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Clinicoepidemiological and mycological study of tinea capitis: A study from a tertiary care centre

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Abstract
Background: *Dermatophytoses are the most common of the superficial fungal infections. Tinea capitis is a superficial fungal infection that predominantly affects the pediatric population. It is common in tropics and may present in epidemic proportions in areas with high rates of humidity. The clinicoepidemiological and mycological aspects of this tinea capitis infection were studied in a tertiary care centre in Ranchi, Jharkhand.*
Materials & Methods: *One hundred sixty patients with positive KOH microscopy were underwent detailed history regarding age, sex, duration and progression of disease socioeconomic status and clinical symptoms and findings were recorded in specifically predesigned proforma. In addition to this a history of similar disease in past, in the family, history of comb sharing, oil application and association with pets was also evaluated.*
Results: *Most common symptom in the present study was scaling, reported in 94.9% of the patients followed by itching, hair loss, and papules in 78.4%, 69.6%, and 31.6% of the patients respectively. Among the patients with localized scalp involvement, vertex was the most common site involved in 40 (25%) of the patients followed by parietal, occipital, temporal and frontal in 26 (16%), 18(11%), 06(3.7%) and 06 (3.7%) patients respectively.*
Conclusion: *Grey patch is the most common variant of T capitis. T. violaceum is the most common isolate in all the clinical variants of T capitis in North eastern part of India. Anthropophilic species are responsible mainly for non inflammatory variants and zoophilic species for inflammatory variants. Intra-familial and animal contacts are major source of the source of infection.*
Keywords: *Tinea capitis, Dermatophytosis, Clinical features, Mycological study.*

Introduction

Tinea capitis is a dermatophyte infection that involves the scalp, hair follicles, and the adjoining skin. Dermatophytes are fungi that commonly infect the keratinous tissues of humans and some lower animals. The superficial layers of the epidermis, particularly the stratum corneum, and the keratin rich appendages, such as the hair and nails of the living host, are invaded by these dermatophytes, where they eventually proliferate and multiply.[1] It is a common scalp infection seen in children from developing countries, often causing varying degrees of hair loss.[2, 3] T capitis has a variety of clinical presentations ranging from asymptomatic carrier state, non-inflammatory varieties like grey patch alopecia, to inflammatory varieties like kerion and favus. Non-inflammatory forms are more common than the inflammatory forms. In India, grey patch is the most common variant and has been reported in up to 60% of the cases.[4] There is an immense need to control and treat this infection not only to prevent its complication of scarring alopecia but also to avoid social ostracism faced by patients of T. Capitis in their school and play environment due to itchy scalp and hair loss.[5, 6] T capitis is caused by a variety of dermatophytes in the genera Microsporum and Trichopyton. Studies on epidemiology of T. capitis suggest that the pattern of causative agents in western countries has been changing with decrease incidence of Microsporum canis and increase in Trichophyton tonsurans (T tonsurans) infection.[7] T. violeceum has been the predominant pathogen of T. capitis in Indian subcontinent and in parts of Far East.[8]

We attempt to assess its various clinical manifestations, the most common sites and clinical patterns, causative agents and predisposing factors of the T capitis. The efficacy of laboratory methods in confirming clinical diagnosis and species identification has also been assessed, carried out at a tertiary care hospital in Ranchi, Jharkhand.

Materials & Methods

One hundred fifty eight, untreated cases of tinea capitis, irrespective of sex and socioeconomic status, of age group 2 to 12 years of age, attending Department of Dermatology, Venerology and Leprology of RIMS, from September 2011 to august 2012, who fulfilled inclusion criteria were included. The study was taken approval by the ethical committee of institution of RIMS.

A clinical diagnosis of T.capitis was made in patients with scaly scalp lesions with or without alopecia, patients with inflammatory boggy mass studded with scales and crust, and patient with diffuse scaling on scalp, not responding to usual treatment. An informed consent was taken from the patient/or/guardian and then scraping material/hair from the lesions of scalp of patient subjected to KOH microscopic examination. The patient showing positive microscopic finding for dermaotophytes in the KOH preparation were subjected to detailed history through clinical examination and investigation as per the predesigned proforma.

Clinical history

One hundred sixty patients with positive KOH microscopy were underwent detailed history regarding age, sex, duration and progression of disease socioeconomic status and clinical symptoms and findings were recorded in specifically predesigned proforma. In addition to this a history of similar disease in past, in the family, history of comb sharing, oil application and association with pets was also evaluated.

Classification

All patients were then classified according to clinical presentations into-

Non-inflammatory variants: Grey patch and Black dot.

Inflammatory variant: kerion and favus

KOH Microscopy

The lesions were decontaminated with 70% alcohol. Small scales were scraped off from the margins by rounded scalpel or glass slide. Affected hair was collected by removing them completely using an epilation forceps. Scales were

then put on a clean glass slide. Scales and hair debris were mixed with 10% KOH. A coverslip was applied and the slide heated gently over a flame. It was then examined under the microscope in 10x and 40x magnification.

Fungal –culture

Hair were plucked from the affected area with a sterile forceps along with scraping of the scales and inoculated in the medium for culture. Sabouraud's Dextrose Agar medium was used to isolate the dermatophytes. The cultures were incubated at 25-300°C and examined weekly for 4 weeks before declaring it negative.

Species identification

The colonies if obtained were identified for the implicated fungus on the basis of gross morphology of the colonies on SDA and slide culture, microscopy and the presence of accessory structures. The microscopic examination of colonies was studied in either teased mounts or slide culture. The colonies were examined for the type of conidia, their shape, size and pattern of arrangement of hyphae/mycelial structure. The efficacy was assessed as clinical and mycological at the end of therapy and follow up period.

Results

Table1: Showing Age & sex distribution [n=158]

Age group in year	Male	Female	Total n=158 (%)
<5	14	24	38 (24)
6 to 10	42	70	112 (70.8)
>10	4	4	08 (5)
Total	60 [38%]	98 [62%]	158 [100%]

The age in the study population ranged from 2 to 12 years (mean 7.8 years). Majority of the patients (70.8%) were in the age group of 6-10 years and 95% were below 10 years. Out of the 158 patients, 38% were males and 62% were females. The female to male ratio was 1.6:1 [Table 1, Fig. 1].

Table 2: Showing baseline characteristic among study participants [n=158]

Demographic profile	Total n=158 (%)
Male	60 (37.6)
Female	98 (62.5)
Mean duration (in days)	102.15
Family history	30 (20)
Pets	08 (5)
Overcrowding	99(62.6)
Comb sharing	136 (85)
Oil application	102(63.8)

Females were more effected (62.5%). There was positive family history in 20% subjects. Comb sharing was one of the most important factor (85%) followed by oil application (63.8%) and overcrowding (62.6%) [Table 2].

Table 3: Showing clinical symptoms in patients with T. capitis

Clinical symptoms	Total (%)
Itching	124 (78.4)
Scaling	150 (94.9)
Hair loss	110(69.6)
Papules	50 (31.6)
Pustules	40 (25.3)

Most common symptom in the present study was scaling, reported in 94.9% of the patients followed by itching, hair loss, and papules in 78.4%, 69.6%, and 31.6% of the patients respectively [Table 3].

Table 4: Showing socioeconomic status of study patients

Socioeconomic status	Total, n=158 (%)
Lower	106 (67)
Middle	48 (30.3)
Upper	04 (2.5)

Sixty seven percent patients (106/158) in the study group belonged to lower class. Only 2.5% (4/158) patients belonged to upper class [Table 4]. Most (60%) of the patients weight was between 20-40 kg. Mean weight of the patients in two study groups were 20.84 and 20.58 kg respectively (total mean wt 20.7 kg).

Table 5: Showing source of infection

History of	Total [n=158 (%)]
Family member infection	30(19)
Pet handling	08 (05)
Farm/soil working	120 (76)

About19% of patients had positive family history of T. capitis, and 5% of patients had pets in their family [Table 5].

Table 6: Showing Site of scalp involvement (localized) [n= 96 patients]

Site involved	Total [n=96 (%)]
Vertex	40 (41.6)
Parietal	26 (27)
Temporal	06(6.1)
Occipital	18 (18.6)
Frontal	06 (6.25)
Total	96

Ninety six patients out of 158 had localized scalp involvement i.e. only one area involved out of vertex, parietal, temporal, occipital or frontal. Sixty two patients had involvement of more than one site. Out of these, 36 patients had contiguous involvement of vertex and parietal area; 4 had generalized involvement of whole of the scalp and the rest had discontinuous involvement of multiple sites. Among the patients with localized scalp involvement, vertex was the most common site involved in 40 (25%) of the patients followed by parietal, occipital, temporal and frontal in 26 (16%), 18(11%), 06(3.7%) and 06 (3.7%) patients respectively [Table 6].

Table 7: Showing clinico-etiological correlation in patients with T capitis

Clinical variants	Etiological agent n= 106					
	T. violeceum	T. rubrum	T. mentagrophytes	M. audouinii	M. canis	Total
Grey patch	30 (48.3)	12 (19.3)	12 (19.3)	2 (3)	6 (9.6)	62
Black dot	12 (75)	2 (15.5)	2 (12.5)	0	0	16
Kerion	13 (48)	4 (14.8)	8 (29.6)	0	2 (7.1)	27
Favus	01 (100)	00	00	00	00	01
Total	56 (52.8)	18 (16.9)	22 (20.7)	2 (1.8)	8 (7.5)	106

Out of 62 cases of culture positive grey patch cases, T. violaceum was isolated from 48.3% cases. Other isolates recovered in grey patch variety were T. mentagrophytes in 19.3%, T rubrum 19.3%, M canis 9.6% and M audouinii in 3% cases. In black dot variant isolates, 75% were T. violaceum, 12% were T. rubrum, and T. mentagrophyte were present in 12% of cases. In kerion 48% patients showed T.violaceum, 14.8% patients showed T. rubrum, 29.6% patients showed T. mentagrophytes, and 7% of patients showed M.canis. One patient of favus showed T. Violaceum [Table 7/Fig. 2, 3, 4].

Table 8: Showing correlation of clinical presentation with lymphadenopathy [n=90 patients]

Clinical Variant	Cervical lymphadenopathy	Cervical and Occipital lymphadenopathy	Total
Grey patch (n=88)	38	06	44 (50)
Black dot (n=28)	10	00	10 (35.7)
Kerion (n=41)	27	08	35(85)
Favus (n=01)	01	00	01 (100)

Lymphadenopathy was associated with the scalp lesions in 90/158 patients. Out of these 90 patients, 84% patients had cervical lymphadenopathy and 16% in addition had occipital lymphadenopathy. Majority (85%) of the patients with kerion, had enlarged lymph nodes, followed by 50% patients of grey patch variety and 35.7% of black dot while single patients of favus reported was associated with cervical lymphadenopathy (100%) [Table 8].

Table 9: Showing Clinical patterns in patients with T capitis

Clinical pattern	Total, n = 158(%)
Non Inflammatory	116 (73.4)
Inflammatory	42 (26.5)

Table 10: Showing Clinical variants in patients with T capitis

Clinical variants	Total, n = 158(%)
Grey patch	88(55.6)
Black dot	28 (17.7)
Kerion	42 (26.5)
Favus	01(0.6)

Non inflammatory variant was more common, seen in 73.4% of the patients than the inflammatory variant, seen in 26.5% of the patients [Table 9]. The most common variant of T. capitis seen in the study population was grey patch, observed in 55.6% patients followed by kerion 26.5% and black dot in17.7% patients respectively [Table 10/ Fig. 3, 4].

Table 11: Showing microscopic examination of hair invasion

Clinical pattern	Gray patch	Black dot	Kerion	Total, n=158(%)
Ectothrix	10	00	02	12 (7.5)
Endothrix	78	28	40	146 (92.5)

In the present study, fungal spores and hyphae were demonstrable in all the cases by direct microscopic examination with 10% KOH and this was eligibility criteria for inclusion in the study. Endothrix was found in 92.5% patients while ectothrix was only present in 7.5% of patients. Ten of these patients with ectothrix had grey patch

variant clinically and remaining 2 had kerion [Table 11/Fig. 6a, 6b].

Discussion

Age Distribution

About 158 patients were included in the study. The mean age of the study population was 7.8 years. Most of the patients were under 10 years of age only eight patients were above 10 years of age. 70.8% of total patients were between 6-10 years of age. Similar to my study, a study carried out in Sri Lanka by Kumar et al[9] also reported the maximum incidence in same age group of 6-10 years. About 95 % of the study population was under 10 years of age. This finding is in agreement with study by Kumar et al[9] and Sahgal et al[10] from Delhi, and Rohtak, who have shown a similar incidence of 79%, and 88%, respectively in this age group. Hussain et al[11] from Pakistan reported that 95% of the study population was below 12 years of age.

Sex Distribution

In the present study, out of 158 patients, 98 (62%) were females and 60 (38%) were males with female male ratio of 1.6:1. There was an overall preponderance of girls in our study. This was also observed by Reddy et al[12] and Dastghaib L et al[13]. Studies from Nepal and Brazil also showed a female preponderance with females constituting 63.6% and 64.2% of the cases of T capitis respectively. In contrast, Sahgal et al[10] and Kumar et al[9] reported equal involvement of both sexes. Equal sex distribution was also noted in studies from Pakistan and Canada.

Socio-Economic Status

About 67 % of the patients in the present study belonged to lower and 30.3% to middle class. There may be a sampling bias because of the profile of patients attending government hospitals, however, our observations is in agreement with other studies from India. A Study from Pakistan by Hussain et al[11] has also reported the similar findings.

Weight Distribution

Majority of the patients weighed between 20-40 kg in the present study. Mean weight of the patients in two groups were 20.8 and 20.5 kg respectively (total mean 20.7 kg). Similar to our study, majority of the patients in studies by Lipozencic J et al[14] also weighted between 20-40 kg. Though, the mean weight group affected in these studies is comparable to our studies, Mean weight found in these studies is in higher range of 23 to 26 kg. The lower weight distribution in the present study can be explained on the basis of the difference in nutritional status, and built of the children in developing and developed countries.

Source of Infection

Source of infection could be traced to intra familial contact or from a sibling in 18.9% of cases in the present study. Family history was positive in 22% of the patients in study by Nawaf et al[15] from Kuwait and 18% by Hussain et al[11] from Pakistan. However, both Kumar et al[11] and Reddy at el[12] reported a little higher rate, 29% of each in their study. In the present study 5% of patients had a history of pets in their families. Sahgal et al[10] and Kumar et al[11] found history or rearing similar in 18% and 20% of their study population respectively. Contact with animals could act as a source of acquiring the diseases caused by zoophilic species from infected animals.

Other Baseline Characteristics

Comb sharing

Sharing of combs among the family members was seen in 85% of the patients in our study. Our findings are in agreement with other studies from India. However, Singal et al[16] reported sharing of combs in only 22% of the patients. Sharing of combs is an important means of transmission of infection between family members especially for anthropophilic Species.

Oil Application

Oil application was seen in 63.8% of the patients in our study which is greater as compared to other studies from South India. This can be explained

on the basis of practice of oil application in these areas.

Site of Scalp Involvement

Approximately 96 out of 158 patients (60%) had single area of scalp involved. in such type of scalp involvement, vertex was the most common site involved in 40 of the patients, followed by parietal, occipital, temporal and frontal in 27%, 18.7%, 6% and 6% of patients respectively. The findings in our study are in agreement with the study carried out by Reddy et al[12] where, vertex was the most common site involved followed by occipital, parietal and frontal area. However, in studies by Reddy et al[12] and Kumar et al[9], majority of patients had lesions at multiple sites.

Clinical Symptoms

Most common symptoms of the patients presenting with T capitis in our study was scaling seen in 94.9% of the patients followed by itching, hair loss, and papules in 78.4%, 69.6% , and 31.6% of the patients respectively. Our findings are similar to the results reported by Figueroa JI et al[17] in Ethopia. Bennett ML et al[18] reported, itching as the predominant symptom in the majority of their patients. In contrast, hair loss (77%) was the most common symptom reported by Singal et al[16] and Reddy et al[12].

Lymphadenopathy

This parameter has not been compared with the clinical presentation in any of the earlier studies T. capitis. In the present study, 85% of the patients with kerion and 100% case of favus had enlarged lymph nodes. The higher incidence of lymphadenopathy associated with inflammatory variants may be considered as a part of the host immune response to greater inflammatory disease processes.

Clinical Variants

Non inflammatory variants (73%) were more common than the inflammatory variants. This is in accordance with majority of the previous studies from India and west. Singal et al[16] reported a much higher incidence of 84% of non inflammatory variants in their study. The most common variant of T capitis seen in the study population was grey patch (55.6%) followed by kerion, black dot variety and favus. Grey patch has been commonest variant seen in majority of the studies from India. Reddy et al[12] and Verma et al[19] observed this variant in 44% and 50% of their study population, while most of the other studies have reported a relatively lower incidence of 30-40%. Black dot variant was present in 17.7% patients in our study. Our findings are in agreement with that of Kumar et al[9]. Other studies from Delhi reported a lower incidence of 8% while studies from Lahore and Kuwait have reported a higher incidence of 30%.

Kerion was observed in 26% of all our cases. The incidence of kerion has greatly varied in other studies. Sehgal et al[10] reported kerion in 18%, while Kumar et al[9] and Singal et al[16] observed an incidence of 10% and 6.5 % respectively in their studies. The studies from South India and Pakistan have reported a higher incidence of up to 30%. Favus was reported in 0.6% of cases. It is in accordance with rare incidence of favus in other studies from india.

Microscopic Examination

In our study, majority of dermatophytes were endothrix (92.5%). This finding is in agreement with Sehgal et al[10] and Kumar et al[9]. However, Singal et al[16], Gururaj et al[20] and Reddy et al[12] reported a relatively lower incidence ranging between 50-60%.

Fungal Culture

In the present study, fungal culture was positive in 66.6% of the total cases. This is in concordance with results by Singal et al.[16] Contrary to this, Sehgal et al[10] and Dastghaib L et al[13] showed a higher rate of isolation of 74% and 84% respectively while a lower isolation rate of 47% was reported by Kumar et al.[9] Studies from Turkey and Kenya have also shown higher isolation rates of 83% and 73% respectively. Higher isolation rates in the west may be because of the better isolation techniques in the developed countries.

Etiological Agents

In the present study, T. violaceum was the commonest isolate followed by T. mentagrophyte, T rubrum and M canis. M audouinii was the least common isolate. T. violaceum has been reported as the predominant isolate by most of previous authors such as Sehgal et al[10] and Reddy et al[12] (67%), Kumar et al[9] (40%) and Singal et al[16] (38%). Our findings are also in agreement with various overseas studies from Pakistan, Libya, Nepal and Iran. T. mentagrophytes was the second most common isolate in our study, seen in 21% of the patients. This isolation rate is higher as compared to previous studies from India, which have reported it in only 3% of the total cases. Studies from Nepal and Italy have shown a similar incidence to our study.

M. Canis and M. audouinii were uncommon isolates in our studies reported in only 7.54% and 1.88% of patient respectively. Kumar et al[9] and Sehgal et al[10] has not reported any case due to Microsporum species in their studies. In contrast M. audouinii and M. canis were reported in 13.15% and 10% of the cases respectively by Gururaj et al[20]. M. canis was the predominant organism found in studies carried out in Spain (62%) and Italy (82%) in 1997. Higher isolation rates of M. canis from west reflects the practice of keeping pets at homes.

Clinico-etiological Correlation

Grey patch: T. violeceum was the most common isolate recovered in 48.3% of the cases of grey patch followed by T. mentagrophytes, T. rubrum, M. canis and M. audouinii. T violeceum has been the major isolate in grey patch variety in other studies from India and neighbouring countries. In Italy Singhal et al[16] noted M. audouinii as the most common isolate in grey patch variety in their study.

T. mentagrophytes were the second most common (19.3%) isolates from the grey patch variety in our study [Fig. 7]. Gujraj et al[20] reported 17.5% of this agent in their study. T. rubrum was isolated in 19.3% of the total isolates of grey patch variety in our study. This data is in agreement with Singhal et al[16] and Kumar et al[9] who reported T. rubrum as second most common isolates in their study. M. canis was isolated in 9.6% of total isolates of grey patch variety in our study. Studies from Tirupathi and Puddichery have reported M. canis in 6% and 4% of cases of their total grey patch isolates respectively.

Black dot: T. violaceum was the predominant pathogen (75%) in black dot variant. This is in agreement with most of the studies from India. Studies from Pakistan and Kuwait have also confirmed the similar findings. In contrast, T. tonsurans was the most common isolate recovered from patients of black dot variant by Singal et al[16]. In the present study, all patients with this variant showed, endothrix, on microscopic examination, correlating well with the clinical presentation.

Kerion: Kerion is caused by both anthropophilic and zoophilic species. Thus, the isolates in this variant has also varied considerably in different studies. In the present study, T violaceum was commonest isolate in kerion followed by T mentagrophytes and T rubbrum. Similar to our study, T violeceum was the predominant pathogen isolated in kerion by Dastghaib L et al.[13] However, the most common species recovered in previous studies from Delhi were T mentagrophytes, T verrucosum and M audouinii respectively. Other species like T rubrum and T tonsurans and have also been isolated.

Favus: In our study only one case of favus was recorded. It is in accordance with rare incidence of favus, from various studies from India [Fig. 5].

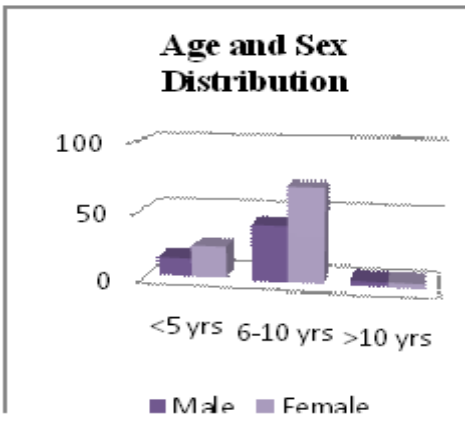

Figure 1: Distribution of study subjects

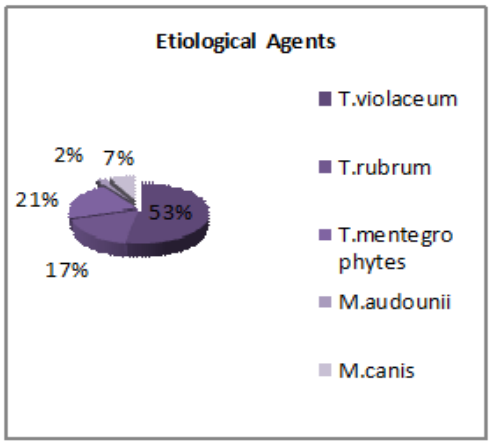

Figure 2: Types of tinea infection among study participants

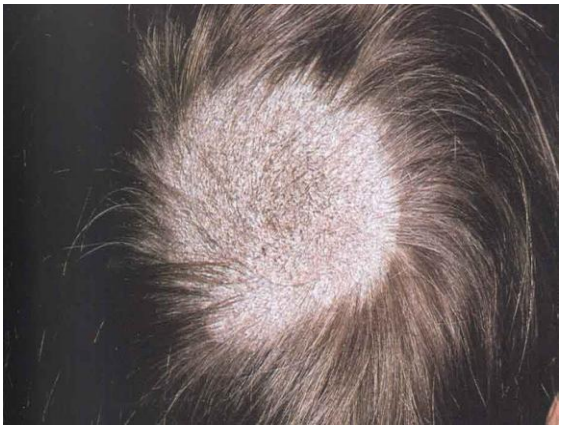

Figure 3: Grey patch of T. capitis

Figure 4: Black Dot T. Capitis

Figure 5: Favus T. capitis

Figure 6a: KOH microscopic appearance of hyphae and spores

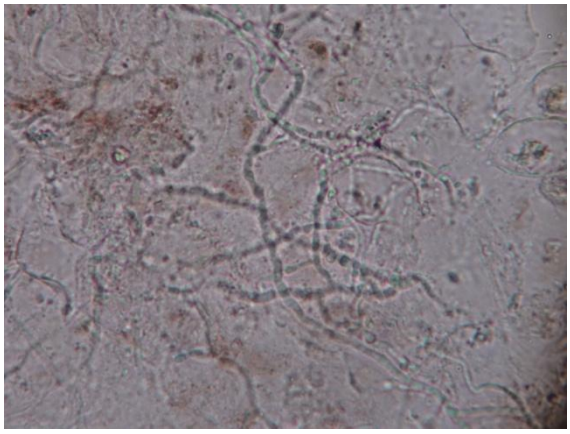

Figure 6b: KOH microscopic appearance of hyphae and spores

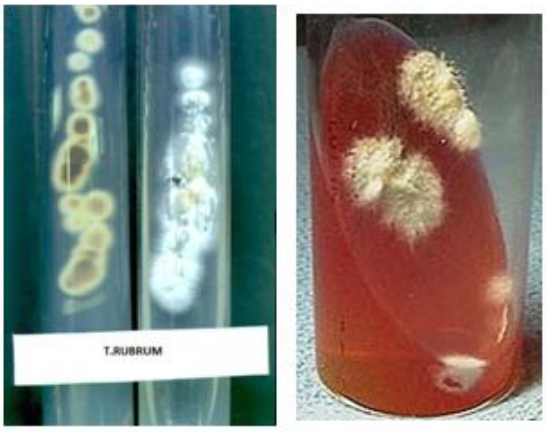

Figure 7: T. Mentagrophytes

Conclusion

About 92.5% of the study population revealed endothrix on KOH microscopic examination and 7.5% had ectothrix. T. violeceum was found in 52.8% of the cases of grey patch, followed by T. rubrum, T .mentagrophyte, M canis and M audouinii found in 16.9%, 20.7%, 7.54% and 1.88 % patients respectively. T. violeceum was the

predominant pathogen found in 75% of black dot variety. The isolate seen in seborrheic variant was T. Mentagrophytes. T. violeceum was isolated in 50% of kerion followed by T. mentagrophytes and T. rubrum in 28% and 7% respectively.

Grey patch is the most common variant of T capitis. T. violaceum is the most common isolate in all the clinical variants of T capitis in North eastern part of India. Anthropophilic species are responsible mainly for non inflammatory variants and zoophilic species for inflammatory variants. Intra-familial and animal contacts are major source of the source of infection.

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