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Original Article

Current Spectrum of Dermatophytosis in a Tertiary Care Hospital of North India – A 6-Year Clinico-Mycological Study

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ABSTRACT
Dermatophytosis is a common infection of skin, hair and nails caused by Trichophyton, Microsporum and Epidermophyton species. The incidence in a particular region varies with population migration, culture and environment.
Aim: *To determine the clinico-mycological pattern of dermatophytosis in patients with culture proven disease.*
Material and Methods: The present study was conducted on 175 cases of dermatophytosis between January 2011 and December 2016 which were culture proven. The demographic profile including age and gender distribution, findings on direct microscopy and culture was done. Causative fungi were identified up to species level.
Results: *Out of 175 cases, 126(72%) were males and 49 (28%) were females. Age ranged between four and 77 years. Majority of the patients were between 21 and 40 years of age and 57.14% reported disease between July and September. Tinea corporis with tinea cruris was the commonest clinical presentation. Tinea capitis was seen in 5.7% cases out of which 78.5% were children less than fifteen years of age. Direct microscopy revealed fungal infection in 68% subjects. Trichophyton mentagrophytes emerged as the leading cause of dermatophytosis seen in 62.28% whereas T. rubrum was isolated in 23.4%. T. violaceum isolates constituted 6.85% and primarily caused scalp infections. Other agents identified were Trichophyton tonsurans, Microsporum gypseum and Microsporum ferrugenum.*
Conclusion: *The species occurrence in dermatophytosis is a dynamic process subject to variation in time and place with emergence of new and resistant strains. Thus knowledge of such epidemiological change is relevant to therapeutic success.*
Keywords- *dermatophytosis, Trichophyton, Microsporum, tinea, corporis, cruris, capitis.*

Introduction

Dematophytosis is a common infection of humans restricted to the outermost cornified keratinized layers involving the skin, hair and nails [1]. These infections are also referred to as 'ringworm' or 'tinea' and classified according to body sites involved[2]. A group of filamentous fungi belonging to three genera, Trichophyton, Microsporum and

Epidermophyton are the causative agents [3]. The incidence of specific dermatophyte species in a particular region varies with time due to population movement; mass migration and travel, economic status and level of hygiene, culture, traditions and habits, ecology and environment and changing therapies and antifungal susceptibilities [2],[4]. New species are being introduced in non-endemic regions, the identification and treatment of which may be challenging. Thus, epidemiological profile of dermatophytosis is a dynamic phenomenon with changes in the clinico-mycological pattern in any location. The knowledge of this variability is relevant to diagnosis and success of therapy. This study is an endeavour to delve into the details of the etiological agents of this common condition in the sub-Himalayan region over last six years from 2011 to 2016.

Material and Methods

The study includes the historical cohort of culture proven 175 cases clinically suspected of tinea attending the Dermatology Department of our tertiary care hospital during the six year period from January 2011 to December 2016. The detailed history of patients including demographic profile were recorded i.e., age, gender, duration of disease, occupation, family history, livestock rearing or household pets, clinical site(s) of infection and treatment prescribed were studied. Patients were examined thoroughly and grouped into various clinical categories. Samples from infected sites like skin scrapings, hair and nails were collected aseptically after cleaning the part with 70% alcohol and allowing the lesion to dry. Samples from skin were collected by scraping from the active edge of the lesion, clippings of nails and subungual debris were taken and infected hair were plucked from base and transported in sterile containers to the Microbiology Department. The direct microscopy of samples of skin and hair were done in 10% KOH and of nails in 20% KOH to screen for arthrospores. Culture was done in a set of tubes of Sabouraud's dextrose agar (SDA) one set of tubes with chloramphenicol (0.05mg/ml) and another with chloramphenicol and cycloheximide (0.5mg/ml). One set of tubes was incubated at 250C and the other set at 370C for four weeks and observed biweekly. Those showing growth were identified by observing rate of growth of colonies, macroscopic characters like texture and pigment on obverse and reverse. Microscopic morphology was studied by preparing tease mounts in lactophenol cotton blue stain and by microslide culture. Identity was established by studying organization of hyphae i.e., spiral, pencil, spindle or club shape, septation, nodular organs, the sporulation pattern and abundance of microconidia and macroconidia. Tests like urease and hair perforation were performed where required. Culture tubes showing no growth even after 4 weeks of incubation were considered negative.

Results

Out of 175 culture confirmed cases included in our study, 126 (72%) were males and 49 (28%) were females. The male to female ratio was 2.5:1.The youngest patient was a 4 year-old male child and the oldest was a 77 year-old man. Majority of the patients belonged to age group of 21-30 years (28%) followed by 31-40 years (24.5%) and mean age was 34 years (Figure 1). Most of the cases were encountered during monsoon months between July and September (57.14%) (Figure 2).

In this study, tinea corporis with tinea cruris was the most common clinical presentation (32%) followed by tinea corporis (28.5%), tinea cruris (21.1%), tinea capitis (5.7%) and tinea ungium (4%). Localised infection with tinea pedis (Figure 5) and tinea faciei (Figure 6) was seen in two (1.1%) patients each, while another two subjects had tinea cruris with tinea corporis with tinea barbae. Other mixed clinical types of dematophytosis were seen in one case each (0.5%). (Table 1).

Out of the 175 cases, arthroconidia were visualized in KOH wet mounts on direct microscopy of 119 (68%) samples. The year-wise isolation of dermatophytes was eight, one, seven, 20, 33 and 106 respectively from 2011 to 2016. T. mentagrophytes was the most frequent isolate

obtained in specimens of 109 (62.28%) subjects followed by T. rubrum in 41 (23.4%), T. violaceum in 12 (6.85%), M. gypseum in 6 (3.42%), T. tonsurans in 5 (2.85%) and one (0.5%) isolate was of M. ferruginum (Figure 3).

Table 1 Distribution of cases according to clinical presentation (n=175)

Clinical presentation	No. of cases	Percentage of cases %
Tinea cruris with tinea corporis	56	32%
Tinea corporis	50	28.5%
Tinea cruris	37	21.1%
Tinea capitis	10	5.7%
Tinea ungium	7	4%
Tinea pedis	2	1.1%
Tinea faciei	2	1.1%
Tinea cruris with tinea corporis with tinea barbae	2	1.1%
Tinea cruris with tinea corporis with tinea capitis	1	0.5%
Tinea corporis with tinea capitis with tinea ungium	1	0.5%
Tinea corporis with tinea capitis	1	0.5%
Tinea corporis with tinea faciei	1	0.5%
Tinea pedis with tinea ungium	1	0.5%
Tinea cruris with tinea capitis	1	0.5%
Tinea ungium with tinea pedis with tinea cruris	1	0.5%
Tinea cruris with tinea barbae	1	0.5%
Tinea pedis with tinea mannum	1	0.5%
TOTAL	175	100%

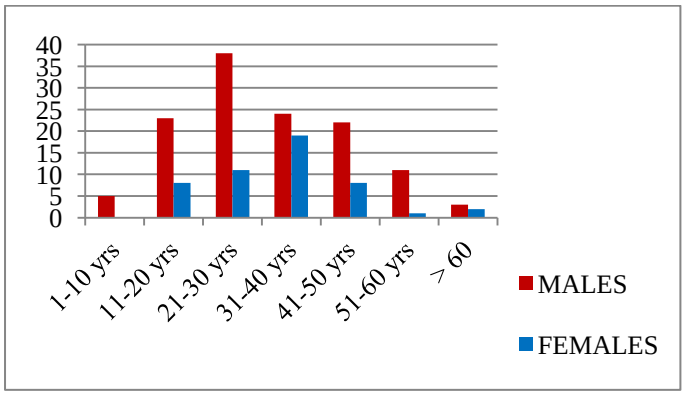

Fig.1 Distribution of cases according to age and sex. (n=175)

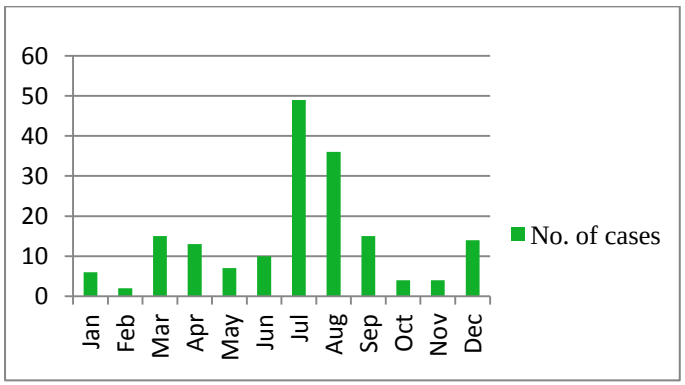

Fig. 2 Month wise distribution of cases of dermatophytosis (n=175)

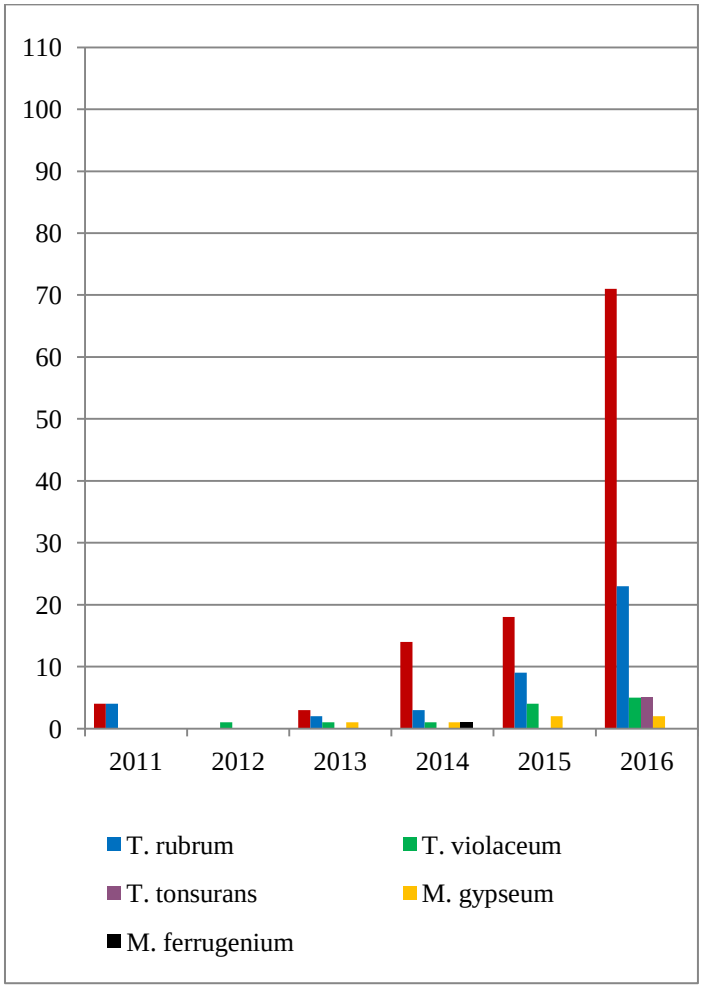

Fig. 3 Year wise distribution of dermatophyte species from 2011-2016. (n=175)

Fig 4 Tinea cruris and corporis.

Fig. 5 Tinea pedis and onycomycosis toenails.

Fig. 6 Tinea faciei / barbae.

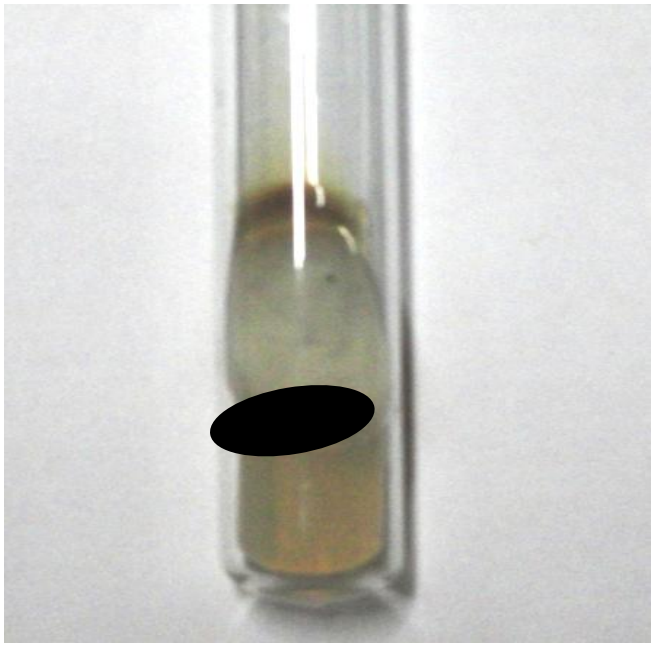

Fig. 7 White to tan powdery growth of Trichophyton mentagrophyte on Sabouraud's dextrose agar.

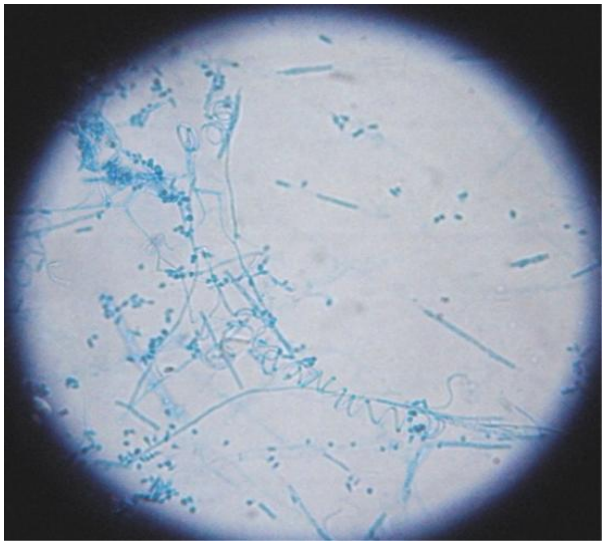

Fig. 8 Photomicrograph of lactophenol cotton blue wet mount of Trichophyton mentagrophyte showing characteristic microconidia in grape like clusters and spiral hyphae. (magnification X 400)

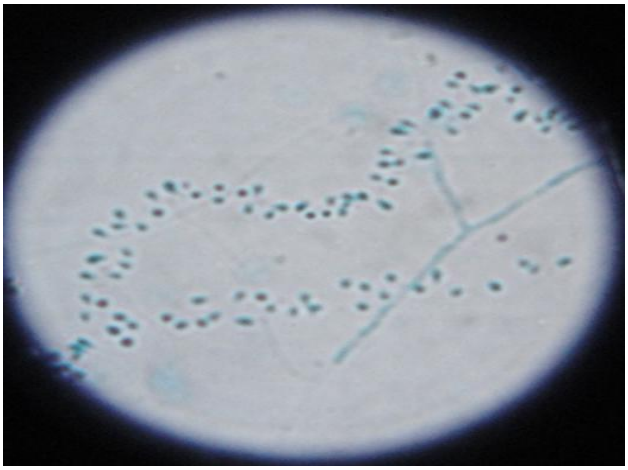

Fig. 9 Photomicrograph of lactophenol cotton blue wet mount of Trichophyton rubrum showing tear-shaped microconidia in "bird- on – the – fence " appearance. (magnification X400)

Discussion

Dermatophytosis is a common cutaneous infection occurring in 20% to 25% of individuals across the world [5]. The potential of the filamentous fungi of the genera Trichophyton, Microsporum and Epidermophyton to specifically invade keratinous structures accounts for this common condition. The disorder is characterised by annular, itchy cutaneous lesions. Dermatophytosis is the only truly contagious fungal infection which may occur in

normal healthy individuals incapacitating them in their daily routine and infected individuals serve as carriers causing disease transmission. The presentation in immunocompromised persons may be extensive and severe. These fungi are divided into anthropophilic which affect the humans exclusively, zoophilic causing disease in animals and geophilic which are the soil fungi.

In the present study, males were predominantly affected constituting 68% of the study group with male to female ratio of 2.5:1. This is in keeping with other recent Indian studies [6]-[12]. The increased outdoor physical activity being a part of their occupation accounts for males being more prone to acquire infection. Moreover, men wear occlusive footwear which leads to excessive sweating creating a favourable environment for fungus to flourish. A large number of subjects were students availing institutional boarding facilities with many of them reporting sharing towels, beddings and exchanged clothes. There was history of similar disease in friends who were sharing rooms. Most of the females suffering due to tinea were housewives who were not just homemakers but practiced farming and cattle rearing as well. Household contact was the predisposing factor in nearly 40% of cases. There was history of contact with pets (dogs and cats that were having pruritic skin condition) in 12 patients. The incidence in females may be an underestimate on account of under reporting as the women in rural areas are usually shy to complain about tinea cruris which is amongst the commonest clinical presentation. The risk of acquiring infection by children and elderly is infrequent as they invariably stay indoors.

The chief complaints are those of lesions and itching in the armpits and neck or abdomen (tinea corporis, Figure 4) or groin (tinea cruris, Figure 4). These were reported by 85% of our patients and are similar to findings in recent Indian literature [6]-[11], [13], [14]. Eleven children were 15 years or less of age out of which eight constituting 72.7% had infection of the scalp. This represented 78.5% of total fourteen cases of tinea capitis. Two children presented with kerion, a severely painful inflammatory scaring alopecia. Non-scaring tinea capitis, gray patch and black dot varieties were seen in adults. Scalp infections are rare in adults but we came across five adults who were suffering from tinea capitis. The clinical presentations were black dot tinea capitis in three and two had grey patch type and isolates were T. mentagrophytes (3) and T. violaceum (2). The incidence of scalp infection is high in childhood and dwindles with age as increased sebum production at puberty has a protective role. Infections of nails have been documented as the second leading dermatophytic infection from Northern parts of the country [6], [13]. These studies report 21% and 20% cases of tinea ungium in their compilations but contrary to these our study revealed merely ten (5.71%) subjects with nail infection and fungal isolates were T.rubrum (5), T.tonsurans and T.violaceum (2 each) and T. mentagrophytes (1). Onychomycosis (Figure 5) has been correlated with diabetes by various workers but no such link was observed in this study [3].

There was a steady rise in infections with T. mentagrophytes which has emerged as a leading cause of dermatophytosis over T. Rubrum (Figures 7,8,9) A previous study of mycological profile of dermatophytosis from this centre has documented T. rubrum in 66% and only 19 % infections due to T.mentagrophytes [15]. This is in contrast with observations of some previous workers [8], [9], [11], [13], [14] but other authors have reported majority of ringworm infections due to T. mentagrophytes [6], [7], [10],[12]. Anthropophilic agents like T. Mentagrophytes and T. rubrum are well adapted to cause human infections. The infective propagules of T. mentagrophytes have greater dormancy on fomites due to their high contents of carbohydrates and carotenoid pigments which have a protective function and are formed in substrate arthroconidia of T.mentagrophytes but not in hyphae or microconidia. The glycoprotein ‘mannan’ of T. rubrum may suppress the inflammatory response and result in chronic infection [1]. Thus the two agents may have aggravated infectiousness accounting for greater number of cases. The anatomical site predilection is another determinant

of the frequency with which various species are isolated [16].

T. violaceum is a universally established principal agent of tinea capitis [4]. It is now an emerging scalp fungus in the Indian sub-continent. Of the scalp infections we observed, T. violaceum accounted for 64.28% (9/14) cases and 35.71% (5/14) were T. mentagrophytes. T. violaceum was also the predominant cause of tinea capitis from similar Indian studies [7]-[9], [11]. M. gypseum is an uncommon geophilic fungus that has been reported as a cause of facial tinea from Brazil [16]. It has been isolated as soil saprophyte from Himachal [17]. It is though an infrequent cause but a constant agent in this geographical region reported earlier [15]. The present study reports the recent re-emergence of T. tonsurans which was documented from the sub-Himalayan region during 2008-2009 [15].

There was a drastic increase in the number of clinical suspects of tinea as well as cases confirmed on fungal culture in the year 2016. Oral terbinafine 250 mg was the therapy prescribed for 3 weeks in the patients. The cases that did not show clinical improvement after extending therapy to 4 weeks were considered clinical failure to terbinafine. The dermatologists encountered 17 cases constituting 9.71% of extensive infection and recurrence in the past one year. Treatment was subsequently switched over to oral itraconazole 200mg in two divided doses. A favourable response was obtained after extending the therapy for 4-6 weeks. In 2003, dermatophyte resistance to terbinafine was reported and a recent study reports 35% resistance [18], [19]. The management of such cases is a problem that physicians are confronting. The emergence of T. mentagrophytes and non-responsive cases was concurrent thus we speculate possible resistance to current therapy of terbinafine and development of resistance to other antifungal drugs. The in-vitro antifungal susceptibility testing is done on filamenteous form of the dermatophytes grown in culture. This may not actually indicate drug responsiveness in-vivo because arthroconidia present in clinical lesions are highly resistant morphological forms. The susceptibilities of clinical isolates of patients who failed on therapy with terbinafine may not reveal any correlation between the MIC and clinical failure as observed in a suscepitibility test [20]. Thus, further studies on clinical trials and definitive laboratory evidence other than MIC testing are required before alternative therapies are recommended.

Conclusion

The effective control of dermatophytes will necessitate sharing the knowledge of occurrence and emergence of different species from time to time. Information regarding therapeutic failure or resistance to available antifungal agents will be helpful in formulating treatment guidelines. The development of new regimens and new generation of antifungal drugs will be required in times to come.

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