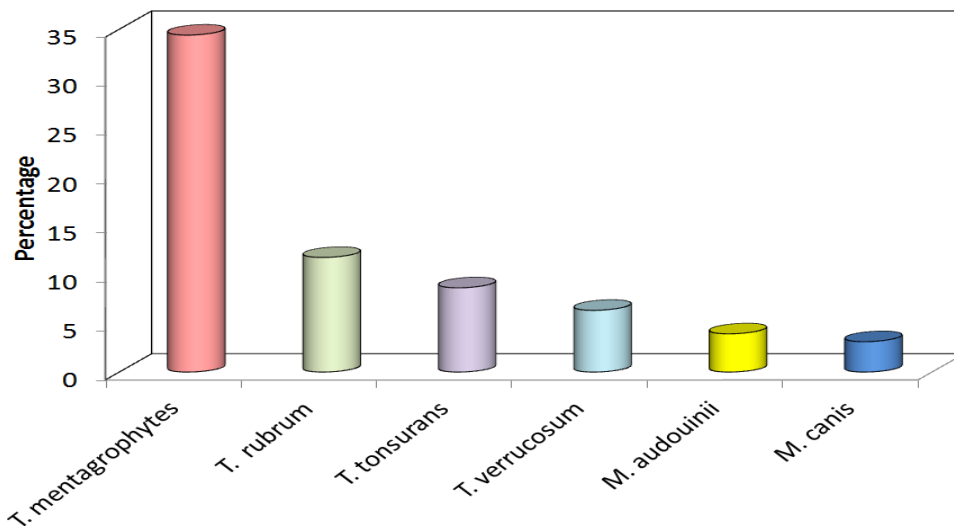


Fig. 1: Organism Identified (n=87)

On evaluating the efficacy of KOH positivity against culture positivity it was found to be 72.4% sensitive and only 46.3% specific. The positive and negative predictive values of direct microscopy were 74.1% and 44.2%. It was 63.3% accurate (Table 3).

Table 3: Association between KOH positivity and culture positivity

SN	KOH Positivity	Culture Positivity	
		Positive	Negative
1.	Positive	63	22
2.	Negative	24	19

Sensitivity: 72.4%; Specificity: 46.3%; PPV: 74.1%; NPV: 44.2%; Accuracy: 63.3%

DISCUSSION

The results of present study showed a dominance of patients aged between 6–10 years (60.2%), males (66.4%), rural residents (56.3%) and lower socioeconomic class (72.7%). *Tinea capitis* is most commonly found in children aged 3 to 14 years old. It accounts for up to 92.5% of dermatophytoses in children younger than 10 years. In a recent study, Kassem *et al.* had found a dominance of children aged 4–6 years (81.6%) and that of males (72.4%) in an immigrant refugee population. Mohta *et al.* too in another recent study from India found dominance of male children (68.3%) aged 6–10 years (72.6%). Susceptibility to *T. capitis* dermatophytosis in male children under 10 years of age has also been established in a recent meta-analysis that included data of 9465 school children from fourteen different studies. Thus age and sex profile of paediatric *T. capitis* patients in the present study is in accordance with most of the cited literature. The dominance of rural children from lower socioeconomic class and poor personal hygiene brought about the role of sociodemographic disparities and deprivation as a major cause for susceptibility to *T. capitis*. Fungal etiology of *T. capitis* is affected by poor socioeconomic status and conditions like overcrowding, lack of good personal hygiene are some of the recorded risk factors associated with it. In the present study, we noted high prevalence of malnutrition, which in turn is related with low socioeconomic status, poverty and poor living conditions of these children. As such undernutrition itself is an independent risk factor for increased susceptibility of children to infections in general and fungal infections in particular. The findings of the present study also establish this link. In present study, history of pet/cattle contact was reported by 40 (31.3%) cases. Cattle/pet are asymptomatic carriers of disease. In rural areas cases may acquire infection of *T. capitis* while handling infected cattle.

Itching, scaling and hair loss were the three major presenting complaints. Similar to results of present study, other workers have also reported itching, scaling and hair loss to be more common and lesions with discharge to be less common presenting complaints. Mohta *et al.* in their study found that itching and pain (due to inflammation) are the most common factors affecting quality of life of children. In the present study, perhaps these were the dominant complaints owing to which a number of asymptomatic children were also identified. Nevertheless, the findings of the study showed that even in asymptomatic state and short duration of symptomatic manifestation (average 2.33 months in our study) could lead to complaints that may result in need for a clinical consultation.

Black dot and grey patch types were the most commonly represented clinical types in the present study and most of the children had multiple patches. Similar to findings of present study, black dot and grey patch have been reported to be the most common clinical type in a number of studies.

In our study, KOH positivity and culture positivity rates were almost similar (66.4% and 68%). Compared to this, Mohta *et al.* reported the KOH and culture positivity rates of 32.9% and 40.8% respectively. Traditionally, both KOH and culture positivity are used for diagnosis of *T. capitis*, though there may be disagreement between the two diagnoses, thus they must be viewed as complementary rather than competing diagnostic tests. KOH definitely has a high sensitivity but it lacks specificity, thus compromising its overall accuracy. Nevertheless, culture positivity helps in better identification of the underlying pathogen involved. In the present study, we found that direct microscopy was only 63.3% accurate against culture positivity that is why we also visualize the two to be complementary techniques to increase the overall detection rate.

In the present study, among fungal isolates, isolated *Trichophyton spp.* dominated the scene with as many as 79/87 (90.8 %) isolates whereas *Microspora spp.* comprised the remaining 9 (9.2%) isolates. This is similar to most of the other studies too that show a dominance of *Trichophyton spp.*^[12,24,25] However, Zeng *et al.* in a recent study reported dominance of *Microsporum spp.* over *Trichophyton spp.*^[22] Between these two genera, *T. mentagrophytes* and *T. rubrum* were the most dominant species of *Trichophyton* whereas *M. audouinii* and *M. canis* were the representatives of *Microsporum spp.*

Considering the fact that fungal profile is dependent on various demographic and geographical patterns, we searched the literature for the reported fungal profile of *T. capitis* in studies from Northern India, and particularly from Lucknow. In a study by Shukla *et al.* that reported the spectrum of fungal isolates in cases of *T. capitis* from our facility itself, *T. tonsurans*, *T. mentagrophytes*, *M. ferrugineum*, *T. verrucosum* and *M. audouinii* to be the five major isolates.^[26] In another study conducted at our facility, Sahai and Mishra also reported *T. tonsurans*, *T. mentagrophytes*, *T. verrucosum*, *M. audouinii* and *M. ferrugineum* to be the five most common fungal isolates in *T. capitis* cases.^[20] Grover *et al.* and Ahmed *et al.* in their study found *T. violaceum* to be present in most of their culture positive specimen in contrast to the present study where there was no isolate of this species.^[10,19] However, similar to our study, Ahmed *et al.* also found *M. canis* to be a less represented fungal organism.^[19] There could be differences in specific fungal pathogens isolated from *T. capitis* cultures as they vary substantially within the same geographical region. In view of the increasing globalization and increasing contact with carriers from different regions, the dynamicity in changing profile of fungal elements has become a reality and needs an audit from time to time.

The findings of the present study are interesting; provide an overview of the clinical, demographic and mycological profile of paediatric *T. capitis* in Lucknow district. Being a hospital study, it had certain limitations that could be overcome and a more representative picture could be obtained through a community-based survey on a larger population.

CONCLUSION

The present study showed that paediatric *Tinea capitis* in Lucknow city was characterized by younger age (≤ 10 years), male sex, rural residence, lower socioeconomic status, poor personal hygiene, and under nutrition were most common demographic features. Itching and scaling, multiple patches and black dot type were common clinical features. Culture positivity rate was 68% with dominance of *T. mentagrophytes* and *T. rubrum* as the mycological pathogens. Secondary prevention is necessary to prevent its spread in the community.

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