Section: DVL

Original Research Article

A STUDY ON THE CLINICO-EPIDEMIOLOGICAL AND MYCOLOGICAL CORRELATIONS OF TINEA CAPITIS IN A TERTIARY CARE HOSPITAL IN TELANGANA

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Received : 23/01/2024
Received in revised form : 30/03/2024
Accepted : 16/042024

Keywords:
Tinea capitis, dermatophytic infection, Trichophyton, Microsporum, epidemiology, mycology, pediatric infection, Telangana.

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DOI: 10.47009/jamp.2024.6.2.175

Source of Support: Nil,
Conflict of Interest: None declared

Int J Acad Med Pharm
2024; 6 (2); 845-852

Abstract

Background: Tinea capitis (TC) is a common dermatophytic infection of the scalp and hair, primarily caused by species of Trichophyton and Microsporum. It manifests in various clinical forms such as grey patch, black dot, kerion, and favus, depending on the causative organism. **Materials and Methods:** This study was conducted at a tertiary care hospital in Telangana, involving 100 clinically diagnosed cases of TC. Diagnostic procedures included KOH examination, Wood's lamp examination, and fungal cultures, with comprehensive documentation of the results. **Results:** The study evaluated the epidemiological, clinical, and mycological profiles of TC in the participants. A higher incidence was observed in males (57%) compared to females (43%), with a ratio of 1.32:1. The disease predominantly affected children under 10 years of age, representing 51% of the cases. A significant percentage (87%) reported contact with an infected individual or animal; transmission sources included hostel mates (39%), family members (31%), and pets (17%). The grey patch type was the most frequent presentation, occurring in 65% of cases. KOH examination identified fungal elements in all samples, while fungal cultures were positive in 40% of cases, with T. violaceum being the most common pathogen isolated. **Conclusion:** Tinea capitis remains a prevalent scalp infection among children, with distinct epidemiological and mycological patterns. Prompt diagnosis and effective treatment are crucial to curb its spread and prevent further complications.

INTRODUCTION

Tinea capitis (TC) is a superficial dermatophytic infection that affects the scalp and associated hair, primarily caused by species of Trichophyton and Microsporum.[1] Characterized by symptoms such as grey scaly patches, alopecia, and occasionally, nodular and inflammatory boggy swellings on the scalp, TC is also known as ringworm of the scalp or tinea tonsurans.[2,3] Dermatophytes, the causative agents, are filamentous, keratinophilic fungi with a high affinity for keratinized structures such as skin, hair, and nails.[4] These fungi are categorized based on their preferred habitats and hosts into geophilic, zoophilic, and anthropophilic groups, all capable of infecting the human scalp.[5]

TC is notably more prevalent in developing countries, where factors such as poverty, overcrowding, poor hygiene, and illiteracy contribute to its spread, particularly among school-going children. The incidence of TC varies widely, from 0.5% to 10%, with the highest occurrence in pre-pubertal children.[6] Infection often spreads through direct contact with infected individuals, asymptomatic carriers, or contaminated objects such as combs, hair brushes, and other personal grooming tools.

Clinically, TC presents in forms such as grey patch, black dot, kerion, and favus, which vary based on the causative organism, the nature of the invasion, and the host's immune response. The condition not only leads to significant physical morbidity manifested through complications like secondary bacterial infections, lymphadenopathy, and potential permanent hair loss—but also causes emotional distress, resulting in loss of school days, decreased

ISSN (O): 2687-5365; ISSN (P): 2753-6556

quality of life, and reduced self-esteem.[7] Early diagnosis and prompt treatment are crucial to halt the spread of the disease. Diagnostic confirmation is typically achieved through direct microscopic examination of the affected hair using a 10% KOH solution and cultures on selective media such as Dermatophyte Test Agar.

Aims and Objectives

To investigate the clinical and epidemiological patterns of TC in one hundred patients of either sex.

To delineate the mycological profile of fungal agents isolated from these patients using direct microscopic examination with 10% KOH solution and culture on Dermatophyte Test Agar.

To establish the clinico-mycological correlation among the patients.

MATERIALS AND METHODS

Study Setting: This prospective cross-sectional study was conducted over 18 months, from April 2022 to September 2023, at the outpatient clinic of the Department of Dermatology, Venereology, and Leprology (DVL) at the Government Medical College/Government General Hospital (GMC/GGH) in Khammam. The objective was to elucidate the clinico-epidemiologic and mycologic profiles of Tinea capitis (TC) in the patient population.

Selection of Patients

Inclusion Criteria

Patients presenting with lesions clinically suggestive of TC.

Patients consenting to undergo necessary laboratory investigations for diagnosis.

Exclusion Criteria

Patients currently undergoing antifungal therapy, either topical or systemic.

Patients with severe systemic or debilitating skin diseases.

Patients unwilling to participate or unable to follow up.

Sample Size: The study included 100 clinically diagnosed cases of Tinea capitis.

Data Collection: Detailed histories were taken, focusing on socio-economic factors (occupation, income, education), personal hygiene habits (sharing of caps, combs, pillows, and bed linen), trauma, previous fungal infections, treatment history, and potential sources of infection (family contacts, dormitory stays, pet contact). Physical examinations assessed the patients' height, weight, and nutritional status, along with systemic health. Scalp examinations were conducted visually and with a 10X magnifying hand lens to evaluate the extent of infection, clinical patterns, secondary bacterial infections, and lymphadenopathy.

Mycological Examination

Sample Collection: Affected areas were cleaned with spirit. Skin scrapings were taken with the blunt edge of a sterile surgical blade (Baird Parker blade number 15), and affected hair was collected with forceps. Samples were stored in autoclaved paper to maintain fungal viability.

Direct Microscopic Examination: Samples were placed on a glass slide, treated with a 10% potassium hydroxide solution, covered, and left to sit for 10-15 minutes before examination under a microscope for fungal hyphae and spores.

Culture: Specimens were inoculated on Dermatophyte Test Medium (DTM) and incubated at room temperature. Cultures were monitored daily and evaluated for fungal growth over a period of 4 weeks. Characteristics such as growth rate, colony morphology, and pigmentation were documented.

Laboratory Media and Stain Preparation

Dermatophyte Test Agar Medium Composition: Phyton - 10 g, Dextrose - 10 g, Phenol red solution - 40 ml, 8N HCl - 6 ml, Actidione - 500 mg, Gentamicin - 100 mg, Agar - 20 g, Distilled water - 1000 ml.

Preparation of Lactophenol Cotton Blue Stain: Phenol - 20 ml, Lactic acid - 20 ml, Glycerol - 40 ml, Cotton blue - 0.05 g, Distilled water - 20 ml.

Mycologic Analysis: Fungal colonies from the culture were teased in a drop of lactophenol cotton blue stain, covered, and examined under a microscope to identify species based on conidia and hyphae characteristics.

RESULTS

During the study period, 40,000 patients attended the outpatient department (OPD) of the Department of Dermatology, Venereology, and Leprology (DVL), among which 100 were diagnosed with Tinea capitis (TC), resulting in a relative prevalence of 0.25%.

Demographic and Socioeconomic Characteristics

Geographical Distribution: 70% of TC patients (M-42%, F-28%) were from rural areas, while the remaining 30% (M-15%, F-15%) were from urban settings.

Socioeconomic Status: A significant majority (68%) belonged to low socioeconomic backgrounds and exhibited poor personal hygiene.

Gender and Age Distribution

Gender Prevalence: There was a male preponderance with a male-to-female ratio of 1.32:1.

Age Range: Patients ranged from 1 to 45 years old, with the highest incidence (51%) occurring in children under 10 years. The mean age was 11.4 years (SD ± 11.05) for males and 8.6 years (SD ± 9.39) for females. Statistical analysis showed no significant difference ($p > 0.05$).

Source of Infection

Contact History: 87% of patients reported some form of contact with an infected source: 39% from hostel mates, 31% from family members, and 17% from pets. The remaining 13% did not specify any contact source.

Duration and Severity of Disease

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Disease Duration: The length of infection ranged from 15 days to 2 years, with the majority (74%) having the disease for up to 3 months.

Clinical Presentation

Type of TC Infection: The 'grey patch' was the predominant clinical type observed in 65% of the cases (M-37, F-28), followed by 'kerion' in 30% (M-16, F-14), and 'black dot' in 5% (M-4, F-1).

Diagnostic Findings

KOH Microscopy: All patients tested positive for fungal elements. Of these, 95% showed ectothrix infection, and 5% showed endothrix infection.

Wood's Lamp Examination: Fluorescence was observed in 37% of patients, indicating the presence of fungal infection under UV light.

Mycological Culture

Culture Positivity: 40% of the specimens cultured on Dermatophyte Test Agar medium were positive for fungal growth, consistent with KOH microscopy findings. Trichophyton violaceum was the most commonly isolated organism (11%), followed by T. rubrum (9%).

Statistical Analysis

Correlations: No significant correlations were found between KOH and culture positivity and the age of patients ($p > 0.05$).

Figure 1: Showing Dermatophyte test culture medium slants

Figure 2: Patient with grey patch type of tinea capitis showing characteristic whitish, scaly lesions with patchy loss of hair over occipital area of scalp

3A

3 B

Figures 3A, 3B: (A) Patient with kerion type of tinea capitis showing characteristic indurated, boggy swelling with prominent loss of hair over temporal area of the scalp

(B) Patient with kerion type of tinea capitis showing characteristic indurated, boggy swelling with few pustules and patchy loss of hair over occipital area of the scalp.

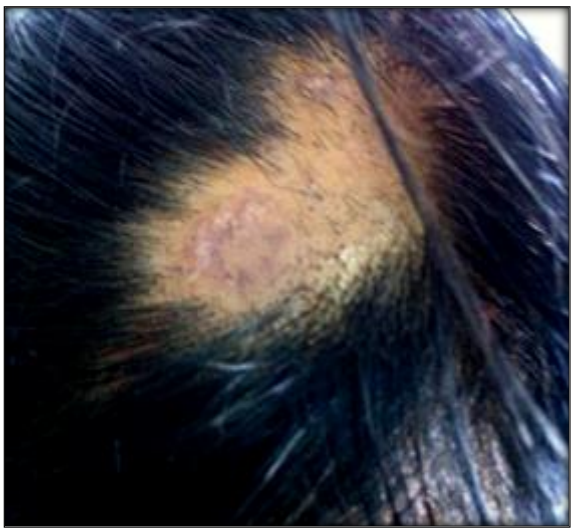

Figure 4: Patient with black dot type of tinea capitis showing patchy hair loss with small stumps of broken hair in the centre of the patch present over occipital region of the scalp

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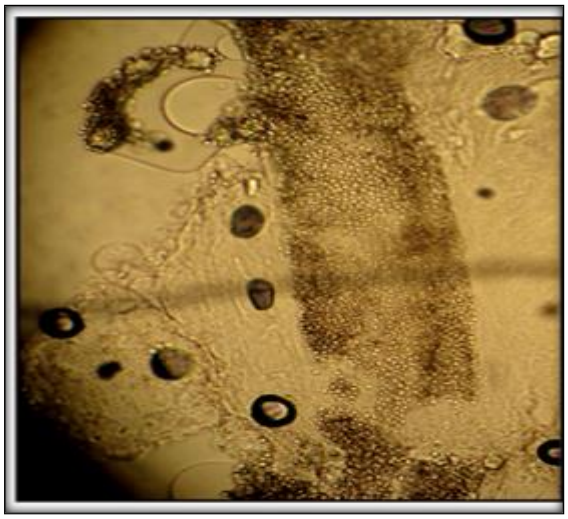
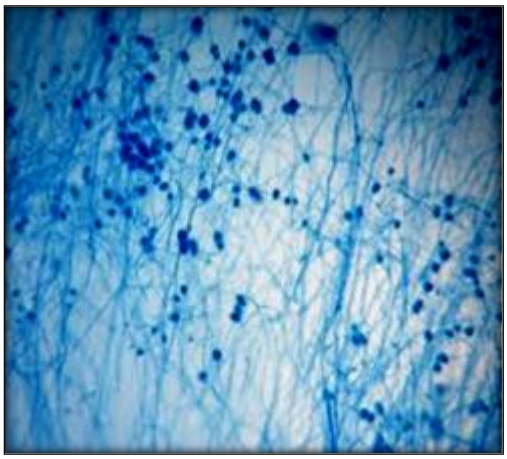
5A



5B

Figures 5A, 5B: (A) Ectothrix type of hair invasion showing spores outside the hair shaft under direct micrpscopy with KOH preparation. (B). Endothrix type of hair invasion showing spores inside the hair shaft under direct microscopy with KOH preparation

6A



6B

Figure 6: T. violaceum. (A). Characteristic waxy, heaped, purple red growth on DTM slant. (B). Irregular hyphae with intercalary chlamydoconidia

7A

7B

Figure 7: T. rubrum. (A). Characteristic white, cottony, heaped growth on DTM slant (B). Small tear shaped microconidia arranged along the sides of hyphae

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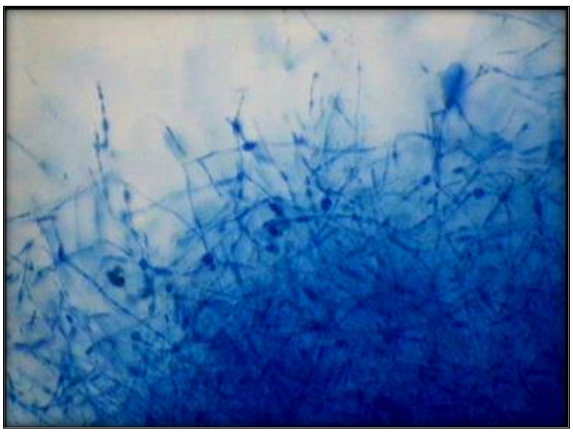
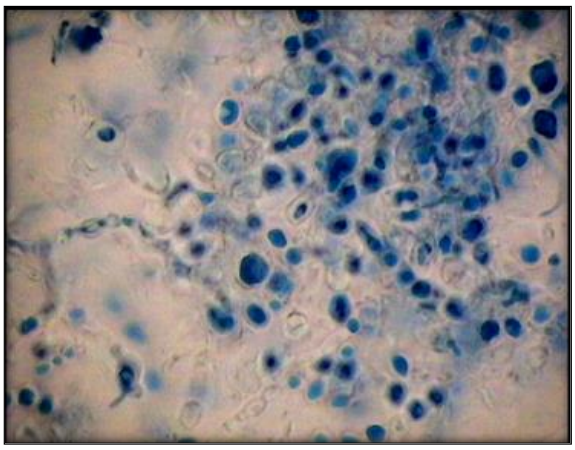
8A



8B

Figure 8: T. tonsurans. (A). Characteristic powdery white growth with feathery periphery on DTM slant. (B). Hyphae with microconidia and chlamydoconidia

9A



9B

Figure 9: T. verrucosum. (A). Characteristic white, waxy, heaped growth on DTM slant. (B). Chains of chlamydoconidia with short hyphae

Table 1: Age and sex distribution in one hundred patients of TC

Age group (years)	Patients with TC						
	Males		Females		Total		
	No.	%	No.	%	No.	%	
0 – 10	27	27	24	24	51	51	p-value is .893511 Not significant
11-20	19	19	11	11	30	30	
21-30	6	6	4	4	10	10	
31-40	3	3	3	3	6	6	
41-50	2	2	1	1	3	3	
>50	0	0	0	0	0	0	
Total	57	57	43	43	100	100	

Table 2: Distribution of one hundred TC patients according to the type of fungal species isolated in cultures

Fungal species isolated	Patients with TC	
	No.	%
T. violaceum	11	11.0
T. rubrum	9	9.0
T. verrucosum	8	8.0
T. tonsurans	6	6.0
T. mentagrophytes	2	2.0
T. schoenleinii	2	2.0
M. audouinii	2	2.0
No growth	60	60.0
Total	100	100.0

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Table 3: Clinico - mycological correlation in one hundred patients of TC

Isolated fungal species	Grey patch No (%)	Black dot No (%)	Kerion No (%)	Favus No (%)	Total (%)
T.violaceum	8 (20)	2 (5)	1 (2.5)	0	11 (27.5)
T. rubrum	7 (17.5)	-	2 (5)	0	9 (22.5)
T.verrucosum	5 (12.5)	-	3 (7.5)	0	8 (20)
T. tonsurans	3 (7.5)	1 (2.5)	2 (5)	0	6 (15)
T.mentagrophytes	0	-	2 (5)	0	2 (5)
T. schoenleinii	0	-	2 (5)	0	2 (5)
T. audouinii	1 (2.5)	-	1 (2.5)	0	2 (5)
Total	24 (60)	3 (7.5)	13 (32.5)	0	40 (100)

Table 4: KOH mount and culture correlation of Tinea capitis cases

Clinical type	Total (%)	KOH Positive (%)	Culture positive (%)	Culture negative (%)	
Grey patch	65	65	24	41	p-value is .785449 (>0.05) Statistically not significant
Black dot	5	5	3	2	
Kerion	30	30	13	17	
Favus	o	0	0	0	
Total	100	100	40	60	

Table 5: Age and culture positivity correlation in Tinea capitis cases

Age group	No of culture positive cases	No of culture negative cases	Total cases	
0-10	22	29	51	X^2=3.848. The p-value is .426962. The result is not significant at p < .05.
11-20	14	16	30	
21-30	2	8	10	
31-40	1	5	6	
41-50	1	2	3	
Total	40	60	100	

Table 6: Mycological species isolated in cultures of TC patients in different studies

Characteristics	Ali et al[8]	Geetha K et al[9]	Gajula Narender et al[10]	Yasmeen J et al[11]	Our study
Common age	<15yrs	5-10yrs	3-14yrs	3-9yrs	<10yrs
Gender M	66.7%	69%	58.5%	69.3%	57%
F	33.3%	31%	41.5%	30.7%	43%
Clinical types					
Grey patch	68.1%	28.57%	36.9%	60%	65%
Black dot	52.2%	7.9%	27.7%	15.3%	5%
Kerion	31.9%	21.4%	18.5%	24%	30%
Favus	0	0	0	0	0
KOH +ve				76.7%	
Ectothrix	30.4%	53.1%	35.4%	-	95%
Endothrix	69.6%	46.9%	58.8%	-	5%
KOH -ve	0	0	5.8%	23.3%	0
Culture positivity	52.2%	75.5%	57.4%	84%	40%
Organism					
T. tonsurance	21.7%	31.1%	18.6%	61.11%	6%
T.mentagrophyte	4.3%	25.7%	25.5%	-	2%
T.violaceum	-	25.7%	37.5%	10.32%	11%
T.verrucosum	15.9%	-	-	4.76%	8%
T.rubrum	-	-	13.9%	13.48%	9%
T.schoenlenii	-	-	-	6.35%	2%
M.audouinii	-	-	-	-	2%
Others	10.3%	-	-	3.97%	-

DISCUSSION

Tinea capitis (TC) presents a significant public health concern, particularly in developing countries, where socioeconomic factors, poor personal hygiene, and environmental conditions contribute to its prevalence. Our study aimed to shed light on the clinico-epidemiologic and mycologic aspects of TC, building upon existing knowledge in this field.

TC is the most common superficial dermatophyte infection of the scalp and associated hair seen in children in developing countries, caused predominantly by Trichophyton and Microsporum species. The dermatophyte species responsible for this infection varies with time and place. Low socioeconomic status, illiteracy, poor personal hygiene, poverty, overcrowding among the people and as well the hot and humid environment prevailing in and around rural areas of Khammam (Telangana state) could be some of the reasons responsible for an increased prevalence of TC noted in the present study (70%). Similar observations

ISSN (O): 2687-5365; ISSN (P): 2753-6556

have been recorded in many earlier studies. (Table 5). Increased prevalence of TC was also reported among the children living even in urban areas but having poor socioeconomic background.

History of contracting TC from family members (31%), hostel mates (39%), pet animals (17%) was noted among the TC patients studied in our series. Close personal contact and sharing of articles like caps, combs, towels, pillows appear to be the important factors in acquiring the disease. Fomites also play an important role in contracting and propagating the infection even after aerosolization also, as reported in some earlier studies including the present study.

TC affects both males and females, however, males are more frequently affected. Male to female ratio of 1.32 : 1 noted among TC patients in our study is akin to the earlier reports.[8-11] This male preponderance has been attributed to the easy implantation of spores in males due to short hair,[12,13] and less frequent involvement of TC in females may be due to traditional application of vegetable oils having fungistatic properties regularly over scalp.[12,14] However, a female preponderance of TC was also noted in some studies,[15,16] and this was attributed to the habit of tight banding of hair in females. In contrast to the above reports, no gender variation was observed in some studies, where in both males and females are equally affected.[1,17]

The common age groups affected by TC in the present study are young children less than 10 years of age (51%), followed by 11- 20 years (30%). Similar observation was also reported by others.[6,17,18] The fact that TC is seen more common in younger age group may be due to the close contact prevailing among the children especially in class rooms, play grounds and at home. The decreased incidence of TC after puberty is believed to be due to the fungistatic properties of sebum in adolescents and adults.[19]

The duration of disease varied in the present study from 15 days to 2 years and in the majority (74%) of the patients, it was 3 months. This is in conformity with other studies.[6] Several factors such as the lack of knowledge about the disease, inaccessibility to the medical facilities coupled with the frequent use of less effective alternative medicines and OTC products prevalent in rural areas may be responsible for this delayed presentation.

Patchy hair loss, regional lymphadenopathy and scarring are the frequent clinical presentations of TC noted in our patients. Grey patch type is the most common clinical type observed in several studies,[18,20] including the present series where in 65% of the patients had this pattern, followed by kerion in 30% of the patients and black dot in 5% of the patients. None of the patients had favus in our series. In some studies black dot type of TC was the most common type.[6,7]

The varied clinical presentation of lesions in TC patients may be due to the nature of etiologic species which vary in different parts of the world and even in the same geographic area from time to time.[21]

Fluorescence under Wood's lamp was observed in 37% of our patients which is akin to the observations noted by Jha et al.[16]

One hundred cases of TC studied in the present series and all of them are positive for fungal elements with direct KOH microscopy. Ectothrix has been found to be the most common type seen in 95% of the patients followed by endothrix in rest of the 5% patients. These findings are in agreement with Adeolu et al,[22] although endothrix was most common type noted in some earlier studies.[1,7,16]

The culture positivity rate for mycologic species (40%) observed in the present series is in near confirmity with some earlier reports but lower than some other reports.[1,7-11] (Table 6) This disparity may be due to the variation in the methodology of laboratory procedures in different places and partly could be due to the prior medication with topical ayurvedic medicines used by some of our patients.

The etiological species responsible for TC vary in different parts of the world and even in the same geographical area from time to time accounting for the parity observed in the culture positivity rates and mycological species isolated in different studies.T. violaceum is the most common fungus isolated in various studies.[1,7,9,10-11] (Table 6)

CONCLUSION

Our study highlights the importance of culture examination in all patients diagnosed with Tinea capitis (TC) to identify the etiological fungal species, guiding appropriate antifungal therapy. Even in cases where cultures yield negative results, treatment decisions should be based on clinical correlation. Moreover, regular epidemiological surveillance of causative fungal organisms and their antifungal susceptibility within communities is essential for effective TC management. By emphasizing these strategies, we can enhance the diagnosis and treatment of TC, contributing to better outcomes for patients and reducing the burden of this common dermatophyte infection.

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ISSN (O): 2687-5365; ISSN (P): 2753-6556

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ISSN (O): 2687-5365; ISSN (P): 2753-6556