

Review

Superficial Fungal Infections Seen at the National Skin Centre, Singapore

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Abstract

Cutaneous fungal infections are common in Singapore. The National Skin Centre is a tertiary referral centre for dermatological diseases in the country, and sees more than 2,500 cases of superficial fungal infections annually.

Aim: This study analyses data collated from the centre's medical record office as well as fungal culture results from the mycology laboratory.

Results: From 1999 to 2003, there were a total of 12,903 cases of superficial fungal infections seen at the centre. The majority of patients (n=9335) (72.3%) were males. The most common infection was tinea pedis (n=3516) (27.3%), followed by pityriasis versicolor (n=3249) (25.2%) and tinea cruris (n=1745) (13.5%). Candidal infections were also common (n=1430), the majority of which were cases of candidal intertrigo. There were very few cases of tinea capitis, which is uncommon in Singapore. The number of cases of onychomycosis has shown a rising trend over the past 5 years. *Trichophyton rubrum* was the most prevalent fungal pathogen isolated from all cases of superficial fungal infections of the skin, except for tinea pedis, where *Trichophyton interdigitale* was the most frequently isolated organism. Dermatophytes remain the most commonly isolated fungal pathogens isolated in toenail onychomycosis, whilst *Candida* species accounted for the majority of isolates in fingernail onychomycosis.

Conclusion: Current epidemiologic trends of superficial fungal infections in Singapore show some similarities to recent studies from the United Kingdom and United States.

Key words: epidemiology, cutaneous fungal infections, tinea, yeasts, Southeast Asia

Introduction

Superficial fungal infections of the skin can be caused by dermatophytes, yeasts and non-dermatophytes. The various fungal organisms that cause skin infection are constantly competing with each other for their particular environmental niche, which can result in the emergence of a dominant species. Knowledge of current epidemiological trends in the incidence of cutaneous fungal infections is important in diagnosis and treatment of the disease. Singapore is a country in Southeast Asia located at the southern tip of Peninsular Malaysia, 136.8 kilometres north of the Equator. It has a cosmopolitan population of 4.45 million people, with Chinese (76.7%), Malays (14%) and Indians (7.9%) forming the majority. This is an

epidemiological study into recent trends of fungal skin infections seen at the National Skin Centre, which is a tertiary referral centre for skin diseases in the country.

Methods

This was a retrospective analysis of data obtained from the medical record office as well as fungal culture results from the mycology laboratory at the centre, covering the period from 2nd January 1999 to 31st December 2003. Cultures were not performed in every case of clinically diagnosed fungal infection. Mycobiotic agar (Difco Laboratories, Detroit, Michigan) was used for growing dermatophytes. The cultures were incubated at room temperature (25°C to 30°C). Morphology of the fungal colonies and their growth characteristics were recorded. The cultures were examined daily for up to 4 weeks. Identification of dermatophyte isolates was on the basis of microscopic

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Table 1. Cases of superficial fungal infections seen at the National Skin Centre from 1999-2003.

Diagnosis	1999	2000	2001	2002	2003
	Total	Total	Total	Total	Total
Candidiasis, Intertrigo	241	200	162	171	225
Candidiasis, Mouth	2	0	2	2	0
Candidiasis (not specified)	77	58	65	54	37
Candidiasis, Penis	8	2	4	4	3
Candidiasis, Vulva/Vagina	35	25	19	14	20
Tinea capitis	0	1	1	0	2
Tinea (not specified)	112	111	99	85	60
Tinea corporis	326	277	311	293	281
Tinea cruris	419	361	345	313	307
Tinea manuum	37	23	18	24	31
Tinea pedis	512	649	770	819	766
Onychomycosis	102	97	174	250	248
Tinea versicolor	832	641	630	625	521
TOTAL	2703	2445	2600	2654	2501

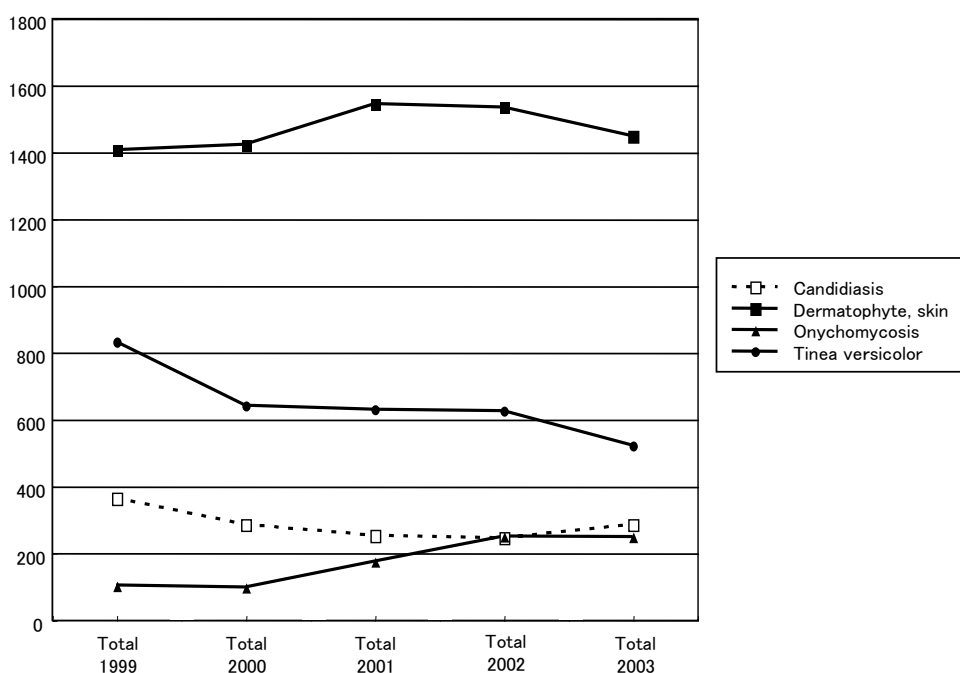


Fig. 1. Yearly trends of some common superficial fungal infections.

morphology, urea testing, and growth on *Trichophyton* agars. Nondermatophyte molds were identified by microscopic morphology. Recovered yeasts were subjected to the germ tube test, and checked for morphology in cornmeal agar.

Results

Over the 5-year period, there were a total of 12,903 cases of superficial fungal infections seen at the centre. Table 1 summarizes the number and types of cases of superficial fungal infections seen yearly. Annually, there are more

than 2,500 cases of superficial fungal infections seen at the centre. This puts superficial fungal infections among the top ten diseases seen at the centre. Dermatophyte skin infections accounted for the majority of cases ($n=7353$) (57%), followed by pityriasis versicolor ($n=3249$) (25.2%), candidosis ($n=1430$) (11.1%) and onychomycosis ($n=871$) (6.8%). There is a rising trend in cases of onychomycosis, a steadily declining trend in cases of pityriasis versicolor, whilst trends for dermatophyte and candidal skin infections remain fairly stable. Amongst dermatophyte skin infections, tinea pedis was the

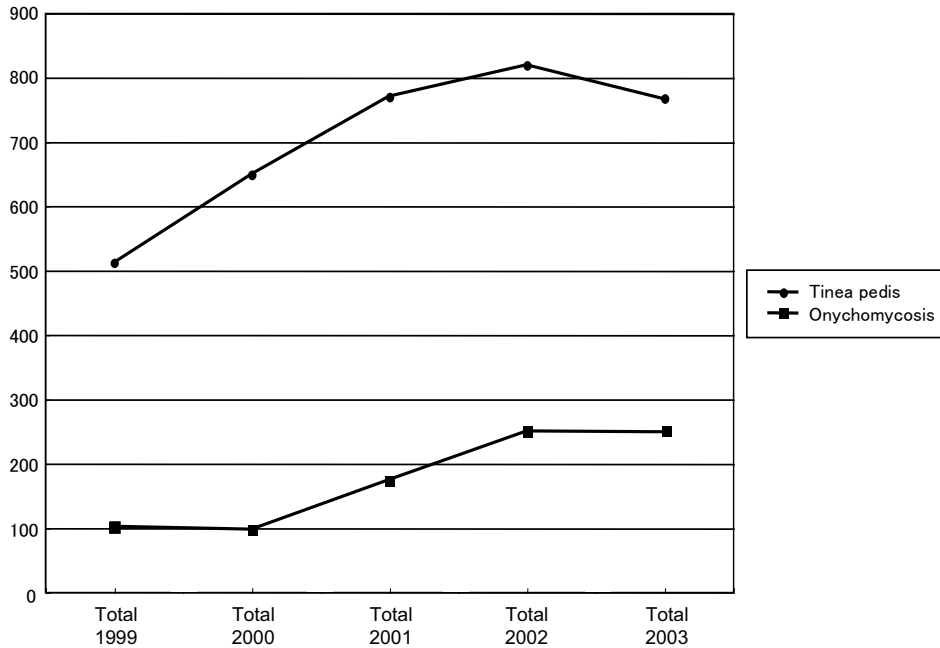


Fig. 2. Comparison of trends between tinea pedis and onychomycosis.

commonest condition seen, followed by tinea cruris and tinea corporis. There were 3516 cases of tinea pedis seen over the study period, accounting for 27.2% of all superficial mycoses seen. There were 1745 and 1488 cases of tinea cruris and corporis, respectively, over the same period. The most common types of tinea pedis were the 'dry-type' and 'moccasin' patterns, followed by the vesicular form of tinea pedis.

T. rubrum was the predominant pathogen isolated, accounting for 53.6% of all isolates. It was the commonest cause of tinea corporis, cruris and manuum. The most common isolate in cases of tinea pedis was *T. interdigitale*, mainly from cases of vesicular tinea pedis. Fig. 1 shows the trends of some of the common superficial mycoses. Looking closer at the trends, we can see that the rise in cases of onychomycosis parallels the rise in cases of tinea pedis (Fig. 2). Tinea capitis is extremely uncommon in Singapore -there were only a total of 4 cases seen over the past 5 years. These cases were mainly caused by *M. canis*.

Candidal skin infections were common. The most common condition seen was candidal intertrigo, followed by vulvo-vaginal candidiasis. There was one case of chronic mucocutaneous candidiasis diagnosed during this period. This occurred in a 20-year-old Chinese man who had an autosomal dominant form of CMC (his mother and brother were also affected, but not seen at the centre) which was not associated with endocrinopathy. In both cutaneous and vaginal candidosis, *C. albicans* was the most

prevalent species, accounting for about 65% of the isolates. In vaginal candidosis, *C. glabrata* was the second most common isolate (23%), followed by *C. tropicalis* (7%) and *C. parapsilosis* (5%).

Onychomycosis affected mainly Chinese patients (64.1%), followed by Indians (16.1%), other races (9.5%), and Malays (6.3%). The figures did not vary significantly from the racial composition of the general dermatological patients attending the centre during the study period. The positive culture rate from infected nails following an initial positive KOH scrape was 69.5%. There were slightly more males (53.7%) affected than females, and the age ranged from 8 years to 82 years, with a median age of 45.2 years. The majority were adults from the third to the fifth decade. The majority of cases of onychomycosis were caused by dermatophytes (56.6%), particularly in toenail infections. Men were twice as likely to have dermatophytes isolated from nail infections, and females were more likely to have *Candida* species isolated. *T. rubrum* was the commonest cause of onychomycosis, being isolated in 44% of all cases of onychomycosis. *Candida* species, predominantly *C. albicans* (78.7% of all *Candida* species isolated), were responsible for 37.9% of all cases of onychomycosis, and were more likely to be isolated from fingernail infections. Non-dermatophyte molds accounted for 5.6% of nail infections, with *Fusarium* being the most common pathogen.

Discussion

Superficial fungal infections are common in Singapore. The superficial mycoses are the commonest of the human fungal infections, and they include dermatophytosis, superficial candidosis and *Malassezia* infections. The commonest organism causing dermatophyte infections in Singapore is *T. rubrum*. This is similar to the United Kingdom¹⁾ and Europe²⁾, as well as the United States³⁾. Tinea pedis is the commonest dermatophyte infection in Singapore and is most often caused by anthropophilic fungi such as *T. interdigitale* and *T. rubrum*. The earliest lesion develops with scaling and itching between the toes, and blisters are generally only seen with *T. interdigitale*, whereas in *T. rubrum* infections, the soles are often covered with a dry scaly rash. The rise in cases of onychomycosis parallels that of tinea pedis, emphasizing the importance of adequately treating fungal foot infections to prevent nail involvement. There has been a change in the three most common fungal pathogens isolated in Singapore. In 1984, the most prevalent fungal pathogen was *T. mentagrophytes*, followed by *T. rubrum* and *Epidermophyton floccosum*⁴⁾. Presently, the three most prevalent organisms are *T. rubrum*, followed by *T. interdigitale/mentagrophytes* and *E. floccosum*. Of isolates obtained from the groin, *T. rubrum* was responsible for 65.9% and *E. floccosum* for 24.5% of the isolates, respectively. From tinea corporis, *T. rubrum* was responsible for 75.2% of the isolates, whereas the next most common isolate, *T. mentagrophytes*, accounted for only 9.4% of isolates.

Onychomycosis in Singapore is caused mainly by dermatophytes, but *Candida* species are more likely to be isolated in fingernail infections, particularly from women. Analysis of finger and toe onychomycosis showed an inverse relationship between *T. rubrum* and *Candida* species, a finding that has also been noted in a recent study in the United States⁵⁾. Similarly, in the United Kingdom, *T. rubrum* and *Candida* species accounted for 39% and 58% of fingernail- and 80% and 1% of toenail-derived isolates, respectively⁶⁾. In finger onychomycosis, *Candida* species have high incidence and *T. rubrum* have relatively low incidence. A study in Singapore in 1992 had showed that

Candida species were the most commonly isolated organism in cases of onychomycosis, particularly from fingernails⁷⁾. Our present study shows that while *Candida* species still remain the most frequently isolated pathogen from fingernail infections, overall, dermatophytes were responsible for the majority of fungal nail infections.

Superficial candidosis tends to present as an intertrigo. This is not surprising, given the hot and humid climate in Singapore. Likewise, pityriasis versicolor remains a common condition in the country, although there is a steady decreasing trend in the number of cases being seen at the centre. This could be because of a real decrease in the prevalence of the disease, or it could be due to the fact that more patients with the condition are self-medicating with over the counter products, or are being treated by their family doctors. The most common type of pityriasis versicolor in Singapore is the hypopigmented form.

In conclusion, these data reiterate the continued predominance of dermatophytes as the principal pathogens in cutaneous fungal infections in Singapore. *T. rubrum* remains the most prevalent pathogen.

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