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Original Article

Microbiology Section

Tinea Capitis: A Clinico-Mycological Profile

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ABSTRACT

Introduction: Tinea capitis a superficial fungal infection infecting the scalp, hair follicles and hair shaft caused by dermatophytes, vary in their etiological agents and predominating anatomical infection pattern with geographical location, environmental and cultural factors.

Aim: To analyse the prevalence of tinea capitis, to know the predominating etiological agent and to assess for any correlation between microscopic and microbiological findings.

Materials and Methods: A total of 821 samples from suspected cases of dermatophytosis were collected for a period of one year from November 2014 to October 2015. Out of which 30 cases belonging to paediatric age group were separated. From all the clinically diagnosed cases samples were collected and subjected to direct microscopy using 10% KOH and confirmation made after preceding the sample for culture.

Results: Of the 30 cases 12(40%) were boys and 18(60%) were girls. patients belonging to age group between 6-10 years (56.67%) showed high rate of infectivity. *Trichophyton violaceum* 8(36.4%) was the main isolate.

Conclusion: It was seen that tinea capitis infection is more prevalent in prepubertal children between 6-10 years of age. *Trichophyton violaceum* was the main isolate from this region. Direct microscopy and culture both together are an important tool for better diagnosis.

Keywords: Dermatophyte, Fungal infections, Prevalence, *Trichophyton violaceum*

INTRODUCTION

Tinea capitis one of the superficial fungal infections caused by dermatophyte infecting scalp, hair follicles and hair shafts chiefly seen occurring in school children and rarely affects infants and adults [1]. The infection may present as a mild subclinical form with slight erythema showing few patchy areas of scaling with dull grey hair stumps to a highly inflammatory form with extensive folliculitis, kerion formation, scaring and alopecia [2]. Clinically the appearance varies depending on the level of host resistance, etiological agent, type of hair invasion that follows and the degree of inflammatory host response [3]. *Microsporum canis* and *Microsporum gypseum* are associated more with inflammatory types while *Microsporum audouinii* and *Microsporum ferrugineum* is mostly associated with non-inflammatory conditions [4]. *Trichophyton violaceum,* an anthropophilic "exotic" dermatophyte commonly seen in tropical regions is known to be the most common dermatophyte causing Tinea capitis in recent years [5].

The pattern of dermatomycoses, their etiological agents and the predominating infection pattern vary over geographical location and a wide range of environmental and cultural factors [6,7]. Superficial fungal infection is known to be relatively common in tropical countries as they are known to thrive at surface temperature of 25°C - 28°C and the infection of the human skin being supported by warm and humid conditions [4].

The incidence of tinea capitis infection has decreased in developed countries by contrast it is endemic in many developing countries and represents a significant dermatological disease [8,9].

India is a large subcontinent with varied topography tropical and subtropical climate which is conducive for acquisition and maintenance of mycotic infection. The epidemiology of tinea capitis is in a constant state of flux with variation in respect to geography and specific population group [10]. The present study aimed to present pertinent mycological findings and to know the prevalence of tinea capitis infection in this region.

MATERIALS AND METHODS

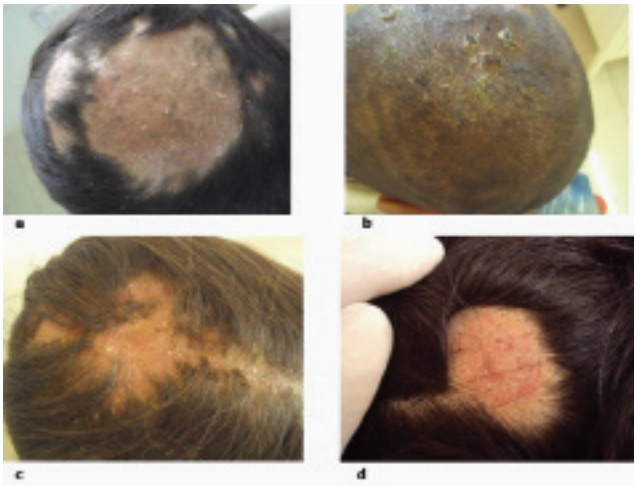
It was a prospective study, conducted in Department of Microbiology of tertiary care Karwar District Hospital, Karnataka, India, for a period of one year from November 2014 to October 2015 after the approval from Institutional Ethical Committee and obtaining a written informed consent from the patients. At the time of collection a detailed history in relation to age, sex, address, occupation, duration of illness, medication and clinical manifestation was noted, similar complaints in the family and contact with soil and animals were elicited and recorded.

A total of 30 samples from children below 15 years of age were collected and those who had already applied antifungal cream or any other local medication were not included in the study.

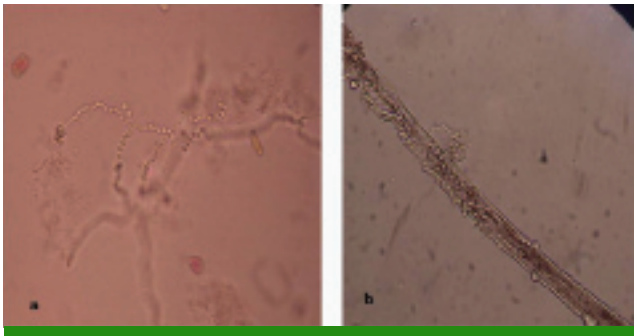
The affected area showing symptoms ranging from patchy scaling to folliculitis with extensive scaling and alopecia was cleansed with 70% alcohol which was allowed to evaporate before taking the specimen [Table/Fig-1]. Scrapings were taken from the edge of the lesion, lustreless hair epilated with the help of forceps. If it was not possible to epilate the hair due to hair fragility scalpel was used to scrape scales and excavate small portions of the hair root.

The collected samples were folded into pre-sterilised black chart paper, labelled appropriately and directed for further proceedings. Each sample was subjected to direct microscopy using 10% KOH and looked for various fungal elements like hyphae and arthroconidia [Table/Fig-2]. Further confirmation was made after proceeding the sample for culture on Sabrouraud's Dextrose Agar with Chloramphenicol and Cyclohexamide (SCCA) (Hi-Media) and Dermatophyte Test Medium (DTM) and incubated at 27°C for 3-4 weeks.

The colonies were examined weekly for a period of one month on appearance of fungal growth its colony and microscopic morphology were observed. If no growth was found after 45 days it was considered negative for the growth of the fungi. Pure isolates were generated by subculture on to SCCA for both macroscopic and microscopic examination of cultural and morphological characteristics respectively for further differentiation. Further identification was done by performing slide culture technique, hair perforation test and urea hydrolysis. Observation was then compared to identification criteria enumerated in Rippon and Larone [11,12].



[Table/Fig-1]: Various clinical presentation of Tinea capitis.



[Table/Fig-2]: Direct KOH microscopy showing thin, hyaline, septate hypal structure.

RESULTS

A total of 821 samples were collected from suspected cases of dermatophytosis out of which 30 cases belonging to the paediatric age group suspected of Tinea capitis infection were separated of these 12 (40%) were boys and 18(60%) were girls [Table/Fig-3]. Age distribution showed that children belonging to age group 6-10 years (56.67%) showed high rate of infectivity followed by children belonging to 11-15 years (26.67%) clinically.

Direct microscopy and culture showed positivity in 17 cases (77.27%) while direct microscopy positive but culture negative in four cases (18.18%), direct microscopy negative and culture positive in five cases (22.73%) and both direct microscopy and culture negative in four cases (18.18%) as seen in [Table/Fig-4].

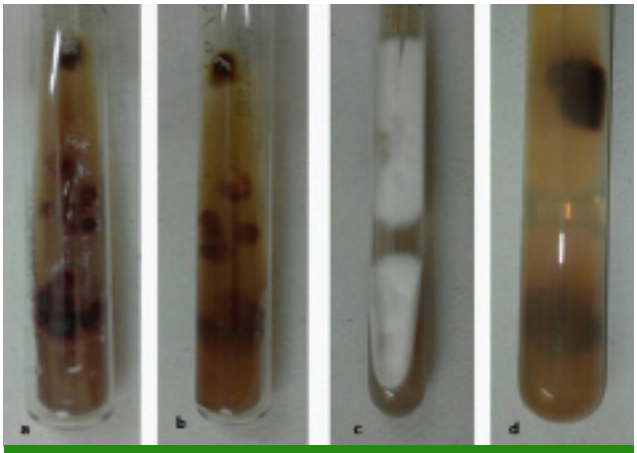
Age group (n=30)	Boys	Girls	Total
0-5 (years)	2(6.67%)	3(10%)	5(16.67%)
6-10 (years)	8(26.67%)	9(30%)	17(56.67%)
11-15 (years)	2(6.67%)	6(20%)	8(26.67%)
	12(40%)	18(60%)	30

[Table/Fig-3]: Distribution in various age groups.

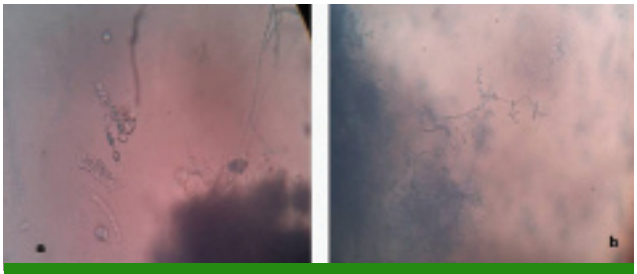
Age (years)	Direct microscopy positive culture positive	Direct microscopy positive culture negative	Direct microscopy negative culture positive	Direct microscopy negative culture negative
0-5	3(13.63%)	1(4.55%)	0	1(4.55%)
6-10	11(50%)	2(9.09%)	2(9.09%)	2(9.09%)
11-15	3(13.63%)	1(4.55%)	3(13.63%)	1(4.55%)
Total	17(77.27%)	4(18.18%)	5(22.72%)	4(4.55%)

[Table/Fig-4]: Direct microscopy in relation to culture.

Dermatophytes belonging to various species formed the majority of isolates accounting for 15(68.18%), out of the total 22 cultures [Table/Fig-5,6]. Non-dermatophytes 4(18.18%), pheaoid 2(9.09%) unidentified 1(4.55%) formed the other groups as seen in [Table/Fig-7]. *T. violaceum* 8(36.4%) was the main etiological agent followed by *T. soudanense* 2(9.1%), *T. rubrum* 1(4.5%) and *T. interdigitale* 1(4.5%) as seen in [Table/Fig-8].



[Table/Fig-5]: (a) and **(b)** cultures showing *Trichophyton violaceum* growth obverse and reverse; **(c)** and **(d)** Cultures showing *Trichophyton interdigitale* growth obverse and reverse.



[Table/Fig-6a,b]: (a) Lactophenol cotton blue stain showing *Trichophyton violaceum* (100x magnification)
(b) Lactophenol cotton blue mount showing *Trichophyton mentagrophyte* (100 x magnification).

Isolate	Total (n=22)
Dermatophyte	15(68.18%)
Non dermatophyte	4(18.18%)
Pheaoid	2(9.09%)
Unidentified	1(4.55%)

[Table/Fig-7]: Distribution of various isolates.

Isolate	Percentage prevalence
T. violeceum	8(36.4%)
T. soudanense	2(9.1)
T. rubrum	1(4.5%)
T. mentagrophyte var. interdigitale	1(4.5%)
M. adouinii	1(4.5%)
T. species	1(4.5%)
M. species	1(4.5%)
Aspergillus fumigatus	1(4.5%)
Candida species	1(4.5%)
Trichosporon species	2(9.1%)
Pheaoid	2(9.1%)
Unidentified	1(4.5%)
Total	22

[Table/Fig-8]: Spectrum of isolate.

DISCUSSION

The epidemiological pattern of tinea capitis has changed significantly in the recent times which could be due to change in socio-economic status, crowded living conditions, booming mass tourism, change in the life style , increasing migration which has led to less common or forgotten species being imported and disseminated [4].

The incidence of tinea capitis infection is said to have decreased in industrialised countries but there is difference in the prevalence of infection depending on the region studies, along with difference in the etiological agents from various regions [8].

In the present study out of the 821 total samples collected 30(3.65%) samples were obtained from children who presented lesions suspicious for tinea capitis. The variation of incidence reported by different workers range from 0.5% to 10% [13-15]. A similar study from northern Karnataka showed a prevalence of 1.16% [16]. Such variations may be due to difference in conditions, geographical locations etc. This incidence rate is low but tinea capitis infection is known to vary widely. The low rate of incidence could be due to the fact patients attending OPD do not reflect the actual incidence of tinea capitis infection in the society as it was observed in a study conducted in Cleveland, 60% of the cases were in the carrier state. There is hardly any sin or symptom in most of the cases and in inflammatory condition sometimes the symptoms resolves by itself unless there are any underlying immunological problems thus most cases go undiagnosed [16-17].

A higher incidence was seen in children ranging in age between 6-15 years (56.67%) which is in relation with other studies [16,18]. This group includes school going children and they constitute the most active in the population especially in play grounds, thus being more likely to be in closer contact with the source of fungal pathogens and higher risk of transmission of the disease because of closer contact with each other [10,19].

Conflict exists with various views regarding the gender predominance of the infection. Some studies have shown that tinea capitis infection is more common in boys due to short hair which allows easy access for circulating spores [20]. Other studies have shown that higher susceptibility of boys may be explained by the fact that boys normally reach puberty later then girls and sebum acidity may prevent the development of dermatophyte [21].

In few studies it was seen that tinea capitis infection may be more common in girls due to the tight braiding [10] and in our present study too it was seen that rate of infectivity as higher in girls (60%) while in boys it was 40% and tight braiding of hair might be one of the reasons for higher prevalence in girls.

In this study 17(77.27%) cases both culture and KOH were positive but in 4(18.18%) cases it was seen that KOH examination was positive but culture was negative, this may

be due to the fact that these culture negative results may reflect the administration of antifungal treatment initiated before sampling as some patients may have given incorrect information on their receipt of antifungal treatment [19]. In 5 (22.73%) of the cases it was seen that culture yielded results but direct KOH examination showed negative result this may be due to very less presence of fungal elements in the sample thus could not be visualised by direct microscopy and false negative in 5-15% of cases is a ordinary practise [11]. High positivity in culture isolation could be due to use of selective media like SCCA and DTM which do not allow contaminants to grow. It was seen that both KOH examination and fungal culture both are important assists for the diagnosis of tinea capitis infection.

Fungal culture gives valuable data with respect to the species involved in producing the disease [22]. The present study has confirmed that dermatophytes represents the most common 15(68.18%) followed by non dermatophytes 4(18.18%) and the predominant species seen by was *T. violaceum* responsible for 8(36.4%) of the culture positive cases. This may be because patients seen in our tertiary care centre come from densely populated areas and it is probably related to increasing population migration. It is noted that *T. violaceum* was reported as the predominant cause of tinea capitis in the Indian subcontinent [16,23,24]. Recent studies have shown that in India and Eastern Europe *T. violaceum* is found to be most common species [16]. The use of griseofulvin which is more effective against *M. Audouinii* is thought to be the reason for the shift in the etiological agent [16]. Authors have reported the isolation of multiple isolates from a single specimen [9], but none of our sample showed growth of more than one fungal species *T. schoenleinii* was not isolated from any cases, unlike previous studies from Indian subcontinent [24,25].

LIMITATION

The present study indicates the need for further epidemiological studies over a large period of time to confirm the apparent emergence of *T. violaceum* and to check for any shift in the prevalence from this region.

CONCLUSION

The present study shows that the most commonly isolated agents from superficial tinea capitis infection were *T. violaceum*. The exact incidence of infection and the fungal isolate in the general population from this region cannot be estimated as this was a hospital based study. A well rounded epidemiological research is needed in this region covering both urban and rural areas. It was also seen that it is beneficial to do fungal culture in addition to direct microscopic examination to rule out false negative, to isolate the species and improve diagnosis.

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