Original Articles

CAUSAL AGENTS OF DERMATOMYCOSIS ISOLATED IN KARACHI

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Abstract

A study was conducted on 139 cases of dermatomycosis at JPMC, Karachi during the year 1977 for fungus etiology and species identification. The disease was more commonly observed among adults either as tinea cruris (predominantly among males) or as tinea corporis. Tinea capitis was observed more often among children while tinea pedis did not seem to have age predilection.

About 73% of cases could be confirmed in laboratory for fungus etiology by culture and/or by direct microscopy. Culture examination was found to be better than direct microscopic examination for laboratory diagnosis of dermatomycosis. T. *rubrum* was the most common species recovered from these cases (44%) followed by T. *Tonsurans*, E. floccosum (21%) and T. Violacium (9%). Very few cases were having M. *gypsium* (2%), T. *mentegraphytes* (1%). T. *vanbrenteghemii* was identified from a case of tinea pedis. This is for the first time that T. Vanbrenseghamii has been reported from Pakistan.

Introduction

Infections with dermatophytes are wide spread throughout the world and high prevalence of superficial mycosis is rather impressive in tropical and sub-tropical regions to which Pakistan belongs. A sufficient number of surveys have been conducted in different parts of the world to isolate dermatophytes from different clinical types, their prevalence, geographical distribution and other factors. Very little information is available from Pakistan about the prevalent types of fungi causing these infections and their public health importance. In view of this it was decided to isolate and identify various species of fungi more commonly involved in cases of dermatomycosis in Karachi.

Material and Methods

Selection of cases: Cases of skin, hair and nail infections attending the skin out-patients departments of Jinnah Post-graduate Medical Centre, or Skin and Social Hygiene Centre, Karachi were studied during 1977 for fungus etiology, isolation and identification of causative species of dermatophytes. A careful clinical history was recorded which included nature and distribution of lesions, information on apparel and footwear used. Stress was also given to enquire if the disease coexisted in other family members, neighbours or domestic animals.

Collection of Material: Material was taken from infected site after carefully cleaning the affected area with 70% alcohol. Skin scrapings were collected from active border of the lesions while material from nails was taken from the edge of infected nails. In suspected cases of tinea capitis material from scalp was obtained by scraping and hair were plucked with sterilized tweezers.

Direct Examination

For microscopic examination material was treated with 10% KOH on clean glass slide and heated gently over a low flame. A drop of lactophenol cotton blue was added to stain the preparation. On examination under high powered objective, presence of hyphae or spores was taken as positive evidence of fungal infection.

Culture Examination

Primary Culture was done on Mycobiotic agar (Difco). Plates were incubated at 28-30°C and observed daily for rate of growth, colony characteristics and pigmentation. Subcultures were made from each representative strain to vials of mycobiotic agar and incubated similarly for pure-growth.

Identification Procedures

Isolated strains of fungi were differentiated first into three genera of Dermatophytes on the basis of microscopic morphology on Sabouraud's Dextrose Agar with 1% yeast extract and on rice grains. From third day onwards slides were prepared daily for 10 days by using lactophenol cotton blue stain, and examined for size, number, shape and arrangement of micro and macroconidia. Other accessory structures like nodular bodies, coiled hyphae, chlamydospores and favic chandlers were also recorded (details will be described else where).

Specific identification was then carried out according to modification of the methods described by Ajello et al (1966). On the basis of colony morphology, pigment production rate of growth and microscopic morphology of the cultures on corn meal dextrose agar, potato dextrose agar, Malt agar, and Sabouraud's dextrose agar with 1% yeast extract. The later medium was incubated at 37°C also to compare the growth rate at two temperatures. Nutritional media (Trichophyton agar No. 1-7) were also used for species identification of genus Trichophyton.

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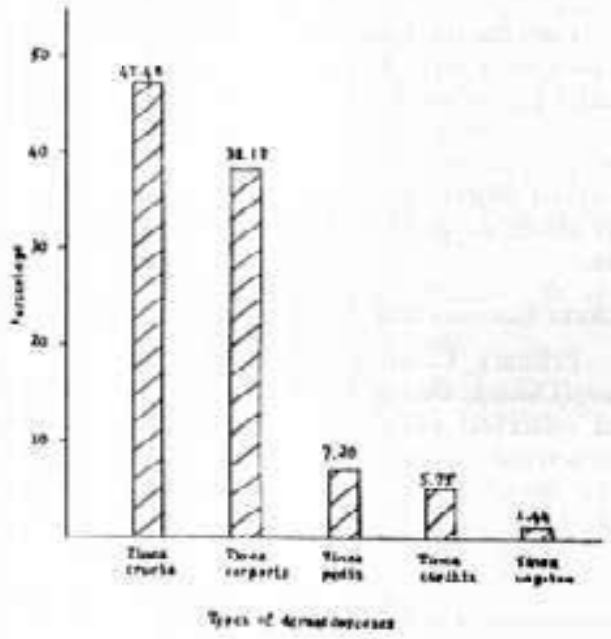
Results

During the present study a total of 139 cases were clinically diagnosed as having dermatomycosis. They were processed in laboratory for direct microscopy and culture examination.

Figure 1 shows the distribution of cases according to clinical types. About 47 percent of cases were infected in the region of groins and genitalia (tinea crusis). 38 percent were infected all over the body (tinea corporis). Out of 66 patients with tinea cruris, 16 were also having fungal lesions on the body (mixed infection). Cases of tinea pedis were recorded in only seven percent and tinea capitis in six percent, while tinea unguin was recorded in only one percent.



Persons of all ages were found to have dermatophyte infection, but it appeared to be more common in adults (68% as compared to adolescents (20%) and children (12%). Tinea capitis was found to be more common among children (88%) while tinea crusis was rare in this age group (Table I).

Regarding the sex distribution, males were more commonly affected than females (Table II). The ratio was 2:1. Tinea cruris was found to be predominantly in males (92%) while tinea pedis was seen more in females (9 out of 10%). Out of the total 16 cases of tinea cruris, which were also having tinea corporis in association, 15 were males and one was female, while cases of tinea corporis were almost equally distributed in males and females.

Table II: Distribution of Clinical Types According to Sex

Clinical type	*Male*	*Female*	*Total*
Tinea cruris	61 (92%)	5 (8%)	66
Tinea corporis	23 (43%)	30 (57%)	53
Tinea pedis	1 (10%)	9 (90%)	10
Tinea capitis	7 (875.%)	1 (12.5%)	8
Tinea unguium	2 (100%)	—	2
Grand Total:	94 (68%)	45 (32%)	139

The results of direct microscopy and culture examination in relation to clinical type is shown in Table III. About 33% of total cases were positive both by direct microscopy and culture, while 37% were positive by culture but negative by smear examination. Eight out of 139 cases (6%) were found to be positive by smear only while 24% cases were negative both by smear and culture examination.

Table I: Distribution of Clinical Types According to Age.

Clinical type	A *Children* (1-15 years)	B *Adolescents* (16-20 years)	C *Adults* (21-60 years)	*Total*
Tinea cruris	1 (2%)	16 (24%)	49 (74%)	66
Tinea corporis	6 (11%)	9 (17%)	38 (72%)	53
Tinea pedis	3 (30%)	2 (20%)	5 (50%)	10
Tinea capitis	7 (88%)	—	1 (12%)	8
Tinea unguium	—	—	2 (100%)	2
Grand Total:	17 (12%)	27 (20%)	95 (68%)	139

Table III: Results of Smear and Culture Examination in Relation to Clinical Types

Clinical types	A *Smear positive Culture positive*	B *Smear positive Culture negative*	C *Smear negative Culture positive*	D *Smear negative Culture negative*	*Total*
Tinea cruris	24 (36%)	2 (3%)	28 (43%)	12 (18%)	66
Tinea corporis	18 (34%)	3 (6%)	21 (40%)	11 (20%)	53
Tinea pedis	0 —	1 (10%)	2 20(%)	7 (70%)	10
Tinea capitis	4 (50%)	2 (25%)	0 —	2 (25%)	8
Tinea unguium	0 —	0 —	0 —	2 (100%)	2
Grand Total:	46 (33%)	8 (6%)	51 (37%)	34 (24%)	139

Table IV: Comparison of Culture and Smear Examination

Clinical type (139)	*Culture positive (Smear positive/or negative)*	*Smear positive (Culture positive/or negative)*
Tinea cruris (66)	52 (79%)	26 (39%)
Tinea corporis (53)	39 (74%)	21 (39%)
Tinea pedis (10)	2 (20%)	1 (10%)
Tinea capitis (8)	4 (50)%	6 (75%)
Tinea unguium (2)	0 —	0 —
Grand Total:	97 (70%)	54 (39%)

Table V: Results of Mycological Examination

Clinical types	*Positive cases (Smear/culture)*	*Negative cases (Smear/culture)*	*Total*
Tinea cruris	54 (82%)	12 (18%)	66
Tinea corporis	42 (79%)	11 (21%)	53
Tinea pedis	3 (30%)	7 (70%)	10
Tinea capitis	6 (75%)	2 (25%)	8
Tinea unguium	0 —	2 (100%)	2
Grand Total:	105 (76%)	34 (24%)	139

Tinea cruris was found to be positive in 82% of cases followed by tinea corporis and tinea capitis respectively. Tinea pedis have only 30% positive yield, while both of the two cases of tinea unguium did not yield any fungus positive case.

Table VI shows the percent distribution of different species of dermatophytes isolated during present study. Out of 139 cases of dermatomycosis 97 strains of dermatophytes were inslated. T. rubrum was the most common species (44%). Next in frequency were T. tonsurans and E. floccosum (21%) each followed by T. violaceum (9%). M. gypseum was present in only 2% while T. mentagrophytes, T. schoenleinii and M. vanbrusegemii each were present in only 1%. Association of dermatophyte species with the various clinical types of dermatomycoses is shown in table VII. In tinea cruris and tinea corporis the distribution of different species more or less followed the same general pattern. Two of the tinea capitis cases were having M. gypsium.

Table VI: Species of Dermatophytes Isolated from Dermatomycoses.

Total Cases	*Positive for culture*	*T-rubrum*	*T. tonsurans*	*E. floccosum*	*T. violaceum*	*T. mentagrophytes*	*T. schoenlenii*	*M. gypsum*	*M. Vanbreuseghemii*
139	97 (70%)	43 (44%)	20 (21%)	20 (21%)	9 (9%)	1 (1%)	1 (1%)	2 (2%)	1 (1%)

Table VII: Species of Dermatophytes in Relation to Clinical Types

Dermatophyte Species	*Total Strains*	*Tinea Cruris*	*Tinea Corporis*	*Tinea Capitis*	*Tinea Pedis*
T. rubrum	43	27 (52%)	15 (38%)	1 (25%)	— —
T. tonsurans	20	10 (19%)	10 (26%)		
E. floccosum	20	11 (21%)	8 (20%)	— —	1 (50%)
T. violaceum	9	3 (6%)	5 (13%)	1 (25%)	— —
T. mentagrophytes	1	1 (2%)	— —	— —	— —
T. schoenleinii	1	— —	1 (3%)	— —	— —
M. gypseum	2	— —	— —	2 (50%)	— —
M. vanbreuseghemii	1	— —	— —	— —	1 (50%)
Grand Total:	97	52 (79%)	39 (74%)	4 (50%)	2 (20%)

Table IV shows the comparison between culture and smear examination. 70% of total cases were found to be positive by culture while 39% were positive by smear. This shows that culture examination gives better results as compared to smear examination. Cases of tinea pedis and tinea unguium mostly remained negative both by culture and smear examination.

Table V shows the distribution of total fungus positive and negative cases by microscopy and culture in the different clinical types.

Discussion

In the present study tinea cruris was found to be the most common clinical type followed by tinea corporis (47%) and 38% respectively (Fig. 1). The results are in confirmity with the reports published by Das Gupta and Shome (1958) and Panda et al. (1967). In most of the surveys made in India tinea corporis has often been found to be the more common type than tinea cruris (Kalra et al., 1964; Shah et al., 1975). Tinea pedis was found in 7% of cases only.

These results are somewhat similar to those shown by Royes and Jacalne (1962) and Vasu (1966). They found tinea pedis in 10% and 9% cases respectively. Kotrajaras (1967) and Padhye and Sekhon (1973) found about 15% cases of tinea pedis. However, in most of the other series tinea pedis was found to be less frequent (Dutta and Rao, 1970; Fleming, 1975).

Low frequency of tinea capitis was found in many surveys like Kandhari and Sethi (1964) and Vasu (1966). They reported 1.86% and 0.49% cases of tinea capitis respectively. However Padhye and Sekhon (1973) reported 6.6% cases. In present study tinea capitis was found to be 6%. In a review by Verhagen (1973) tinea capitis was reported to be 10-30% in Africa.

Tinea unguium was found to be less frequent, i.e. 2%. This is similar to the results of Kandhari and Sethi (1964) and Vasu (1966). No case of tinea barbae was recorded in the present study. Mankodi and Kanvinde (1969) also did not record any case of tinea barbae in their series.

As regards the age and sex predilection, the disease seems to be more common in adult males. The ratio between males and females was found to be 2:1. Cases of tinea cruris were noticed predominantly in male adults while tinea corporis was slightly more in female adults. Gupta and Shome (1959) also reported it to be more common in adults. A study from Karachi (Khan and Anwar, 1969) also found tinea cruris more common in adults, while Kotrajaras (1967) reported tinea corporis most commonly found among adult females.

Tinea capitis was found predominantly in children (88%) as shown in table I. The disease seemed to have sex predilection for males (Table II). This is in confirmation with the general observation that tinea capitis is a disease of prepubertal age, mostly affecting the male children. From Karachi, Shaikh (1968) found tinea capitis as the second most prevalent type of dermatomycosis among children, however, Khan and Anwar (1968) recorded cases of tinea capitis to be equally present in children, adolescents and adults.

In the present study cases of tinea pedis were recorded mostly in females (9 out of 10). This is in contrast with the other reports like Padhye and Sekhon (1973). They found that males had 88% infection of tinea pedis.

Only two cases of tinea unguium were recorded and both were in males. The number is too small to offer any comments, however many reports in literature show predominance of tinea unguium in adult males (Gupta and Shome, 1959; Padhye and Sekhon, 1973).

In present study 76% of total cases were found to be positive either by direct microscopy or culture (Table V), isolation rate by culture was 70% (Table IV) while direct microscopic examination revealed only 39% positive cases. Desai and Bhatt (1961) and Amin et al. (1971) found culture positive cases as 70% and 68% respectively.

The information on the type of apparel used and on the positive culture findings in various clinical types, the results of the present study show that cases of tinea cruris and corporis were 100% positive in those patients using nylon clothes. About 75%—77% positive were found among those patients using mixed fibre clothings, while a much lower percentage of positive cases was found in those using cotton clothes. It is possible that moisture and humidity in nylon clothes support the dermatophytes to grow. *T. rubrum* was mainly responsible for cases of tinea cruris (52%) and tinea corporis (38%). Reyes and Jacalne (1962) from Phillipines found *T. rubrum* in 49% and 82% cases of tinea corporis and cruris respectively. A higher percentage of *T. rubrum* (95%) was found by Mankodi and Kanvinde (1969) in cases of tinea corporis (95%) and tinea cruris (91%). Khan and Anwar (1969) from Karachi reported *T. rubrum* in 60% cases of tinea cruris, while Uppal and Kamil (1974) reported this species in only 12% of cases.

E. floccosum was the next common type, more often causing tinea cruris and tinea corporis (20-21%). Khan and Anwar (1969) from Karachi also reported comparatively higher prevalence of *E. floccosum* in cases of tinea cruris (31%). Uppal and Kamil (1974) from Peshawar reported this species in 48% of the total isolates, with 80% of tinea cruris being due to this species. Fleming (1975) reported 57% cases of tinea cruris by *E. floccosum* in Northern Ireland.

The high percentage of *T. tonsurans* in the present study (25%) in tinea corporis and 19% in tinea cruris, however does not agree with the findings of Khan and Anwar (1969) who found this species in only 0.26% of cases in Karachi. Mankodi and Kanvinde (1969) reported *T. tonsurans* in 2.85% cases of tinea corporis. The higher prevalence rate of *T. tonsurans* in present series may be due to better techniques of identification and differentiation.

In the present study only one strain each of *T. mentagrophytes* and *T. Schoenleinii* was recovered from the patients of tinea cruris and tinea corporis respectively. Similarly Kandhari and Sethi (1964) noted 0.8% cases by *T. schoenleinii*. However in most of the studies abroad, *T. mentagrophyte* was found to be the second prevalent type causing ringworm from Phillipines (Das Gupta and Shome, 1959, Reyes and Jacalne,

1962), Kalra et al. (1964) and Kotrajaras (1967) from Thailand. Blank et al. (1969) in vietnam isolated *T. mentagrophytes* (65%) as the main causative agent followed by *T. rubrum* (65%) and (30%) respectively. The lower isolation rate of *T. mentagrophyter* in this study may again be due to the same reason as for the higher prevalence rate of *T. tensurans*.

In present study *T. violaceum* was found to be the third common species responsible for 9% of total cases. Desai and Bhat (1961) and Shah et al. (1975) found *T. violaceum* as the second prevalent type. In present series it was recovered from 6% of tinea cruris cases and from 13% of tinea corporis cases. No strain of *M. canis* was isolated while in a study from British Columbia (Bowner, 1966) *M. canis* was found to be the second prevalent species.

Among geophilic species *M. sypseum* was isolated from two out of four cases of tinea capitis (50%) in the present study. Kandhari and Sethi (1964) recovered *M. sypseum* from 75% of total tinea capitis cases. In the present study one strain of *E. floccosum* was isolated from the cases to tinea pedis. Reports of many surveys showed again that *T. rubrum* was mainly responsible for infection of feet followed by *E. floccosum* (Kandhari and Sethi, 1964; Vasu, 1966). One species of dermatophyte recovered from tinea pedis was recognised as *M. vanbrusegheni*. Unless its identification is confirmed no comments can be offered as this will be the first instance of its isolation from Indo-Pakistan sub-continent.

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