

Clinical types of tinea capitis and species identification in children: An experience from tertiary care centres of Karachi, Pakistan

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Abstract

Objective: To study the clinical types of Tinea Capitis and identify species in children reporting to two tertiary care centres of Karachi, Pakistan.

Methods: The descriptive, cross-sectional study was conducted at the Dermatology Outpatients' Department, PNS Shifa Hospital and the Institute of Skin Diseases, Karachi, from January 1, 2008 to December 31, 2009. It comprised 202 children with clinical diagnosis of tinea capitis, confirmed by skin scrapings, showing fungal hyphae and spores in 10% potassium hydroxide on direct microscopy. Wood's lamp examination was carried out and the scrapings were cultured on Sabouraud's agar. A detailed dermatological examination was performed for evidence of fungal infection elsewhere in the body. SPSS 19 was used for data analysis.

Results: Male-to-female ratio was 1.1:1 and age ranged from 1 to 14 years. The commonest clinical type gray patch was observed in 71 (35.1%) of the patients, black dot in 63 (31.2%), kerion in 50 (24.8%), favus in 10 (5.0%), diffuse pustular in 6 (3.0%), and diffuse scale in 2 (1.0%) patients. The most frequent species grown on culture was *Trichophyton* (T). *Soudanense*, followed by *T. tonsurans*, *T. schoenleinii*, and *T. mentagrophytes* respectively.

Conclusion: Most of the patients of Tinea capitis presented with gray patch and black dot variety. The most common species identified by culture was *Trichophyton Soudanense*. Disease was equal in both gender and predominantly affected the population belonging to low and middle socioeconomic class.

Keywords: Hair loss, Tinea capitis, Clinical variants. (JPMA 64: 304; 2014)

Introduction

Tinea capitis is an infection caused by dermatophyte fungi, usually species of genera *Microsporum* ("M") and *Trichophyton*¹ ("T"). The disease is a form of superficial mycosis. It has the propensity of attacking the hair shaft, follicles and surrounding skin of scalp.²

It is predominantly a disease of pre-adolescent children; adult cases being rare.³ Clinical presentation varies from scaly non-inflamed lesions resembling seborrheic dermatitis or psoriasis⁴ to an inflammatory disease with scaly erythematous plaque and hair-loss. It may even progress to inflamed deep abscess termed "kerion", which can lead to scarring and permanent alopecia. The infection may be associated with painful regional lymphadenopathy, particularly of inflammatory variety. A generalised eruption of itchy papular lesions may occur as

a reaction phenomenon (an 'ide' response), which may start with introduction of systemic therapy.⁵ The type of disease elicited depends on interaction between the host and the etiologic agent, the causative agents of tinea capitis include keratophilic and keratinolytic fungi termed 'dermatophytes'.²

Classification and severity of Tinea capitis depends on how fungus invades the hair shaft and the formation of their arthroconidia.⁶ There are three recognised patterns: Endothrix where the hair shaft is filled with fungal branches (hyphae) and spores (arthroconidia) clinically termed black dot. It results from invasion with *T. tonsurans*, *T. violaceum* and *T. soudanense*. It does not fluoresce with Woods Light. Ectothrix when the hyphae and spores cover the outside of hair. There is fragmentation of the mycelium into conidia around the hair shaft or just beneath the cuticle of the hair, with destruction of the cuticle. *M. canis*, *M. audouinii*, *M. distortum*, *M. ferrugineum*, *M. gypseum*, *M. nanum*, and *T. verrucosum* can cause it. It may give a brilliant green fluorescence in Woods light. Favus is characterised by the presence of yellowish cup-shaped crusts known as scutula, which result in a honeycomb destruction of hair shaft. It is caused by *T. schoenleinii* infection and causes a paler green fluorescence of infected hair.⁶

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Various epidemiological studies have been published in literature and the predominant species causing tinea capitis in the United States during the first half of the 20th century was the anthropophilic species *Microsporum audouinii*.⁷ By the 1970s to 1980s *Trichophyton tonsurans*, another anthropophilic dermatophyte, had become the most common cause of tinea capitis.⁷

In a report from Lahore, Pakistan, *Trichophyton violaceum* was the most common etiologic agent, responsible for 82% of infection, followed by *T. tonsurans* (8%), *T. verrucosum* (5%), and *T. mentagrophytes* (5%).⁸

Despite being a significant public health problem and a financial burden, data regarding the condition is scant from our population. No study from southern part of Pakistan has been published in the literature.

Patients and Methods

The descriptive, cross-sectional study was conducted at the Dermatology Outpatients' Department, PNS Shifa Hospital and the Institute of Skin Diseases, Karachi, from January 1, 2008 to December 31, 2009.

Epi-Info was used to calculate the sample size. In a previous study,⁹ tinea capitis with fungal culture predominant isolates were anthropophilic species, with 46% of the isolates being *T. tonsurans* and 33% *M. langeronii*. *T. violaceum* was reported in 5.5% of cases and *T. tonsurans* in 2.8%. Therefore, taking the frequency of 46% with a bound on error of 0.07 (7%) with a power of 0.8, an alpha significance level of 0.05 with a 95% Confidence Interval, a sample of at least 195 was calculated.

Data was collected using non-probability, convenience sampling. The inclusion criteria entailed patients of either gender, clinically diagnosed Tinea capitis of ages up to 14 years. Patients with negative hyphae or spores on direct microscopy and those treated or partially treated with antifungals were excluded.

After taking informed consent, a total of 202 patients, age up to 14 years, reporting to Dermatology outpatients' department (OPD) were recruited in the study. The diagnosis was clinically confirmed by direct microscopy of skin scrapings showing fungal hyphae and spores in 10% potassium hydroxide. Demographic data like age, gender, duration of disease and relevant information, including associated factors like living conditions, sharing of towels, combs, having animals at home, socio-economic group, fungal infection among siblings and prior antifungal treatment was documented in the preset questionnaire.

Scalp was properly examined and clinical variant of infection i.e. diffuse scale, gray patch, black dot, cellulitis type, diffuse pustular, kerion or favus was identified. Dermatological examination was performed for the presence of fungal infections elsewhere in the body and ide eruptions. Wood's lamp examination was carried out in all patients. Skin scrapings were cultured on Sabouraud's agar to identify the infecting fungus, and appropriate treatment was prescribed.

Data was analyzed using SPSS version 19. All numerical response variables, including age, weight, were expressed as mean $\pm$ Standard Deviation, and all categorical variables including gender, clinical type, tinea elsewhere on body, Ide eruption, Wood's light examination and culture results were presented as frequencies and percentages. No statistical test of significance was applicable for this descriptive study.

Results

Overall, the age of 202 patients ranged from 1 to 14 years, with the mean of 6.4 ± 3.23 years. The male-to-female ratio was 1.1:1. Duration of disease varied from one week to 52 weeks, with a mean of 9.7 ± 13.4 weeks.

Of the total, 19 (9.4%) patients had previous history of Tinea capitis, for which they had been treated. They had remained symptom-free for six months to one year before presenting again with the disease. Siblings of 81 (40.1%) of the patients had dermatophyte infection and among these the most prevalent species isolated in culture was anthropophilic species.

Besides, 24 (11.9%) patients had contact with animals. These included household animals like goats and cattle. The frequency shown in majority of the patients belonged to lower socioeconomic class, and only 4 (2%) were from the higher socioeconomic group.

The most common clinical type of Tinea capitis was found

Table: Characteristic of study population (N=202).

Gender	n = 202 (%)
Male	106(52.50)
Female	96(47.50)
Evidence of tinea elsewhere in the body	
None	165(81.80)
<i>T. corporis</i>	16(7.91)
<i>T. ungum</i>	4(2.01)
<i>T. Faceie</i>	17(8.42)
Ide Eruption	
Pompholyx	6(3.02)
Urticarial	6(3.01)
None	190(94.13)

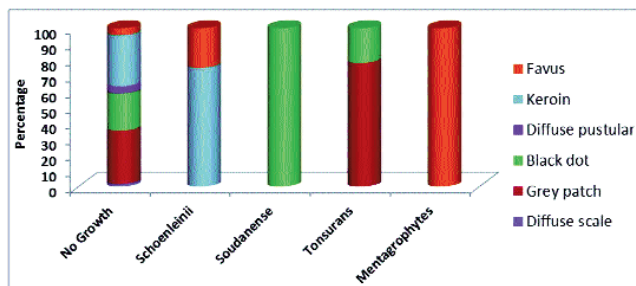


Figure-1: Gray Patch Variety - Hairs in the involved areas showing a characteristic dull, grayish, discoloured appearance. Infected hairs are broken and shorter.



Figure-2: Kerion Variety - Numerous yellow purulent areas on skin surface, surrounded by adjacent edematous and erythematous areas of alopecia.

to be gray patch (Figure-1) 71 (36%). Black dot, Kerion (Figure-2), Favus, Diffuse pustular, and Diffuse Scale variety were seen in receding order of frequencies. Overall, 37 (18.2%) had dermatophyte infection elsewhere on the body; 17 (8.4%) of them had Tinea faciei, 16 (7.9%) had Tinea corporis and remaining 4 (2%) patients had Tinea unguium. Tinea capitis preceded these lesions in 25 (67.5%) patients, and in the remaining 12 (32.5%) followed the body lesions. Ide eruption was observed in



A correlation of fungal species isolated with the clinical type of Tinea capitis

Figure-3: Comparison of clinical type and culture.

only 12 (6%) patients; 6 (50%) had pompholyx and 6 (50%) had urticarial type (Table).

Fluorescence with Wood's light was present in 64 (31.7%) patients. All patients with kerion fluoresced with Wood's light.

Moreover, 66 (32.7%) patients had positive culture after six weeks of incubation. The prevalent species was *T. Soudanense*. *T. Tonsurans*, *T. Schoenleinii*, and *T. Mentagrophytes* in decreasing order of frequency (Figure-3).

Discussion

Tinea capitis is the commonest fungal infection in children⁶ with variable clinical appearance and duration.

Clinical diagnosis was made in patients with lesions on scalp such as diffuse or patchy scaling, inflammatory swelling with easy pluckable hair, boggy tumour studded with pustules or patches of alopecia with broken off stubs. Positive fungal hyphae or spores in skin scrapings on direct microscopy confirmed it.

The male-to-female ratio in our case series was almost equal with 52.5% males affected. It is somewhat similar to the study from North India by Chander Grover et al,¹⁰ who studied a total of 214 cases over a 2.5-year period and found a slight female preponderance comprising 51.4%. The gender variation has been conflicting in literature; it is thought to be more common in boys due to shorter hair, allowing easy access for circulating spores, while others believe that it may be more common in girls due to tight hair braiding.¹¹

Although it is a chronic disease, but the clinical pattern does not depend upon the duration of disease, but on how the hair is invaded, the level of host resistance and the degree of inflammatory host response.¹

In our study gray patch was the most frequently observed

clinical type, 71(35%), followed by black dot in 63(31%). In comparison to the study by Chander Grover et al¹⁰ the non-inflammatory black dot variety was the most common clinical type in 62(28.9%) children followed by the grey patch in 55(25.7%). Seborrhoeic dermatitis or dandruff-like pattern was noted in 4(1.8%), and 30(14%) patients had kerion. In our study, only 1% were found to have Diffuse scale type and 50(24.8%) had the kerion variety.

In a study from southeastern China,¹² a retrospective analysis of 866 patients with *Tinea capitis* from January 1993 to December 2008 was done; 562 patients (64.9%) had ectothrix infection. Endothrix infection was seen in 303 (35.0%). Only one *Favus* was found, while Kerion was observed in 89 (10.3%) patients. Average age was 10.5 years, amongst them, the highest incidence was in the age group of 6-10 (48.5%), followed by 0-5 (30.5%), 11-15 (11.0%), and down to the age older than 15 (10.0%). In our study, the mean age was 6.4 years. Maximum numbers of patients were in the age group of 3 to 9 years. This can be explained by the fact that there is an increase in natural antifungals, such as triglycerides produced from the sebaceous gland from puberty onwards. The change in composition of sebum with simultaneous increase in the fungi static fatty acids coincides with the fact that *Tinea capitis* is more prevalent among younger age groups, almost exclusively in prepubertal children.¹

However, in another local study done at Mayo Hospital, Lahore,¹³ has shown that gray patch was the most common presentation among 58 patients, followed by Kerion in 16. Therefore, this study was in accordance with our study about the predominance of gray patch variety.

The majority of the patients in our study belonged to lower socioeconomic class (52%) and middle socioeconomic class (46%). Only (2%) belonged to high socioeconomic class. In the study by Chander Grover,¹⁰ approximately 74% of the children belonged to the lower middle and 19% belonged to the lower income groups. It was emphasised in that study that *Tinea capitis* was more in this group of children because of low standard of living, poor hygiene, sharing of combs and hair accessories in 62% patients. More number of siblings, low level of parental education and overcrowded living conditions also contribute to the risk of infection.

As the lower socioeconomic class forms the majority of population in any society, therefore, the increase in prevalence of disease can naturally be expected.

In our study, 40.1% of the patients had a positive family history of *Tinea capitis* or other fungal infections. In all

these families there were few common factors such as overcrowding, comb-sharing and common towel usage among family members. The dermatophyte infection among family members acts as being one of the sources of recurrent fungal infections in patients.

In a local study,¹⁴ from Lahore analysing 100 patients, it was seen that 17% of the patients had a second focus of dermatophytic infection other than *Tinea capitis*. In our study *Tinea* elsewhere was found in 18.2% of the patients. *Tinea faciei* was 17(8.4%), *Tinea corporis* 16(7.9%), *Tinea unguis* 4(2%) along with *Tinea capitis*. A thorough cutaneous examination should be done to detect the unsuspected focus of infection.

The proximity with domestic animals in our study was noted in 24(11.9 %) and most of the patients had the clinical type Kerion. On further query, it was revealed that the animals were mostly cattle, goats and hen. However, the animals were not investigated.

There are various studies which have emphasised this fact about animal contact playing a role in spreading the infection. In a study¹⁵ done in Ethiopia on 104 children infected with *Tinea capitis* showed that 97% of the patients had animal contact. The infection may be acquired from infected animals.

Ide eruption was present in patients with the clinical type Kerion. Six of the patients had urticaria and 6 had pompholyx. *Tinea capitis* and with a secondary papular pruritic eruption of the trunk has been reported due to *Trichophyton soudanense*, an anthropophilic dermatophyte.¹⁶

Patients with positive microscopy were included in our study, but culture was positive in only 32.7% (66/202) patients. *T. tonsurans* was found in 15.8%, *T. soudanense* in 11.9%, *T. schoenleinii* 4% and *T. mentagrophytes* 1%.

In a 15-year retrospective study in Mississippi,¹⁷ 39% (478/1220) had positive cultures for dermatophytes.

In another study¹² cultures of dermatophytes were positive in 715 (82.5%) patients. The predominant isolates were *Microsporum canis* in 62.4%, followed by *T. violaceum* in 19.0%, *T. tonsurans* in (9.8%), *T. tonsurans* in 3.8%, *T. mentagrophytes* in 2.5%, and *M. gypseum* in 1.8%.

In a publication from tropical Africa,¹⁸ a cross-sectional study was conducted with 454 children aged 4-17 years, attending a rural school and an urban school. Of them 105 (23.1%) of 454 children had *Tinea capitis*; 16.3% children had positive culture. *T. soudanense* (29.4%) was the most

prominent species, followed by *T. tonsurans* (27.9%) and *M. audouinii* (25.0%).

Study by Chander¹⁰ yielded culture in 156 (72.8%) patients and showed predominant species to be *T. violaceum* 138 (64.4%).

The epidemiological survey of dermatophytosis¹⁹ in Iran showed that amongst 257 isolates obtained from hair- and scalp-derived tissues. *T. violaceum* was the most common etiological agent of *Tinea capitis* cases.

A retrospective study (1999-2010) enrolled all the cases of inflammatory *Tinea capitis* observed at a referral hospital in northern Tunisia. It had 121 patients with a mean age of about 8 years. The majority (71.9%) were in patients lesser than 10 years of age. Direct examination was positive in 110 cases and positive cultures were obtained in 105 patients (49 *T. violaceum*, 31 *M. canis*, 13 *T. interdigitale* complex, 12 *T. verrucosum*).²⁰

Conclusion

Gray patch was the predominant variant of *Tinea capitis* followed by black dot in the study population. Culture was positive in 66 (32.7%) samples, and *T. tonsurans* was the most common aetiological agent isolated.

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