Increasing Incidence of Dermatophytic Infection among Patients

Jha BK[1], Mahadeva Murthy S[2]

[1]Research Scholar
Department of Microbiology
Yubraja College, Mysore, India
baiju010@gmail.com

[2]Professor and Head
Yubraja College of Microbiology, Mysore, India
smmurthy2025@gmail.com

Abstract: ***Dermatophytes can digest keratin and other proteinaceous substrates present in skin and its appendages such as nail, hair, and feather and use it as its sole source of carbon and nitrogen. Despite the availability of effective antifungal agents, dermatophytic infections continue to be one of the principal dermatological diseases throughout the world, especially in tropical countries. A cross-sectional descriptive study in the K R Hospital, Mysore, India, which is one of the main tertiary care centre in central part of Mysore so all referred patients samples were collected and prossed from November 2010 to September 2012. This study was done to study the clinical variants, species of fungus causing dermatophyte infection and epidemiological factors responsible for the disease in Central Mysore. The prospective observational analysis of clinically suspected 920 positive cases out of 1418 dermatophytic infection attended at the Dermatology department of K R Hospital, Mysore, India, was selected for our study. All the cases were evaluated by us and patient's data were recorded as per pre-designed proforma. Skin scraping, hair and nail samples were collected and processed according to standard protocol. Maximum numbers of cases with dermatophytosis were observed between June to September and almost half of the cases were farmer by occupation. Dermatophytosis was common in male (55.7%) as compared to female (44.3%) and the youngest patient was 27 days old and oldest was 77 years old. Majority of the cases in this study were between 26-30 years of age 243 (26.4%). Most common clinical type observed in this study was tinea corporis 289 (31.4%) followed by t. capitis 187 (20.3%), t. cruris 130 (14.1%), t. pedis 99 (10.7%), t. manum 51 (5.5%), t. faciae 32 (3.4%) and t. barbae 21 (2.2%). Cases with tinea capitis were less than 10 years of age and male preponderance was observed. Direct microscopic examination (KOH) of the samples revelled overall 72.1% (1023 out of 1418) positive for KOH, while (64.8%) cases were culture positive. High positivity was found in cases of tinea corporis 289 (31.4%) followed by t. capitis 187 (20.3%) by direct microscopy. The predominant species of dermatophyte isolated was T. rubrum 223 (24.3%) followed by T. tonsurans 206 (22.3%), T. verrucosum 159 (17.2%), T. mentagrophytes 147(15.9%), T. violaceum 128 (13.9%), E. floccosum 40 (4.3%) and T. schoenleinii 11(1.1%). The study highlighted tinea corporis as the most common clinical pattern of dermatophytosis followed by tinea capitis in Central Mysore. The predominant causative fungal species isolated was Trichophyton rubrum followed by T. tonsurans and T. verrucosum. Clinical evaluation and fungal species identification is mandatory for proper management of dermatophytosis rather than empirical treatment.***

Keywords: Dermatophytes, clinical types, T. rubrum.

1. Introduction

Robert Remak (1841-1844) discovered first fungus causing human disease so called father of Mycology. Raimond Sabouraud a Frinch Dermatologist establish the plurality of ring worm and its clinical aspect. Emmons (1934) reclassified Dermatophyte into 3 genera as Epidermophyton, Tricophyton and Microsporum and in last 1958 Gentles opened a new door to the therapy of dermatophytes by Griseofulvin.1 Fungi are numerous, ubiquitous, and diverse in their adaptations. Fungal species causing superficial infections called dermatophytosis, ringworm or tinea infections.

The dermatophytosis constitutes a group of superficial fungal infection of keratinized tissue such as the epidermis; hair and nails caused by fungal species closely related filamentous fungi known as dermatophytes[2] though, dermatophytes are worldwide in distribution but are present mostly in tropical and subtropical countries like India and Nepal in increased frequencies.

The incidence of dermatophytosis in a particular area depends mainly on environmental, socioeconomic factors, geographic distribution of the organism, species of organism and epidemiological parameters like age, sex, occupation, nutrition, hygiene and associate systemic disease. Hot and humid climate facilitate fungal growth to cause disease and aggravate the condition.3

Despite the development of effective antifungal agents and patient's awareness as regards to the fungal infection, dermatophytic infections continue to be one of the principal dermatological diseases in patients attending Dermatology clinic throughout the world especially in tropical countries. The clinical manifestations of the disease depend on the keratinous structure affected, species causing disease and the host parasite relationship. Fungal Infection may occur through contact with infected humans (Anthopophilic), domestic animals (Zoophilic), and soil (Geophilic) or through inanimate objects.4 Since several dermatophytic fungi are capable of infecting one or more keratinous structures, the disease has been generally classified according to the anatomic area of the body involve rather than infecting organism. Dermatophytic infection involves scalp (skin and hair)

known as tinea capitis. Skin involvement at trunk is tinea corporis, crural region involvement is Tinea cruris, and glabrous skin involvement at hand and feet is tinea manum and pedis respectively. Finger and toenail involvement is known as tinea unguim. Tinea barbae fungal infection at mustache and beard area and the condition when skin involvement at face occurs this is known a tinea facei.5,6 It is quite pertinent to study prevalence of fungal infection of skin, its clinical presentation and causative fungal species prevalent in central Mysore.

2. Materials Methods

A total of 920 patient samples, including nail clippings, subungual debris, hair and skin scrapings were collected at our laboratory from November 2010 to September 2012. Study was conducted at Department of Dermatology of K R Hospital, Mysore, India. Specimens were obtained from clinically suspected fungal infections especially dermatophytosis of various body sites - trunk, groin, head and scalp, face, hand, toe and finger nails. All collected specimens were analyzed by direct microscopy and culture. Microscopic examination of these specimens was carried out in potassium hydroxide solution (20%) with dimethyl sulfoxide (4%). These specimens were cultured on Sabouraud dextrose agar with chloramphenicol and Sabouraud dextrose agar with chloramphenicol and cycloheximide. Cultures were incubated at 25°C for up to 28 days and checked twice weekly for growth. Negative cultures were confirmed after 4 weeks of no growth. Identification of dermatophyte isolates was on the basis of microscopic morphology, urea testing, growth on Trichophyton agars and hair perforation assay were done according to standard protocol.7,8 Non-dermatophyte molds were identified by microscopic morphology. The data collection form included questions about age, sex, number of siblings, residence, hair-loss history for other siblings and income level.

A detailed historical data of patients recorded on proforma with particular reference to onset of disease, duration and site of involvement, type of initial lesion and progression, associated dermatophytosis and systemic illness in past and familial occurrence of similar disease. General and systemic examination performed and findings were recorded on prescribed proforma. Patients on topical and systemic antifungal treatment were excluded from the present study.

If no growth was observed at the end of 3 weeks, culture was labelled as “negative”. Lectophenol cotton blue mounts were prepared for the identification of the structure and morphology of the spores. Data were collected on prescribed proforma. Clinical photograph of representative skin lesions and colony characteristics of fungus species identified were taken. Microscopic picture of Lectophenol cotton blue preparation of fungal culture were taken for the identification of species.9,10

3. Results

Current cross-sectional study was carried out in Dermatology and STD department of K R Hospital, Mysore, India. In present study 920 cases of dermatophytosis were diagnosed as per clinical data, direct microscopy and culture. Distribution of cases according to clinical type of disease in relation to species of dermatophytes. In this study Trychophyton rubrum 223 (24.3%) was predominantly isolated species followed by 206 (22.3%) Trychophyton tonsurans and 159 (17.28) Trychophyton verrucosum.

3.1. Seasonal variation

Table 1: Distribution of cases according to months

Months (2010-2012)	Total number of cases	Positive culture (No. and %)	P-value
September	280	173 (18.8)	
October	173	105 (11.4)	
November	44	30 (3.2)	
December	33	23 (2.5)	
January	30	22 (2.3)	P<0.001
February	36	20 (2.1)	
March	38	23 (2.5)	
April	84	44 (4.7)	
May	108	69 (7.5)	
June	188	120 (13.0)	
July	212	159 (17.2)	
August	192	132 (14.3)	
Month- 24	**1418**	**920**	**Mean=76.6**

Table 2: Distribution of different age group cases according to age and sex

Age group in year	Sex		Total (%)
	Males (%)	Females (%)	
< 1	16 (3.1)	14 (3.4)	**30 (3.2)**
1-5	26 (5.0)	22 (5.4)	**48 (5.2)**
6-10	71 (13.8)	38 (9.3)	**109 (11.8)**
11-15	59 (11.5)	40 (9.8)	**99 (10.7)**
16-20	23 (4.4)	88(21.6)	**111 (12.0)**
21-25	80 (15.5)	54 (13.2)	**134 (14.5)**
26-30	145 (28.2)	98 (24.0)	**243 (26.4)**
31-35	37 (7.2)	22 (5.4)	**49 (6.4)**
36-40	21 (4.0)	18 (4.4)	**39 (4.2)**
>40	35 (6.8)	13 (3.1)	**48 (5.2)**
Total	**513 (55.7)**	**407 (44.2)**	**920**

Table 3: Distribution of cases according to clinical type of disease in relation to species of dermatophytes

Species of Dermatophytes	T.corporis No. & %	T.capitis No. & %	T.cruris No.&%	T.ungium No. & %	T.pedis No.&%	T.manum No. & %	T.faciae No. & %	T.barbae No. & %
T. rubrum	101(45.2)	36(16.1)	78(34.9)	-	-	-	-	8(3.5)
T. verrucosum	40(19.4)	-	32(15.5)	38(18.4)	48(23.3)	28(13.5)	11(5.3)	9(4.3)
T. tonsurans	72(45.2)	87(54.7)	-	-	-	-	-	-
T. mentagrophytes	37(25.1)	-	-	53(36.0)	13(8.8)	19(12.9)	21(14.2)	4(2.7)
T. violaceum	24(18.7)	53(41.4)	-	19(16.4)	32(25.0)	-	-	-
E. floccosum	9(22.5)	-	20(50.0)	1(2.5)	6(15.0)	4(2.0)	-	-
T. schoenleinii	-	11(100.0)	-	-	-	-	-	-
M. canis	6(100.0)	-	-	-	-	-	-	-
Total- 920	**289**	**187**	**130**	**111**	**99**	**51**	**32**	**21**

4. Discussion

The incidence of dermatophytic infections in Mysore is high. However, neither the medical professional nor the research workers paid any attention towards the investigations of these important emerging human fungal infections. In this present studies, all patients comes with complain of fungal especially clinically suspected dermatophytic infected 1418 cases were taken for our study. Among all these cases culture positive was only 920 isolates of different clinical types of tinea. The study revelled an overall prevalence rate was (64.8%) of dermatophytic infections, this positive rate is higher then that of reported by other investigators11, 14 (Table 1).

Maximum numbers of cases were observed in month of June to September, which was due to high humidity and farmers mostly getting exposed with soil and their domestic animals (Table-1). Male patients 513 (55.7%) had more infection rates then female patients 407 (44.2%) of infection rate. These results showed similar pattern as that of study done by Desai et al.12 this was may be due to male works more outside then females, so chances of exposure and acquiring disease is more in male then female patients. In this study over all predominant species of dermatophyte isolated was T. rubrum.11

Most of the infected person were child, but infection rate was seen more among age below 40 years, where maximum was found among the group of patients age between 26-30 i.e. 243 (26.4%)(Table-2). Similar report was also noted by two different investigators Macura AB15 and Sofia et al.19. Urban people with lower socioeconomic condition patients had more fungal infection rate than that of labour group of patients from rural area, which was 58.9% and 41.1% respectively. This was may be due to urban people are more health conscious than that of rural people, who might have taken medication without consulting doctors. While asking questionnaire we found that rural people had taken more unwanted drugs or some time half course treatment than that of urban patients.

On the basis of different clinical types, mostly we found Tinea corporis was 289 (31.4), next to this 187 cases (20.3%) of Tinea capitis, Tinea cruris 130 (14.1%), Tinea ungium 111 (12.0%), Tinea pedis 99 (10.7%), Tinea manum 51 (5.5%), Tinea faciae 32 (3.4%) and Tinea barbae 21 (2.2%) as shown in (Table-3). In the present study over all male 56.5% predominance was observed as compared to female 43.3%. Macura AB15 from western state of India and Omar et al.18 from Egypt also reported similar results. However, Shahindokht et al.16 from Tahran reported female predominance in their study.

As (Table-3) showed T. rubrum was the most common etiologic agent isolated from the trunk 223 (24.3%). Although several species of dermatophytes were isolated, the predominant pathogens in the present study were T. tonsurans 206 (22.3%), T.verrucosum 159 (17.2%), T. mentagrophytes 147(15.9%), T. violaceum 128 (13.9%), E. floccosum 40 (4.3%) and T. schoenleinii 11(1.1%). It is well known that different body areas are involved by different dermatophytes. According to our study, T. rubrum was the most frequently isolated dermatophyte on feet and toenail and then trunk and groin of middle-aged males. Recently, numerous authors reported similar findings.6, 8, 13.

Soo-Hoo et al.6 noted the commonest age group of tinea infection between 11 to 20 years of age. Similar result was also observed by Jones et al.8 In contrast with reported finding present study showed that youngest patient was of age 27 days and oldest was 77 years of age had tinea infection. This study showed 40.5% had tinea infections in age group between 26 to 30 years followed by 15% in 21 to 25 years of age (Table-1). This study documented all cases of tinea capitis were less than 10 years of age with male predominance. Whereas study conducted in Eastern Nepal showed that patients with tinea capitis were less than 11 years of age with male to female ratio of (1:1.9).13

Present study showed cases of tinea corporis were higher in female as compared to male (M: F; 0.88: 1) which is not in accordance with other studies. Jones et al. from south and western India reported male predominance in their study.8 Increase incidences of tinea corporis in female patients may be because women in Nepal are engaged in farming as a part time work. Physical exercise, working in hot and humid environment increase sweating that may facilitate parasitization of fungus 14 although, tinea cruris is not common in female but 5 out of 24, (20.8%) cases were also found to have tinea cruris in this study. Desai et al.12 reported male between 15 to 45 years of age had more tinea pedis as compared to female. However present study showed tinea pedis were predominantly higher in age groups between 26 to 30 years with female predominance (M:F 0.6:1).

Most common clinical type observed in this study was tinea corporis (31.4%) followed by tinea capitis (20.3%, Table-3). In present study, prevalence of tinea capitis was 20.3%, 187 cases out of 920 cases but study conducted in Nepal reported prevalence of tinea capitis was 4.6% whereas prevalence of 15.1% was reported from Saudi Arabia. 17, 20 Study carried out in India, noted low prevalence of tinea capitis and was attributed to the use of mustard oil over scalp and oil has fungi static property.21 However, similar study showed that there was no significant association with the use of mustard hair oils in cases of tinea capitis.22

Studies conducted in Poland and Spain documented 27.4 % and 2.9% prevalence of tinea pedis with male predominance respectively.12,23 In the prospective study done by Sofia et al.19 reported prevalence of tinea unguium was 2.8% with male preponderance. The present study also noted male predominance with higher incidence of tinea ungium 12.0%, 111 out of 920 (Table-3). This increase incidence in tinea unguium may be as country like Nepal majority of people are farmer by occupation.

So there are more chances of transmission of Geo and Zoophilics species.

In present study, overall 72.1% (1023 out of 1418) cases were positive for fungus in direct microscopic examination (KOH). In this study positive culture was observed in 64.8% of cases. Whereas, it was 45.3% and 44.6% in study conducted at Calicut and Baroda respectively.8,12 High positivity in cases of present study could be due to use of selective media which does not allowed contaminants to grow. T. rubrum is the predominant species reported worldwide whereas Shahindokhi24 from Tahran noted Epidemophyton as a dominant species followed by T. rubrum. In contrast with their findings, present study showed Trichophyton verrucosum (24.3%) as a predominant species identified followed by T. rubrum (22.3%), T. tonsurans (17.2%) and T. mentagrophytes (15.9%). This is in consistent report with Moh. Reza et al.23 who also documented T. verrucosum as a dominant species in various tinea infection (14 out of 27) cases.

Study conducted at western state of India.16 reported T. rubrum as the main dermatophytes isolated in cases of tinea corporis. While study done at eastern Nepal14 obtained T. mentagrophytes as a predominant species. In present study T. verrucosum (24.3%) was found to be commonest causative agent of tinea corporis which is in concordance with the study of Iran24 showed T. verrucosum as a predominant species in tinea corporis followed by tinea capitis. In present study, T. tonsurans (17.2%) was found to be predominant species followed by T. violaceum (13.9%) in cases of tinea capitis. However, Jha5 et al. reported T. violaceum as the main causative agent of tinea capitis.

This study showed T. rubrum 35.4% was isolated from tinea cruris, whereas various studies documented E. floccosum as a predominant species.18 Sofia et al.19 reported T. rubrum (82%) followed T. mentagrophytes in cases of tinea unguium whereas this study showed T. mentagrophytes (36.0%) was most commonly isolated followed by T. rubrum (18.4%). Desai et al.12 found equal number of T. rubrum and T. mentagrophytes species in tinea pedis however in present study T. rubrum was isolated which is in accordance to the various reports in literature (Table-3). In cases of tinea faciae, present study found T. mentagrophytes followed by T. rubrum this suggest infection with anthropophilic fungus in house hold contact. T. rubrum and T. mentagrophytes were reported to be causative agent in tinea manum in another study 15 in patients with extensive tinea infection (T. corporis, cruris, manum, unguium and pedis) T. verrucosum was isolated from all the sites (Table 3).

5. Conclusion

Measures for prevention of these fungal infections should be based on maintenance of local resistance to infection by individual care and hygiene. Further investigation over the course of several years will be needed to determine whether these changes reflect a continuing trend. The fluctuations recorded in the aetiology of dermatophytosis are believed to be due to changes in the environment, human migration pattern, newer therapies, the pathogen and the host relationship.25 Dermatophytes infection is worldwide in distribution with increase frequencies in tropical and subtropical countries. The predominant occupation of patient under study was agriculture. In spite of best availability of medical personals, there was delayed in treatment due to medication over the counter and use indigenous medication or house hold remedies is a common practice. This was the most important cause of delay in treatment leading to disease spread.

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Author Profile

Brajesh Kumar Jha, received the BSc MLT from Rajiv Gandhi University, Bangalore, India in 2003, after this he worked as a Laboratory Technologist in Manipal Medical College, Pokhera, Nepal, then he did MSc Medical Microbiology from Kathmandu University, Nepal in 2007 and after this he is working as an Assistant Professor in college of medical Sciences, Bharatpur, Nepal. Now he is about to finish his Research Scholar in Microbiology under Mysore University, Mysore, Karnataka, India.

S Mahadeva Murthy did his BSc, MSc, M Phil and PhD, now working as an associate Professor in Department of Studies Microbiology, Yubarajas College, Mysore, India. He is equally getting involved in different researches as a Research Guide and having publications in national and international journal.