Original article

Emergence of *Trichophytontonsurans* in Tineacapitis cases in Lucknow: A hospital based study.

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Abstract

Background: Tineacapitis (TC) is a common superficial mycoses, affecting paediatric as well as adult population. Etiological agents are usually species of *Trichophyton* (T) and *Microsporum* (M). Recently there have been reports of change in frequency of etiological agents, worldwide. There is paucity of literature on TC from our region. Present study was conducted to know clinic-epidemiological aspects of TC and any correlation between clinical types, demographic details and microbiological findings in our region.

Materials and methods: Clinical pattern, KOH findings and etiological agents were studied in 118 patients suspected of TC.

Results: Out of total 118 patients enrolled, TC was commonest in 6-10 years age group (28.8%) with non-inflammatory type being more common (49.1%) than inflammatory type (28.9%). Mixed pattern was seen in 10.1% cases and TC with tineacorporis was present in 11.9% cases. On direct microscopic examination in KOH mount, endothrix pattern (37.3%) was more common compared to ectothrix (28.8%), both types was seen in 15.3% cases. *T. tonsurans* (22%) was the commonest dermatophyte isolated followed by *T. mentagrophytes* (11.9%), *T. verrucosum* (8.5%), *M. audouinii* and *M. ferrugineum* (6.8% each) and *T. schoenleinii* (5.1%). *Trichophytonviolaceum* ,*T.rubrum* and *T.soudanense* were found in 3.4% cases each.

Conclusion: Present study hints towards change in frequency of etiological agents in TC cases in our region with emergence of *T. tonsurans* and two rare species i. e. *T.soudanense* and *M. ferrugineum*. Clinico-etiological studies at regular intervals are important for effective diagnosis, treatment, prevention and control of tineacapitis cases

Introduction

Tineacapitis (TC) commonly known as ringworm infection of scalp is a worldwide public health problem of paediatric, as well as adult population. Clinical presentations vary from non-inflammatory to inflammatory types and it depends on etiological agents i.e. dermatophytes. Various species of *Trichpohyton* (T) and *Microsporum* (M) genus are common etiological agents of tinea capitis.[1] *M. audouinii* and *M. ferrugineum* usually cause gray-patch type TC, while *T. tonsurans* or *T.violaceum* cause black-dot typeand zoophilic species like *T. verrucosum*or *M. canis* and geophilic species e.g. *M. gypseum* cause inflammatory type of TC. [2]The prevalence and and the etiological agents of TC vary from regions, environmental changes and time period. TC transmits among humans and from animals to humans via close contact and fomites.[3]We are observing change in spectrum of dermatophytes from superficial mycoses cases in our region.[4]Present

study was undertaken to know the distribution of dermatophytes in TC cases in our region.

Materials and Methods

A prospective study from 1st April 2010 to 30th September 2010 was conducted in the departments of Microbiology and Dermatology, Venereology and Leperology in Era's Lucknow Medical College,Lucknow. The study was approved by the Institutional Ethics Committee and written informed consent was taken from all adult patients or from parents in case of children. Patients of all age groups attending outpatient department of Dermatology with suspected diagnosis of TC were enrolled for the study. Patients unwilling to give consent or with history of antifungal treatment in last six weeks were excluded from the study.

Detailed demographic details, duration and pattern of hair loss were recorded. Family history and contact with animals was also taken from every patient. Examination of whole head was done to assess the type of TC. Patients were classified on the basis of morphological types of TC as non-inflammatory (black dot [BD], gray patch [GP]) and seborrheic dermatitis type), inflammatory (pustular, kerion or favus) or mixed type for any combination of above types. Concurrent tinea infection of other body parts was also examined.

All patients were asked to come after head wash to remove any oil residue from hairs. Hair fragments or stubs and skin scrapings from the affected body area, were collected by aseptic precautions in every patient. All specimens were examined by 10% KOH mount microscopically under low or high power dry objectives for direct examination of fungal elements and type of hair invasion i.e. endothrix or ectothrix or both. All samples were inoculated on Sabouraud'sDextrose Agar supplemented with 0.05 mg/ml chloramphenicol and 0.5 mg/ml cycloheximide and kept at 25°C for three weeks in a BOD incubator. All culture were observed twice weekly for any growth. Cultures were reported as negative if no growth in threweeks' time. Fungal isolates were identified by standard laboratory procedures.[1] The clinical, demographic details and microbiological findings were recorded and correlated. Fisher's exact test was used to calculate p value and p value <.05 was recorded as significant.

Results

Total 118 patients were enrolled in the study, out of which 62 (52.5%) were males and 56 (47.5%) were females; male female ratio came out to be 1.1:1. Most common age group affected was 6-10 years (28.8%) followed by 0-5 (27.1%), 21-30 (13.5%), 31-40 (8.5%), 11-15 (6.8%) and 16-20, 41-50 and >50 (5.1% each). Male female ratio in all age groups was found to be statistically insignificant. [Table 1] Among various clinical types, non-inflammatory TC was more common (66.1%) than inflammatory TC (11.9%), mixed pattern was seen in 10.1% cases and 11.9% cases presented along with tineacoprporis [Table 2]. No case of favus was seen. Among non-inflammatory types, gray patch (25.4%) was the commonest clinical type followed by black dot (23.7%) and seborrheic (16.9%). Among inflammatory types only pustular cases (11.9%) were seen and no case of kerion was seen. On direct examination in KOH mount preparation,endothrix infection was more common (37.3%) than ectothrix (28.8%), both types of hair invasion was seen in 15.3% cases and 18.6% cases were negative.

On correlation with clinical types, endothrix pattern of hair invasion was more common in black dot (45.5%), followed by gray patch (20.5), mixed (13.6%), cases with tineacorporis (11.4%) and

sebborheic types (9.0%)[Table 3]. However, ectothrix invasion was more common in gray patch (44.1%) , followed by pustular variant (29.4%), mixed (11.8%), 8.8% cases with tineacorporis and only 5.9% cases in seborrheic type. No case of ectothrix was seen in black dot types.Both types of hair invasion was most commonly seen in cases with tineacorporis (33.4%) followed by equal number of cases (22.2%) in gray patch and black dot types and 11.1% cases in mixed and pustular category each. This type of hair invasion was not seen in seborrheic type. No fungal elements were seen in majority of sebborheic types (63.6%) followed by black dot (18.2%) and 9.1% cases in gray patch and pustular variants each. All cases in mixed type and associated with tineacrporis were positive for fungal elements.

Out of 118 cases fungal growth was seen in 84 cases (71.1%), contamination was seen in 11.8% cases and no growth was observed in 16.9% cases (Table 4). Most common dermatophyte species isolated was *T. tonsurans* (22%) followed by *T. mentagrophytes* (11.9%), *T. verrucosum* (8.5%), *M. audouinii* and*M. ferrugineum* (6.8% each), *T.shoenleinii* (5.1%) and *T.rubrum, T. violaceum* and *T. soudanense* (3.4% each).

A correlation between fungal species and clinical type of TC was analyzed and it was seen that *T. tonsurans* was most commonly isolated from black dot cases (78.6%), *T. mentagrophytes* from cases with T. corporis (42.8%), *T. verrucosum* in pustular type (57.1%), *M. audouinii* and *M. ferrugineum* (20% each) followed by *T. rubrum* and *T. soudanense* (13.3% each) in gray patch cases. Half of the cases in seborrheic type developed contamination.

Table 1: Age and sex distribution of tineacapitis cases

Age Group (years)	N (%)	Clinical types												Total		M : F ratio	P value
		Gray Patch		Black dot		Seborrheic		Pustular		Mixed		Tineacapitis + Tineacorporis					
		M	F	M	F	M	F	M	F	M	F	M	F	M	F		
0-5	32(27.1)	8	6	2	2	0	2	6	2	2	0	0	2	18	14	1:1.3	0.596
6-10	34(28.8)	4	0	2	10	4	6	4	0	0	2	2	0	16	18	1:1.1	0.864
11-15	8(6.8)	0	4	0	0	2	0	0	2	0	0	0	0	2	6	1:3	0.289
16-20	6(5.1)	0	2	0	0	0	0	0	0	0	2	2	0	2	4	1:2	0.688
21-30	16(13.5)	4	2	2	0	0	2	0	0	0	2	4	0	10	6	1.6:1	0.455
31-40	10(8.5)	0	0	4	0	2	2	0	0	0	0	2	0	8	2	4:1	0.109
41-50	6(5.1)	0	0	2	0	0	0	0	0	2	2	0	0	4	2	2:1	0.688
>50	6(5.1)	0	0	0	4	0	0	0	0	0	0	2	0	2	4	1:2	0.688
Total	118(100)	16	14	12	16	8	12	10	4	4	8	12	2	62	56	1:1.1	0.646
M:F ratio		1.1:1		1:1.3		1:1.5		2.5:1		1:2		6:1		1.1:1			

Table 2: Clinical types of tineacapitis

Clinical types	N (%)
Non-inflammatory	**78 (66.1)**
Gray patch	**30 (25.4)**
Black dot	**28 (23.7)**
Sebborheic	**20 (17)**
Inflammatory	**14 (11.9)**
Pustular	**14 (11.9)**
Kerion	**0**
Mixed	**12 (10.1)**
With Tineacorporis	**14 (11.9)**
Total	**118 (100)**

Table 3: KOH findings in different types of Tineacapitis cases

KOH findings	N (%)	Clinical types					
		Gray Patch	Black dot	Seborrheic	Pustular	Mixed	Tineacapitis + Tineacorporis
Endothrix	44 (37.3)	9	20	4	0	6	5
Ectothrix	34 (28.8)	15	0	10	10	4	3
Both	18 (15.3)	4	4	0	2	2	6
Negative	22 (18.6)	2	4	14	2	0	0
Total	118 (100)	30 (25.4)	28 (23.7)	20 (17)	14 (11.9)	12 (10.1)	14 (11.9)

Table 4: Distribution of dermatophytes in different clinical types of Tineacapitis cases

Dermatophyte	N (%) N=118	N (%)					
		Gray patch (N=30)	Black dot (N=28)	Sebborheic (N=20)	Pustular (N=14)	Mixed (N=12)	Tcap + Tcorp (N=14)
T. tonsurans	26 (22)	0	22 (78.6)	0	0	4 (33.2)	0
T. mentagrophytes	14 (11.9)	2 (6.7)	0	2 (10)	2 (14.3)	2 (16.7)	6 (42.8)
T. verrucosum	10 (8.5)	0	0	0	8 (57.1)	2 (16.7)	0
T. violaceum	4 (3.4)	0	4 (14.3)	0	0	0	0
T. rubrum	4 (3.4)	4 (13.3)	0	0	0	0	0
T. soudanense	4 (3.4)	4 (13.3)	0	0	0	0	0
T. schoenleinii	6 (5.1)	2 (6.7)	0	4 (20)	0	0	0
M. audouinii	8 (6.8)	6 (20)	0	0	0	2 (16.7)	0
M. ferrugineum	8 (6.8)	6 (20)	0	0	0	0	2 (14.3)
Contamination	14 (11.8)	2 (6.7)	0	10 (50)	0	0	2 (14.3)
Negative	20 (16.9)	4 (13.3)	2 (7.1)	4 (20)	4 (28.6)	2 (16.7)	4 (28.6)

Discussion

Tineacapitis is usually a disease of childhood and in present study majority of cases (55.9%) belonged to children < 10 years of age group, similar findings have been reported previously by others from north [5,6], south [7], east[8] and west India.[9]However few studies from abroad have reported higher incidence in 4-7 years age group. [10,11]Majority of studies on tineacapitis are done on pediatric population and very few have included all age groups. Higher prevalence of TC in 21-30 years age group (13.5%) found in the present might be due to small sample size, however, Kamalam*et al*. have reported a prevalence rate of 8.5% in this age group.[7]Moreover, in 14 (11.9%) cases- majority of whom belonged to adult age group,were found to be co-infected with tineacorporis, similar findings have been reported in a previous study from south India.[7]Gender predominance is a controversial issue in tineacapitis, as majority of studies report higher prevalence in males due to short hairs allowing easy entry of fungal spores and regular visit to barbers might provide an easy source of infection,[5-12] while, few authorities report higher prevalence in females due to their long hairs.[12,13] However, male female ratio was almost 1.1:1 in the present study and no statistically significant difference was found in any age group, which is in accordance with many previous studies done in India and abroad.[5-11]

As reported in earlier studies non-inflammatory types of TC were more common (66.1%) compared to inflammatory types (11.9%).[5,6,8-11]Variations in clinical types have been reported previously; among the non-inflammatory cases encountered in the study, gray patch and black dot were found at almost equal frequency which is in accordance with a study done by Grover at al [5], while few earlier studies have reported black dot[9] or gray patch [7,8] or seborrheic types more common. [6] No case of kerion and favus were found in present study.

On direct examination of KOH mount, 81.4% samples were positive out of which endothrix pattern was more common (37.3%) compared to ectothrix type (28.8%), Both types of pattern was seen in 15.3% of cases. The results are in accordance with the previous studies reporting 82.3% positivity and predominance of endothrix pattern.[5]Out of 18.6% negative cases majority belonged to seborrheic type (63.6%).

Fungus isolates give important information about the pattern of prevailing dermatophytes in particular region. Fungus culture positivity has been reported to be in the range of 61-82.6%,[5,6,9,13] and culture positivity in 71.3% cases, observed in our study is within the expected range. Most interesting finding of our study is, a change in frequency of dermatophytes from tineacapitis cases.*T. tonsurans*was the most common isolate in 22% cases followed by *T. mentagrophytes* (11.9%), *T. verrucosum* (8.5%), *M. audouinii* and *M. ferrugineum* (6.8% each), *T. schoenleinii* (5.1%) and *T. violaceum*, *T. rubrum* and *T. soudanense* (3.4% each). Epidemiology of dermatophytes is not static and it is known to keep changing by the geographical area and time.[2]In India, *T. violaceum* is the predominant dermatophyte isolated from tineacapitis cases especially from south[7] and west regions [9], but emergence of other anthropophilicdermatophytes e.g. *T. schoenleinii*, *T. tonsurans* and *M. audouinii* has being reported earlier by Singhal A et al. from Delhi.[6] We are first to report such a high prevalence of *T. tonsurans* from tineacapitis cases from India. Previously, Grover S et al. have reported high prevalence of *T.tonsurans* (20.5%) from superficial mycoses cases attending a

hospital in North-East India.[14] In recent years,*T. tonsurans* is emerging as a predominant isolate in tineacapitis cases worldwide.[15] Recent studies from United Kingdom and United States of America have demonstrated that, *T. tonsurans* is responsible for around 83-90% of tineacapitis cases, replacing *M. audouinii* as the principal agent.[16, 17]*T. tonsurans* can exists as an asymptomatic carrier state in children, acting as reservoir of infection, resulting in rapid increase in worldwide prevalence.[18]We have previously reported a change in spectrum of fungal isolates from superficial mycoses cases from same region.[4] Findings of present study reconfirms that the distribution of dermatophytes is consistently changing in our region. Moreover, re isolation of two previously reported rare dermatophytes, namely *T. soudanenese* and *M. ferrugineum*[4] in 3.4% and 6.8% of cases respectively, hints towards emergence of these species in India.*T. soudanense* and *M. ferrugineum* are both common and endemic cause of tineacapitis in western tropical Africa and Oriental Asia, but these species have appeared sporadically in Western Europe and USA in recent years. [2]

India is a growing economy and in last couple of decades there has been significant increase in interstate as well as international travel by the people. International travel might be one of the important reasons of worldwide dissemination of endemic species namely *T. soudanense* and *M. ferrugineum*.

Conclusion

Present study confirms the finding of our previous study reporting change in frequency of dermatophytes isolated from superficial mycoses cases in our region. *T. tonsurans* has emerged as the predominant isolate in tineacapitis cases worldwide and emergence of *T. tonsurans* in our region is not unexpected. As *T. tonsurans* can remain in asymptomatic carrier state, it is difficult to eradicate from humans and poses a public health challenge. Small sample size is a limitation of our study and a large cross sectional population based study is needed to confirm the findings of our study. Nevertheless, updated knowledge about epidemiological trends of dermatophytoses and their etiological agents helps in early diagnosis, treatment, prevention and control of these common diseases.

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