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ORIGINAL ARTICLE

Profile of Dermatophytic and Other Fungal Infections in Jaipur

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Abstract The common cause of skin infections are dermatophytes and opportunistic fungi. Aim of present study is to find predominant etiological agent of dermatophytoses and to isolate various fungal agents from clinical samples of patients with different mycoses and Clinical samples from 260 patients were subjected to potassium hydroxide (KOH) examination and culture isolation; causative agents were identified macroscopically and microscopically. One hundred sixty three (62.7%) were found to be positive by KOH examination while 132 (50.8%) were culture positive. Dermatophytes were isolated in 90/140 (64.3%) specimens. *Trichophyton rubrum* (75.5%) was the commonest isolate among the patients suffering from dermatophytoses. *Candida* spp. and *Malassezia furfur* were isolated from patient suffering from candidiasis and pityriasis versicolor.

Keywords Dermatophytoses · Dermatophytes · Opportunistic fungi

Infectious diseases, particularly those involving the skin and mucosal surfaces, are a serious problem all over the world due to deficient sanitation and education. An important group of these skin pathogens are fungi [1]. Recently there has been an increase in the incidence of fungal infections. This increase may be a result of frequent usage of antibiotics, immunosuppressive drugs and various conditions like organ transplantations, lymphomas, leukemia and human immunodeficiency virus (HIV) infections [2]. Superficial mycoses refers to the disease of the skin and its appendages caused by fungi. This group includes Dermatophytoses, Pityriasis versicolor and Candidiasis. They possess the affinity for parasitising keratin rich tissues and produce dermal inflammatory response and cause redness, intense itching and burning in addition to a cosmetically poor appearance [3]. Candidiasis encompasses infections that range from superficial, such as oral thrush and vaginitis, to systemic and potentially life-threatening diseases. *Candida* infections of the latter category are also referred to as candidemia and are usually confined to severely immunocompromised persons, such as cancer, transplant, and AIDS patients [4]. Superficial infections of skin and mucosal membranes by *Candida* causing local inflammation and discomfort are common in many human populations [5]. Jaipur has got a dry climate but in the summer, the temperature exceeds even 44°C with high humidity during the monsoon season. These climatic conditions favour the occurrence of fungal infection so the present report describes the occurrence of dermatophytic and other fungal infections in Sitapura and Sanganer rural population of Jaipur among the patients attending the O.P.D, Department of Dermatology, E.S.I.C hospital, Jaipur.

Materials and Methods

Two hundred and sixty clinically suspected cases of dermatophytoses and other fungal diseases, attending the

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dermatology O.P.D of E.S.I.C. hospital, Jaipur during the period 2008–2009 were included in this study. Samples were collected from patients who were clinically suspected for dermatophytoses and other fungal diseases in sterile plastic bags. The infected areas or lesions were wiped with 70% alcohol to remove the dirt and other ointments. The specimens included skin scales, hair, hair roots, nail clippings and swabs. Clinical material was collected for microscopy and culture using standard mycological techniques. Direct microscopic examination was undertaken in 10% potassium hydroxide (KOH) wet mount for the specimens of skin scales while 40% KOH was employed for hair and nail specimens [6]. Once the specimen was confirmed for the presence of fungal elements, the samples were streaked on the Sabouraud Dextrose Agar (SDA) slants prepared with cycloheximide (50 mg/l) and chloramphenicol (500 mg/l) were used for culture [6]. The culture tubes were incubated at 30°C and the culture growth was observed and the tubes were discarded only after 6 weeks in the absence of growth. The mycological identification was based on macroscopic and microscopic examination of the culture isolates [7]. The macroscopic examination of dermatophytes was characterized by duration of growth, surface morphology and pigment production on the reverse.

Results and Discussion

Out of 260 patients of dermatomycoses, 163 (62.7%) samples were found to be positive by KOH examination and 132 (50.8%) were culture positive cases. 140 out of 260 samples (53.8%) were dermatophytoses, 90 (34.6%) were pityriasis versicolor and onychomycosis were 17 (18.9%). Candidiasis was suspected in 8 (3.1%) and blastomycosis in 5 (1.9%) patients (Table 1). Among the 140 suspected patients with clinical symptoms of dermatophytoses, 120 samples were found to be positive by KOH examination and 90 were confirmed in culture. Thus the diagnosis of dermatophytoses could be established in 64.3% of the cases examined. In our present investigation, it was found that, among these confirmed cases of dermatophytoses males are more prone to dematophytoses than females (Table 4). The lower incidence of females may be also due to the non-reporting of the female patients to the hospital due to prevailing social stigma in the rural population and also due to the higher exposures in the army, school and sporting activities and due to the wear of uniform and closed footwear for prolonged periods in all weathers. This promotes sweating and sweat retentions due to high environment moisture content in summer season, thus facilitating fungal growth resulting in a high incidence of fungal diseases in males. These observations were supported by some of the earlier reports [8, 9]. The maximum number of patients of dermatophytoses were found from rural population of Sitapura, Sanganer area and most of the patients in working profession were found labours working in a small cottage industries and farmers. The results of the present study indicate that dermatophytoses is the most common skin disease in the rural population of Sitapura area, Jaipur. It was observed that the living condition of the patients played a major role. Almost all the patients belonged to lower economic group with occupations as daily wage labours and farmers which are in close contacts with animals and soil. Some of the patients had closer association with pet animals such as cattle, dogs and cats. The higher incidence of dermatophytoses could be attributed to environmental conditions such as hot temperature and humid weather in Jaipur. Poor personal hygiene and illiteracy are major factors that influence dermatophytoses. Several earlier workers have reported similar findings [10, 11]. The isolation rate of dermatophytes was 64.3% (90/140), with six species of dermatophytes being isolated, *T. rubrum* (isolation rate: 75.5%), *T. mentagrophyte* (16.7%), *M. gypseum* (3.3%), *Chrysosporium tropicum* (2.2%), *T. violaceum* (1.1%) and *M. canis* (1.1%). In our present investigation, *T. rubrum* was the predominant species to be isolated (75.5%) followed by *T. mentagrophyte* (16.6%). The other etiological agents encountered were *M. gypseum* (3.3%), *Chrysosporium tropicum* (2.2%), *T. violaceum* (1.1%) and *M. canis* (1.1%). Our findings coincides with the work of most of the earlier workers [8, 9, 12] who reported *T. rubrum* was the predominant etiological agent of dermatophytoses. In terms of site of infection, tinea corporis was prevalent among the majority of the cases (77.8%). The commonest clinical type of dermatophytoses that presented to us were tinea corporis (77.8%) followed by tinea cruris (11.1%) which concurs with reports from other parts of India [13]. *T. rubrum* was the major causative species isolated from tinea corporis and tinea cruris patients. The incidence of tinea capitis was 5.6% in our study which is comparable to the reports from other workers 0.57 to 10% [14, 15]. In our study, *M. gypseum* was found predominant etiological agent from tinea capitis patients. Present study showed the isolation of *M. gypseum* (geophilic dermatophyte) which could be accounted due to patient's interaction with soil and domestic animals [16]. Tinea capitis is less common in India than in other countries [17]. This may be attributable to the use of hair oils (particularly mustard oil) which are customarily used by Indians and have been shown to have an inhibitory effect on dermatophytes in vitro [18, 19]. We reported the incidence of tinea pedis (2.2%) in our study. The predominance of tinea pedis in western countries could be because of the regular use of shoes and socks, predisposing to perspiration and maceration. Tinea pedis, T.

Table 1 Types of dermatomycoses included in the study and their laboratory results (n = 260)

Mycoses	Total no of cases	%	KOH positive	Culture positive	% of culture positives of total isolates
Dermatophytoses	140	53.8	120	90	64.3
Pityriasis versicolor	90	34.6	25	30	33.3
Onychomycoses	17	18.9	10	6	35.3
Candidasis	8	3.1	5	4	50
Blastomycosis	5	1.9	3	2	40

Table 2 Clinical manifestation of dermatophytoses

Clinical manifestation	Isolates	*T. rubrum*	*T. mentag-rophyte*	*T. violaceum*	*M. gypseum*	*M. canis*	*Chryso-sporium tropicum*
	No of isolates (%)	No of isolates (%)	No of isolates (%)	No of isolates (%)	No of isolates (%)	No of isolates (%)	No of isolates (%)
Tinea corporis	70 (77.8)	55 (61.1)	12 (13.3)	–	1 (1.1)	1 (1.1)	1 (1.1)
Tinea cruris	10 (11.1)	7 (7.8)	2 (2.2)	–	–	–	1 (1.1)
Tinea capitis	5 (5.6)	1 (1.1)	1 (1.1)	1 (1.1)	2 (2.2)	–	–
Tinea pedis	2 (2.2)	2 (2.2)	–	–	–	–	–
Tinea manum	2 2.2	2 2.2	–	–	–	–	–
Tinea facie	1 (1.1)	1 (1.1)	–	–	–	–	–
Tinea barbae	–	–	–	–	–	–	–
Total	90 (100)	68 (75.5)	15 (16.6)	1.1 (1.1)	3 (3.3)	1 (1.1)	2 (2.2)

manum and T. facie were the least to be reported among the cases in the present study (Table 2). Culture positivity was highest with tinea corporis (77.8%) and lowest with tinea barbae (0%). In the present investigation, tinea infections were more common in the 16–30 years (70/140) followed by 31–40 years (25/140) as shown in Table 3. Tinea corporis was the most predominant clinical type reported in all the age-groups but higher incidence was observed in the 16–30 and 31–40 age groups (Table 4). Similar results were also obtained by various authors [20, 21].

Malassezia furfur were isolated from 30 patients with pityriasis versicolor disease. In our present investigation, *M. furfur* was found to be most predominant etiological agent of pityriasis versicolor infection. Among total 90 patients of pityriasis versicolor, majority 60 (66.6%) were in the age group of 11–20 followed by 20 (22.2%) (21–40) and 10 (11.1%) 1–10 age groups (Table 5). It was recorded that among these confirmed pityriasis versicolor cases, 25 (27.7%) were males and 5 (5.5%) were females (Table 6). In our survey study, it was reported that, majority of patients that are infected with Pityriasis versicolor infection were labours of Sitapura and Sanganer area of rural population and in the age-group of 11–40 years and most of them are young adults which are physically active outdoors. Males are found more vulnerable to this infection than females due to their nature of work related with their occupational hazards and we also found that, most of the male patients were involved in exhausting physical work with long hours under the sun which leads to profuse sweating as compared to females and hormonal changes, increase in sebum secretion mainly in young adults facilitates the growth of lipophilic yeast, *Malassezia furfur*. Similar to our present study, Rao et al. [22] and Krishnan et al. [23] also found predominance of male patients. Most of the patients were young adults.

Candida albicans and non-albicans were isolated from four culture positive cases (Table 1). Out of 4 cases, 3 patients presenting a oral candidiasis and 1 patient with vulvovaginal infection. In our study, *Candida albicans* was found to be predominant species isolated from oral candidiasis in 3 patients. Our results are in favour of earlier workers [24, 25] where *C. albicans* was predominant species isolated from candidiasis infection.

A total of 17 patients of onychomycosis (12 males and 5 females) were examined (Table 1). Out of which, 10 were KOH positive but had negative in culture. Six specimens were found culture positive. *T. rubrum* (23.5%) and *T. mentagrophyte* (11.76%) are the dermatophytes isolated from nail specimens. *T. rubrum* was found main etiological agent of onychomycosis. Our findings corroborating with Garg et al. [8]. In our study, onychomycosis was found to be most prevalent in the age group of 25–45 and uncommon in children. The increased prevalence of

Table 3 Distribution of patients with dermatophytoses according to the age-groups and gender

Age-groups	Male	Female	Total
0–15	8	7	15
16–30	50	20	70
31–40	15	10	25
41–50	8	4	12
51–60	8	2	10
>60	5	3	8

Table 4 Distribution of patients with dermatophytoses positive by culture examination according to age and gender

Clinical types	Tinea corporis		Tinea cruris		Tinea capitis		Tinea pedis		Tinea manum		Tinea facie		Total	
Age-groups	M	F	M	F	M	F	M	F	M	F	M	F	M	F
0–15	3	2			2	2	–	–					5	4
16–30	25	5	5	1	1	–	2	–	1	1	1	–	35	7
31–40	20	5	4	–	–	–	–				–	–	24	5
41–50	6	2			–	–	–	–	–	–	–	–	6	2
51–60	1	1			–	–	–	–	–	–	–	–	–	1
>60	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Total	55	15	9	1	3	2	2	–	1	1	1	–	71	19

Table 5 Distribution of patients with Pityriasis versicolor according to the age-groups and gender

Age-groups	Male	Female	Total (%)
1-–10	6	4	10 (11.1)
11–20	40	20	60 (66.6)
21–40	11	9	20 (22.2)
>40	–	–	–
Total	57	33	90 (99.9)

Table 6 Distribution of patients with Pityriasis versicolor positive by culture examination according to age-groups and gender

Clinical type	Pityriasis versicolor	
Age-groups	Male (%)	Female (%)
1–10	–	–
11–20	12 (13.3)	3 (3.3)
20–40	13 (14.4)	2 (2.2)
Total	25 (27.7)	5 (5.5)

onychomycosis in men compared to women could be the result of more traumas in men compared to women and more common use of occlusive footwear and greater work activity.

A rare and unusual human pathogen of *Blastomyces dermatitidis* was isolated from skin scrapings in two cases of blastomycosis (Table 1). Present study showed the isolation of *Blastomyces dermatitidis* could be accounted due to patients in contact with soil and animals [10].

In our study, we also reported in some cases, candidiasis and dermatophytic infections in HIV infected patients and also found that these infections occur as a result of decrease in natural human defenses in immunocompromised patients. *Trichophyton rubrum* and *Candida albicans* were the organisms most commonly isolated from HIV patients and in some cases of candidiasis infection, we also reported the decreased susceptibility to antifungal drugs, due to prolonged use of drugs against some resistant strains and also found side effects of oral fluconazole (antifungal drug), which causes heavy exposure to the opportunistic fungus *Aspergillus* and ultimately leads to a invasive Aspergillosis in the respiratory tract (asthma and lung disease) in immunocompromised HIV infected patients. Our findings are in favour of earlier workers [2, 26].

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