

## A TEN-YEAR SURVEY OF ONYCHOMYCOSIS IN THE CENTRAL REGION OF THE RIO GRANDE DO SUL, BRAZIL

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### SUMMARY

Onychomycosis is a common infection of the nail plate caused by fungal microorganisms, and represents approximately 50% of nails disorders and 30% of all superficial mycotic infections. We present a study of the frequency, epidemiology and clinical aspects of onychomycosis in the central region of Rio Grande do Sul during the period 1988-1997.

**KEYWORDS:** Onychomycosis; Frequency; Epidemiology; Clinical aspects.

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### INTRODUCTION

Onychomycosis is a common infection of the nail plate caused by fungal microorganisms, and represents approximately 50% of nails disorders<sup>2</sup> and 30% of all superficial mycotic infections<sup>10</sup>. The term onychomycosis traditionally referred to a nondermatophyte infection of the nail, but now some authors used as a general term to encompass any fungal nail infection<sup>15</sup>. The disease is far more common in the toe nail and is usually associated with trauma. The majority of toe nail infections are caused by dermatophytes (*tinea unguium*), specially *Trichophyton rubrum* and *T. mentagrophytes*. However, other molds can infect damaged nails, and a recent survey on onychomycosis revealed that nondermatophyte molds were isolated in 11 to 22%, but without determination whether these fungi were pathogens because direct examination were not available<sup>6</sup> or were doubtful<sup>12</sup>. The majority of finger nail infections are caused by *Candida* species, specially *C. albicans*.

According to extend of involvement and the portion of the nail unit involved in onychomycosis, the infection caused by fungi is classified as: 1) distal subungual onychomycosis (DSO), when the fungus invade the distal nail bed and hyponychium, developing onycholysis and later hyperkeratosis; 2) proximal subungual onychomycosis (PSO), when the fungus invade under the cuticle and infect the proximal nail bed; 3) superficial white onychomycosis (SWO), when the fungus directly invade the nail plate surface, which results in a crumbly nail plate surface; 4) total dystrophic onychomycosis (TDO), when the fungus invade the entire nail plate as the result of any of the clinical forms of onychomycosis, and 5) candidal paronychia and onycholysis<sup>1,16</sup>.

### MATERIAL AND METHODS

During the period 1988-1997 a total of 2,664 cases of superficial mycotic infections were diagnosed in Laboratório de Pesquisas Micológicas-LAPEMI, of the Santa Maria University Hospital, from which 601 (22.5%) of onychomycosis. Nail scrapings were clarified in 30% potassium hydroxide for microscopic examination. From cultural studies the nail scrapings were inoculated on Sabouraud glucose agar with antibiotics (Mycosel, BBL) and Littman oxgall agar (Difco), and then incubated at 25 °C for two weeks. When nondermatophyte fungi were suspected, at least five clinical samplings were collected for confirmatory diagnosis<sup>4</sup>.

### RESULTS

Of the patients 377 (62.7%) were females and 224 (37.2%) males, with a female/male ratio of 1.68/1.0. The age of the patients ranged between seven and 89 years (Table 1); the onset of the lesion ranged between one week and 50 years. Cultures failed to grow in 261 (43.4%), then 340 strains were isolated. *T. rubrum* was the most frequent fungus isolated, and predominate in the toe nail infection; *Candida* species were the second, and predominates in the finger nail infection (Table 2); in 227 (37.7%) patients other site, specially the feet were also infected by the same fungus. Of the 502 patients with onychomycosis caused by filamentous fungi, 491 (97.8%) had the DSO with onycholysis (261/53.1%) or hyperkeratosis (230/46.8%), and 63 (63.6%) of the 99 with onychomycosis caused by yeasts presented with onycholysis (Table 3). The patient with PSO was infected by HIV.

**Table 1**  
Frequency of onychomycosis according to the age

Age	Filamentous	Yeasts	Total
0-09	7 (1.39)	1 (1.01)	8 (1.33)
10-19	28 (5.57)	4 (4.04)	32 (5.32)
20-29	90 (17.9)	16 (16.1)	106 (17.6)
30-39	113 (22.5)	21 (21.2)	134 (22.2)
40-49	99 (19.7)	19 (19.2)	118 (19.6)
50-59	92 (18.3)	22 (22.2)	114 (18.9)
> 60	73 (14.5)	16 (16.1)	89 (14.8)
Total	502 (83.5)	99 (16.4)	601

**Table 2**  
Agents of onychomycosis in Rio Grande do Sul

Filamentous fungi	Toe nails	Finger nails	Both	Total (%)
<b>Dermatophytes = 236 (69.4%)</b>				
<i>T. rubrum</i>	155	8	8	171 (50.3)
<i>T. mentagrophytes</i>	58	1	-	59 (17.3)
<i>E. floccosum</i>	4	-	-	4 (1.1)
<i>T. tonsurans</i>	1	-	-	1 (0.3)
<i>M. canis</i>	1	-	-	1 (0.3)
<b>Nondermatophytes = 5 (1.4%)</b>				
<i>S. brevicaulis</i>	2	-	-	2 (0.6)
<i>Penicillium sp</i>	1	-	-	1 (0.3)
<i>Aspergillus sp</i>	1	-	-	1 (0.3)
<i>A. kiliense</i>	1	-	-	1 (0.3)
<b>Yeasts = 99 (29.1%)</b>				
<i>Candida sp</i>	3	94	1	98 (28.8)
<i>Malassezia sp</i>	-	1	-	1 (0.3)
Total	227 (66.7)	104 (30.6)	9 (2.6)	340

## DISCUSSION

Onychomycosis is a chronic mycotic infection of toe nails and finger nails that affects the quality of life in a significant proportion of the population, with estimates prevalence ranging from 8% to 9% of the total population<sup>1</sup>. Since onychomycosis are particularly difficult and expensive to eradicate, care should be taken to correctly diagnosis the infection. Differential diagnosis include idiopathic onycholysis, bacterial infections, traumatic onychodystrophies, lichen planus, psoriasis, contact dermatitis, pachyonychia congenita and nail bed tumors.

In onychomycosis females were affected more frequently than males. This fact is mainly due to onycholysis and paronychia of the

**Table 3**  
Clinical forms of onychomycosis in Rio Grande do Sul

Fungi	DSO	SWO	TDO	PSO	YO	YP	Total
<i>T. rubrum</i>	167	3	-	1	-	-	171
<i>T. mentagrophytes</i>	57	2	-	-	-	-	59
<i>E. floccosum</i>	4	-	-	-	-	-	4
<i>T. tonsurans</i>	1	-	-	-	-	-	1
<i>M. canis</i>	1	-	-	-	-	-	1
<i>S. brevicaulis</i>	2	-	-	-	-	-	2
<i>A. kiliense</i>	-	1	-	-	-	-	1
<i>Penicillium sp</i>	-	-	1	-	-	-	1
<i>Aspergillus sp</i>	-	-	1	-	-	-	1
<i>Candida sp</i>	-	-	-	-	63	35	98
<i>Malassezia sp</i>	-	-	-	-	-	1	1
Total	232	6	2	1	63	36	340

DSO: distal subungual onychomycosis; SWO: superficial white onychomycosis; TDO: total dystrophic onychomycosis; PSO: proximal subungual onychomycosis; YO: yeast onycholysis; YP: yeast paronychia.

finger nails caused by *Candida* species. However, in our casuistry *tinea unguium* of toe nails was also prevalent in women (56.1%), on contrary that occur in Australia<sup>8</sup> where the infection is prevalent in men (68.4%). Prevalence rates for onychomycosis among children and adults are quite variable: a review of the subject lists prevalence rates varying from 0.0% in Finland; 0.44% in USA to 2.85% in Italy<sup>9</sup>, among children; and from 37.6% in Italy to 60.9% in Spain<sup>14</sup>, among adults over the age of 50 years. Similarly, 28.1% of the patients aged 60 years; 1.1% and 2.9% for those aged 10 to 18 years and 19 to 30 years respectively, were culture positive for onychomycosis<sup>2</sup>. In our casuistry peak prevalence occurs in patients aged 30 to 39 years, with a decreasing occurrence of *tinea unguium* in the elderly patients over the age of 60 years (Table 1).

The most common fungi involved in onychomycosis are the dermatophytes in toe nail infections, and *Candida* species in finger nails infections<sup>3</sup>. Culture is the only method by which the causative fungus can be identified<sup>2</sup>. All dermatophytes should be considered pathogens, and all other filamentous fungi or yeasts isolated need direct examination that indicates the atypical elements associated with nondermatophyte or *Candida*, and the same organism be repeatedly isolated<sup>4</sup>. Recently two new diagnostic techniques were suggested to provide an effective means of differential diagnosis: immunochemistry employing antibodies to certain fungi for identification *in situ*, and flow cytometry which differentiates fungi on the basis of molecular differences<sup>11</sup>. These techniques confirm that the nondermatophyte fungi and yeasts invade nail plate and mixed infections occur, causing implication in the treatment of onychomycosis. However, there is considerable controversy on the significance of nondermatophytes and yeasts (Table 4), and is accept that such nondermatophyte infections may account for between 1.5% and 6% of onychomycosis<sup>3,10,13</sup>.

**Table 4**  
Fungi involved in onychomycosis in a serie of reported cases

Country (ref)	Dermatophytes n° (%)	Nondermatophytes n° (%)	Yeasts n° (%)	Total
Australia (5)	214 (21.7)	119 (12.1)	651 (66.1)	984
Spain (14)	12 (18.7)	11 (17.1)	41 (64.1)	64
Italy (9)	394 (23.2)	299 (17.6)	1002 (59.1)	1695
USA (6)	303 (81.9)	41 (11.1)*	26 (7.0)	370
Brazil	236 (69.4)	5 (1.47)	99 (29.1)	340

\* Data without confirmatory results by direct examination.

Our data has confirmed previous observation that during past decades there has been an increase in the incidence of onychomycosis<sup>5,7</sup>, primarily distal and lateral subungual dermatophytosis of toe nails (Table 5). Many hypothesis have been made regarding predisposing causes for onychomycosis, such growing elderly population, immunosuppressives and other drugs, spread of HIV infection, impaired immune system that makes some people predisposed to the infection and more difficult to treat<sup>1</sup>. However, is important to emphasize the concomitant increase in incidence of *tinea pedis* due to increased wearing of nonporous athletic shoes that induce softening and maceration of intertriginous and plantar skin, as well as the nail plate surface. The use of occlusive footwear particularly by young people involved in vigorous physical activities seems to be the most important predisposing cause for *tinea pedis*. On the other hand, recurrence of *tinea pedis* due to incomplete eradication, when the patient stop applying topical therapy because their symptoms are alleviated, and the persistence of infecting elements in the skin of the feet, socks and shoes, makes *tinea pedis* the underlying condition for the appearing of *tinea unguium*. This hypothesis is corroborated by the fact that in our casuistry peak prevalence of *tinea pedis* occur in patients aged 20 to 29 years, while *tinea unguium* of toe nails in patients aged 30 to 39 years (Table 5).

**Table 5**  
Increase in incidence of onychomycosis in the central region of the Rio Grande do Sul

Period (ref)	Tinea total n°	Tinea pedis n° (%)	Tinea unguium n° (%)
1960-1969 (7)	885	143 (16.1)	41 (4.63)
1970-1979 (7)	2862	1108 (38.7)	187 (6.53)
1980-1987 (7)	2855	1272 (44.5)	236 (8.26)
1988-1997 (pr)	1991	909 (45.6)	497 (24.9)

## RESUMO

### Um estudo de 10 anos sobre onicomicoses na região central do Rio Grande do Sul, Brasil

Onicomicoses são infecções comuns da lâmina ungueal causadas por fungos filamentosos e leveduras, que representam aproximadamente

50% das alterações das unhas e 30% de todas as infecções fúngicas superficiais. Apresentamos um estudo sobre a frequência, epidemiologia e aspectos clínicos das onicomicoses na região central do Rio Grande do Sul durante o período 1988-1997.

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