

## A study on Tinea Capitis and its etiological agents in patients attending the Dermatology Out Patient Department in a tertiary care hospital in Eastern India.

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**Abstract:** Tinea capitis is one of the commonest forms of superficial mycosis that we come across in the dermatology OPD, though the etiology of the disease is not regularly documented. Here among 72 clinically diagnosed cases of tinea capitis, the age group mostly affected was found to be between 0-10 years (58.3%). After direct microscopy it was found that 60 (83.3%) were positively showing presence of filamentous fungi under KOH mount in direct microscopy. The number of samples showing ectothrix type of infection was higher (70%) than the samples showing endothrix type of infection (23.3%). Among the 72 cases, 48 (66.6%) cases were culture positive for dermatophytes. The rest were either showing no growth after 45 days of incubation (27.8%), or found to have growth of other non dermatophytic fungi like *Aspergillus* spp. (4.2%) or *Fusarium* spp. (1.6%). The Male: Female ratio among culture positive cases was 1.25:1. Though the culture of dermatophytes showed predominance of *Trichophyton* (66.7%) among the isolates over *Microsporum* (33.3%), but the commonest dermatophyte isolated was *M. gypseum* in 16 (33.3%) cases followed by *T. rubrum* in 12 (25%) cases along with other *Trichophyton* species. Though *Trichophyton* species is the commonest etiological agent of tinea capitis, *Microsporum* species is catching up quite fast in this respect. Early diagnosis and prolonged treatment along with proper surveillance can bring down the burden of the disease in our community.

**Keywords:** Dermatophytes, Endothrix, Exothrix, KOH mount, *Microsporum*, Tinea capitis, *Trichophyton*

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### I. Introduction

Superficial mycoses are one of the commonest skin infections and are prevalent all over the world.<sup>1</sup> Among the fungal etiological agents, dermatophytes are most common causing cutaneous fungal infections in man affecting skin, hair and nails, with a morbidity of 10-20% especially in the tropical and subtropical countries like India.<sup>2</sup>

Tinea capitis occurs most commonly in children less than 10 years old presented as well-demarcated scaly patches in which hair shafts are broken off right above the skin; alopecia can result. The infection can be inflammatory type, like Kerion and Favus, or non-inflammatory type like black dot and grey patch.<sup>3</sup> If the sheaths of arthroconidia formed on the outside of the hair shaft it is called ectothrix and if sheaths of arthroconidia formed within the hair shaft, it is called endothrix.<sup>4</sup>

It is to be noted that the commonly prescribed antifungal agent, fluconazole is ineffective against dermatophytes.<sup>4</sup> Further, etiological diagnosis to genus level is essential in selecting the correct antifungal agents. This study was undertaken to isolate, identify and speciate the different etiological agents of dermatophytes from the clinically suspected lesions of Tinea capitis, and to determine the proportion and distribution pattern of the etiological agents among the patients coming to the dermatology out patients department of a tertiary care hospital in Kolkata.

### II. Materials And Methods

The study was carried on 72 clinically suspected tinea capitis patients attending the dermatology department of RGKMCH, Kolkata from 2011-2012. After taking detailed history, clinical examination of patient was made in broad day light. The following parameters for each patient were recorded in a Microsoft Excel database: age, sex, any history of contact with animals, presence of fungal elements in the hair samples and its type of involvement, culture, species of the dermatophytes identified by LPCB mount and biochemical tests (urease test). Patients undergoing any types of antifungal therapy for any cause currently were excluded from the study. Patients having simultaneous bacterial co-infections in the affected sites were excluded from the

study. The study was approved by the Institutional Ethical Committee and properly informed consent was taken from the patients.

Hair samples were collected by plucking so that the root is included. If hair was too fragile, as in “black dot” tinea capitis, a scalpel was used to scrape scales and excavate small portions of the hair root. For each patient samples were taken on at least 2 different occasions on 2 different days to rule out the chance of environmental contamination in the cultures.

The sampled material was divided into 2 portions: one for direct microscopy and the remainder for culture. Infected hair a delicate sample, hence it is examined as soon as possible after mounting in 10% KOH solution. The base of the hair shaft and follicular debris are the areas where fungi are mostly seen. The ectothrix type of fungal appearance are noted when arthrospores appear as mosaic sheath around hair or as chains on the surface of hair shaft. The cuticle of the hair remains intact. In the endothrix type, hyphae form arthrospores within the hair shaft, which is severely weakened and cuticle of hair is destroyed. The arthrospores are 3-4µm in diameter and are observed in chains filling inside shortened hair stubs. The slides are examined under the microscope with low power objective, first and then under high power.

Each sample was inoculated in 3 tubes of SDCA, for aerobic fungal culture at 22 ° C, 25 ° C and other in 37° C, at room temperature, BOD and aerobic incubator respectively. Another part of the sample is inoculated in the DTM agar and incubated at 25 ° C in BOD.

The cultures were examined every two days for a period of 6 weeks for the presence of growth. The growth was generally observed starting from sixth day onwards. If no growth was found after 45 days it was considered negative for the growth of fungi. In DTM, growth of dermatophyte was associated with change of colour of the media to red within 3 – 6 days. If no change was seen upto 2 weeks, the sample was declared mycologically culture negative.

Identification of a dermatophyte was based on its gross colonial morphology on culture media, biochemical tests, and on its microscopic morphology on LPCB mount.

### III. Results

Out of 72 clinically suspected cases of tinea capitis, 48 were found to be due to dermatophyte infection, which showed growth of different dermatophytes on culture. Remaining 24 were either contaminants, fungi other than dermatophytes, or did not show any positive finding in culture. In the different age groups, dermatophytic infection was frequently found in the age group of 0-10 years, 28 out of 48 culture positive cases, 58.3% (Table 1). The mean age of patients infected with dermatophytes, was 6 years.

**Table 1 - Age-wise distribution of tinea capitis patients**

Age groups (in years)	No. of cases N = 48
0-10	28 (58.3%)
11—20	16 (33.3%)
21-30	1 (0.02%)
31-40	2 (0.04%)
41-50	1 (0.02%)

The number of male patients (55.5%) were marginally greater in number than the female (44.5%) patients in the study group. The burden of dermatophytic infection was also higher in the males (38.9%) in comparison with the female patients (27.8%) (Table 2). Male: Female ratio of dermatophyte infected patients was 1.4: 1.

**Table 2 - Gender wise distribution of tinea capitis patients (N = 72)**

SEX	DERMATOPHYTE INFECTED CASES	TOTAL NO. OF CASES
MALE	28	40
FEMALE	20	32

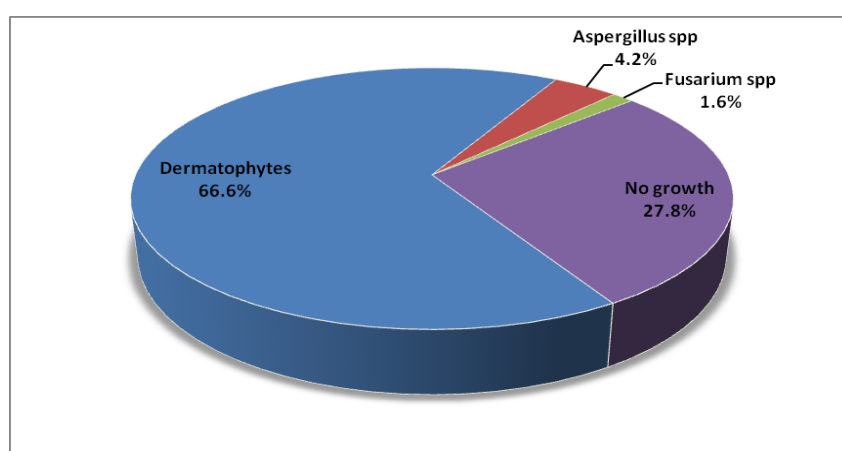
Out of 72 clinically suspected cases of Tinea capitis, fungal elements were demonstrated with KOH mount in 60 cases (83.3%) by direct microscopy. 48 cases (66.6%) were positive by both microscopy and culture (Table 3). The KOH mount examination for diagnosis of dermatophytosis was found to be very useful with high sensitivity (100%) but the specificity was 50%.

**Table 3 - Comparison of positive and negative direct microscopy by KOH mount, versus positive and negative culture of dermatophytes**

	KOH +ve	KOH -ve
Culture +ve for Dermatophytes	48	0
Culture -ve for Dermatophytes	12	12

Among 60 cases which showed presence of fungal elements under KOH mount, 42 (70%) cases were found to have Ectothrix type of infection of the hair samples, where 14 (23.3%) were having Endothrix type of infection. The rest 4 (6.7%) were found to have both ectothrix and endothrix type of infection in different samples from the same patients.

The isolates from the culture of the different samples were diverse. As multiple sampling was done from a single patient on repeated occasions, fungal etiology other than dermatophytes were documented when similar organism was isolated in all the culture tubes in different samples from the same patient. Though dermatophytes were found in 48 (66.6%) of the 72 samples, filamentous fungi such as different species of *Aspergillus* in 3 (4.2%) cases and *Fusarium* spp. was isolated in 1(1.6 %) case from culture (Figure 1) and in rest 27.8% cases no fungal growth was seen after 45 days of incubation.



**Figure 1- Distribution of different fungal etiology isolated from culture**

Among 48 dermatophytes, 16 (33.3%) were *Microsporum* and 32 (66.7%) were *Trichophyton*. Most common isolate was *M.gypseum* 16 (33.3%), followed by *T. rubrum* 12 (25%), and *T. violaceum* 8 (16.7%). The rest of the dermatophyte isolates were *T. mentagrophytes*, *T. verrucosum* and *T. schonleinii* 4 (8.3%) cases each. (Table 4)

**Table 4 - Distribution of different species of dermatophytes isolated from culture**

Dermatophytes isolated from cultures		
<i>Microsporum gypseum</i>	16	33.30%
<i>Trichophyton rubrum</i>	12	25%
<i>Trichophyton violaceum</i>	8	16.70%
<i>Trichophyton mentagrophytes</i>	4	8.30%
<i>Trichophyton verrucosum</i>	4	8.30%
<i>Trichophyton schonleinii</i>	4	8.30%
Total	48	100%



**Figure 2- KOH mount of hair sample showing presence of fungal elements, ectothrix type.**



**Figure 3** – Tinea capitis with alopecia



**Figure 4** - *M. gypseum* macroconidia – LPCB MOUNT

#### IV. Discussion

Tineacapitis is among the commonest superficial infections affecting Indian population. However its microbiological etiology is seldom documented up to species level. The present study shows that commonest age group affected was 0-10 years, 28 out of 48 culture positive cases, 58.3% (Table 1). The mean age of patients infected with dermatophytes, was 6 years. The highest incidence in young patients aged 0-10 years, similar to the studies done by Bindu et al and Peerpur et al, may be due to the use of contaminated blades in the pilgrimage centers where ritual head shaves are carried out in large numbers, mostly in unhygienic and overcrowded surroundings.<sup>5,6</sup> Infection also occurs through fomites like towels, combs, hair brushes and theatre seats<sup>3</sup>. In the present study, male patients (58.3%) were more affected than female patients, which is comparable with other studies.<sup>7</sup> Male predominance in our study may be due to increased outdoor physical activities leading to increased opportunity for exposure to infection, and as well as higher medical awareness and hence higher OPD visiting rate among males.

In the present study, out of 72 cases, 60 (83%) were positive for fungi, by KOH mount, 48 (66.7%) were positive by both KOH mount and culture, 12 (16.7%) were positive by KOH mount but dermatophytes were not grown in culture. The culture positivity rate (66.7%) for dermatophytes. 12 cases (16.7%) were negative by both KOH and culture. These 12 patients highlight the importance of laboratory diagnosis and repeated sampling to confirm a clinical suspicion of tinea capitis. The clinical picture of tinea capitis may mimic different other diseases, which may be the reason behind the KOH negativity of some clinically suspected cases. Though KOH examination can yield false negative results in 5 – 15% cases<sup>2</sup>, but it is a great aid for prompt detection of dermatophytes in the clinical sample.<sup>8,9</sup> The data in the present study was analyzed and it was found that the sensitivity of the KOH mount technique for dermatophytic infection is 100 %, but the specificity is 50 %. The KOH mount can show presence of fungal elements in case of any other non dermatophytic etiology of hair infection also, being the reason of its low specificity<sup>3</sup>. The species distribution among dermatophyte infected cases yielded striking results in our study. Among the 48 culture positive cases, Trichophyton was found in 32 (66.7%) occasions and Microsporum was found in the rest 16 (33.3%). Though *T. rubrum* was a common etiology 12 (25%), *M.gypeum* 16 (33.3%) was the undisputed leading cause of infection. *T. Violaceum* 8 (16.7%), *T.verrucosum*, *T. mentagrophytes*, *T. schoenleinii* (8.3% each) also emerged as important causative agents. Though in several other studies *T. violaceum* is the leading causative agent,<sup>10, 11, 12</sup> but the emergence of

*Microsporum* as the leading dermatophyte causing tinea capitis has also been documented by Oke O et al<sup>13</sup> and Dehghan et al.<sup>14</sup> The predominance of *T. violaceum*, *T. mentagrophytes*, *T. verrucosum* and *T. schoenleinii* may be due to the geographical distribution of these fungi in our local population.

**Limitation of our study** Our study is a hospital outdoor based study. A community based study to estimate the burden of dermatophyte infection in the tinea capitis cases along with more specific investigations like histopathology or molecular techniques would reveal the actual picture.

## V. Conclusion

Dermatophytosis of hair and scalp are very common form of superficial mycosis in our country where hot and humid climate play an important role in the growth of these fungi. By and large though Trichophyton species is the commonest etiological agent of tinea capitis, *Microsporum* species is catching up quite fast in this respect.<sup>15,14</sup> Without proper treatment, dermatophytic infections become chronic and more difficult to treat; ketoconazole is frequently prescribed by the clinicians but may become ineffective against in chronic cases. Topical application of antifungal lotions in the hairy sites of the body and shampoos like azoles, selenium sulfide, povidone iodine and zinc pyrithione (ZPT) in tinea capitis could reduce the spore load, but these are not sufficient.<sup>16</sup> Systemic therapy with Griseofulvin and Terbinafine is helpful along with topical therapies. Hence proper diagnosis of the etiological agent of tinea capitis is necessary.<sup>17</sup> Surveillance of infections and the awareness level in the common population if increased, the burden of this disease can be reduced to a much lower level.

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