

A STUDY OF ONYCHOMYCOSIS IN TEHRAN

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ABSTRACT

The main purpose of this original investigation is to report the results of the study on the frequency and type of the fungi that cause onychomycosis in Tehran.

In a mycological study of patients with onychopathy during a period of 18 months, mycotic infection of the nail plate in 268 cases out of 927 examined persons were noticed. The causative agents were candida (66.04%), dermatophytes (32.1%), and mold (1.86%).

Candida onychomycosis was more common in women than men. The most frequently occurring species was *C. albicans* (66.6%). *T. unguium* was predominant in the males and *T. rubrum* was the most frequently isolated fungus being present in 50% isolates. Nondermatophytic onychomycosis was seen in toe nails in all cases. The etiologic agents were *Aspergillus* 4 and *penicillium* species 1.

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INTRODUCTION

Onychomycosis is a fungal infection of nails.¹ The three groups of fungi involved in onychomycosis are dermatophytes, molds, and yeasts.²

When fingernails are infected, the causative fungi are dermatophytes and yeasts, but in case of toenail infections dermatophytes and yeasts as well as molds may be isolated.¹ The clinical appearance of

onychomycosis caused by one species of fungus is indistinguishable from that caused by any other species.³ Classically, four types of onychomycosis have been described: distal subungual onychomycosis, white superficial onychomycosis, proximal subungual onychomycosis, and candida onychomycosis.³

A diagnosis of onychomycosis can not be made on clinical bases alone and also requires both microscopic and cultural evidence.¹

Table I. Frequency distribution of candida onychomycosis in relation to sex and age in 177 patients (Tehran 1988).

Sex \ Age group		0-5	6-11	12-17	18-23	24-29	30-35	36-41	up 42	Total
Female	Number	27	7	3	10	26	17	14	24	128
	Percent	21.09	5.49	2.34	7.81	20.31	13.28	10.93	18.75	100
Male	Number	33	6	2	1	2	1	1	3	49
	Percent	67.35	12.24	4.08	2.04	4.08	2.04	2.04	6.13	100
Total	Number	60	13	5	11	28	18	15	27	177
	Percent	33.90	7.35	2.82	6.22	15.82	10.17	8.47	15.25	100

Table II. Frequency distribution of infected fingernails in relation to occupation.

Fingernail occupation		Thumb	Index fingernail	Middle fingernail	Ring fingernail	Little fingernail	Total
Children	Number	58	10	12	4	3	87
	Percent	20.56	3.55	4.25	1.42	1.06	30.84
Housewife	Number	49	24	26	18	9	126
	Percent	17.38	8.52	9.22	6.38	3.20	44.70
Staff	Number	13	5	5	5	1	29
	Percent	4.61	1.78	1.78	1.78	0.35	10.30
Medical group	Number	3	1	3	1	-	8
	Percent	1.06	0.35	1.06	0.35	-	2.82
Miscella neous	Number	14	5	6	4	3	32
	Percent	4.96	1.78	2.12	1.42	1.06	11.34
Total	Number	137	45	52	32	16	282
	Percent	48.57	15.98	18.43	11.35	5.67	100

MATERIALS AND METHODS

From January 1987, to June 1988 (18 months), 927 patients with nail lesions resembling fungi infection were referred to the Department of Medical Mycology, School of Public Health, Tehran University of Medical Sciences. Nail scrapings were examined by direct smears in 10% KOH, and cultured on Sabouraud's dextrose agar and Sabouraud's dextrose agar with cycloheximide and chloramphenicol and incubated at room temperature. Cultures were identified by different techniques, including slide culture for dermatophytes and the molds; corn-meal agar, urease test and hair penetration test to differentiate *Trichophyton mentagrophytes* from *Trichophyton rubrum*; and the corn-meal agar and API 20 c system were used for yeast identification.

Table III. Number of infected fingernails.

One fingernail		2-3 fingernails		4 or more fingernails	
Number	Percent	Number	Percent	Number	Percent
97	55.42	57	32.57	21	12

RESULTS

268 patients with onychomycosis were studied in this observation. In 177 cases (66.04%) the causative organism was yeast, in 86 cases (32.1%) dermatophytes, and in 51 (1.86%) molds.

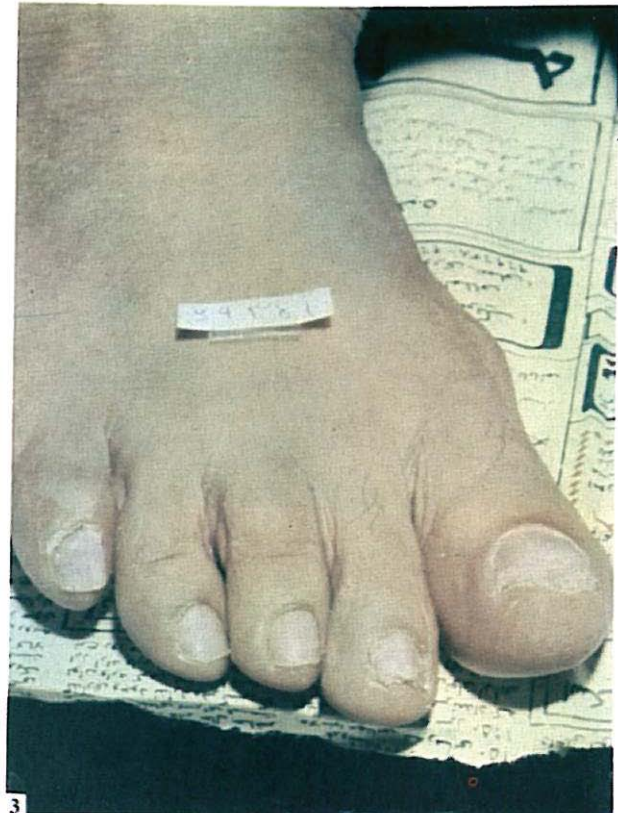
Candida Onychomycosis

Details of the age and sex of the patients are shown in Table I. The youngest patient who was one month old, was born to a mother with candida vaginitis.

Candidiasis of the fingernails in 172 (97.17%), toenails in 2 (1.13%) and combination of both sites (fingernails and toenails) in 3 (1.7%) patients were seen. Fingernails were affected with fungal paronychia in 111 patients (62.7%). The thumb showed a much higher frequency than expected and housewives and children were mostly affected (Table II). The number of fingernails infected are shown in Table III.

The predisposing factors which were seen included fingersucking, diabetes mellitus and candida vaginitis. Out of 60 children in the 0-5 year age group 18 cases had the habit of finger sucking. In adults diabetes mellitus was seen in three patients under drug therapy. In eight patients candida onychomycosis coexisted with candida vaginitis.

Out of 177 positive cases, 66 (37.3%) were positive



Figures 1,2, and 3. *Tinea corporis* and *T. unguium* in a patient on corticosteroid and immunosuppressive therapy.

by the direct KOH preparation. 17 (9.6%) by culture, and 94 (53.1%) by both methods.

The most frequently occurring species was *Candida albicans* being present in 74 (66.6%) of isolates, followed by *C. parapsilosis* in 10 (9%), *C. tropicalis* in eight (7.2%), *C. guilliermondii* in four (2.2%), *C. stellatoidea* in two (1.8%), *C. paratropicalis* in two (1.8%), *C. famata* in one (0.9%), *Geotrichum* in one (0.9%), *C. species* in one (0.9%), and undifferentiable yeast in eight (7.2%).

Tinea unguium

Out of 86 patients with *Tinea unguium*, 48 (55.8%) were male and 38 (44.2%) were female. The age and sex of the patients are shown in Table IV.

Toenails in 51 cases, fingernails in 32 cases, and a combination of both sites were seen in three cases. The big toenail had a much higher rate of infection than expected (Table V and VI).

The clinical type of the lesion in all the patients was invasive form (distal subungual onychomycosis). Nails alone were affected in 57 cases and it was associated with *Tinea pedis* in 21, *Tinea manuum* in three, *Tinea corporis* in two, both *Tinea pedis* and *Tinea cruris* in



Figures 4,5, and 6. Extensive *Tinea corporis* and *T. unguium* in a recipient of a kidney transplant.

two, *Tinea capitis* in one, *Tinea cruris* in one, and *Tinea versicolor* in one.

Extensive *Tinea corporis* was observed in two patients with both diabetes mellitus and asthma (on corticosteroid therapy) (Figures 1,2, and 3); also in a

renal transplant recipient (on corticosteroids and the immunosuppressive drug "Imuran") (Figures 4,5, and 6), by *violaceum* and *T. rubrum*.

In four families (a mother and a daughter, two brothers, a mother and a baby, a mother and a son) and

Table IV. Frequency distribution of *Tinea unguium* in relation to sex and age.

Sex \ age group		0-9	10-19	20-29	30-39	40-49	50-59	up 60	Total
Male	Number	2	3	12	10	8	7	8	50
	Percent	2.33	3.49	13.96	11.62	9.3	8.15	9.3	58.15
Female	Number	2	5	7	6	9	5	2	36
	Percent	2.33	5.81	8.14	6.97	10.46	5.81	2.33	41.85
Total	Number	4	8	19	16	17	12	10	86
	Percent	4.66	9.3	22.1	18.59	19.76	13.96	11.63	100



Figure 7. Toenails infected by *Aspergillus ochraceus*. White spotted discoloration is evident.

in one married couple, *Tinea unguium* with another dermatophytosis were noted. Out of 86 positive cases, 64 (74.4%) were positive by direct KOH preparation, two (2.4%) by culture, and 20 (23.2%) by both methods. The frequency of dermatophytes isolated was as follows:

T. rubrum 11 (50%), *T. mentagrophytes* eight (36.3%), *T. violaceum* two (9.2%), and *E. floccosum* 1 (4.5%).

Nondermatophytic Onychomycosis

In five cases onychomycosis was induced by molds, in four of which great toenail and in one patient middle toenail was affected. The age, and sex of the patients in relation to the infected nail is shown in Table VII.

In all patients there were white patches on the surface of the nailplate (Figure 7). The mold was

identified by direct KOH preparation (Figure 8) and culture in all cases. The etiologic agents were *Aspergillus flavus* (2), *A. fumigatus* (1), *A. ochraceus* (1), and *Penicillium* species (1).

DISCUSSION

Onychomycosis was considered to be a very rare disease in the past. However, it has been now stated to constitute 15% of all nail disturbances.⁴ In the present study, mycotic infection of nails was observed in 268 cases (28.9%) out of 927 persons examined. The frequency of the infection is similar to those reported by Kubec.⁵ In positive cases, 66.04% were caused by candida, 32.1% by dermatophytes, and 1.86% by

Table V. Frequency distribution of infected fingernails in relation to type of finger in different sexes.

Nail Sex	Hand					Total
	Thumb	Index	Middle	Ring	Little	
Male	13	5	8	9	6	41
Female	10	8	8	11	5	42
Total	23	13	16	20	11	83

Table VI. Frequency distribution of infected toenails in relation to type of finger in different sexes.

Nail Sex	Foot					Total
	Big toe	Second toe	Middle	Fourth toe	Little toe	
Male	29	10	8	10	10	67
Female	20	3	5	4	6	38
Total	49	13	13	14	16	105



Figure 8. Direct microscopy of nail fragments Prepared in potassium hydroxide solution (X 400).

molds, and these percentages are similar to those reported by Achten and Wanet-Rouard.⁶As it is apparent in this study, candida infection of the nailplate is more common in women than men. In relation to age it occurs most frequently at the age group of 0-5 (in both sexes) and at the age group 24-29 years in women. The paronychia fold is readily colonized, particularly in people whose occupation requires frequent immersion of finger in water.⁷

In chronic paronychia the nail beomes invaded and only the nail may be effected. In order of frequency the thumb and the middle fingernails showed a much higher incidence than expected. These results agree with Ganor and Pumpianski's studies.⁸ In most cases involvement of only one fingernail (55.4%) was observed. Mechanical trauma which destroys the cuticle of finger is responsible for the invasion of *C. albicans* into the nailfold.⁸ In housewives the higher frequency of candida infection of the nail may be due to

continued immersion of fingers in water and mechanical trauma, and in children may result from a habit of finger sucking. Theoretically, the source of *C. albicans* in the finger infection could be the vagina, mouth, or bowel.⁸ Eight patients showed candida onychomycosis associated with vaginitis. *C. albicans* is rarely found in the vagina of patients with chronic paronychia. Therefore, this site seems to have a minor epidemiological significance.⁸ The incidence of dermatophytosis or yeast infection is not significantly higher in diabetics than in normal subjects.⁹ However, the association of onychomycosis with diabetes mellitus needs further study. The two species most frequently involved in the infection of the nails and considered to be potential pathogens, are *Candida albicans* and *Candida parapsilosis*; although in this study *C. albicans* was the predominant agent isolated.

The frequency of *Tinea unguium* which was predominant in males was similar to that reported from India¹⁰. It was most frequent in the toenails especially in big toenail in both sexes. Ringworm infection of the toenails is an exceedingly common disease condition in races accustomed to wearing shoes, and the disease has been attributed to the constant pressure applied on the toes, particularly the great toenail, caused by tight footwear.⁴

The majority of *Tinea unguium* infections were seen at the second to fourth decades and only four cases were seen below 10 years. The rarity of *Tinea unguium* in children in comparison to adults is explained by a faster dynamic growth of nails in children than adults.¹⁰ In 30 cases, *Tinea unguium* was associated with *Tinea pedis*,

Table VII. Distribution of nondermatophytic onychomycosis in relation to age, sex, and the infected nail in five cases.

Patient	Age	Sex*	Toenail involved	Left	Right
1	24	M	Middle	+	-
2	43	F	Great	+	-
3	30	F	Great	+	-
4	52	F	Great	-	+
5	56	F	Great	+	-

* M = Male
* F = Female

mamuum, cruris, corporis, and Tinea capitis. These findings agree with that of Kamalam and Tambiah.¹⁰

Extensive skin involvement in two patients with diabetes and asthma (on corticosteroid therapy) and in a renal graft recipient (on corticosteroid and immunosuppressive therapy) by *T. violaceum* and *T. rubrum*, suggests that the agents may behave opportunistically under conditions of suppressed immune response. Disseminated ringworm infections by *T. violaceum* in two familial cases associated with a deficiency of cellular immune response and a case of multiple, subcutaneous, neutrophilic abscesses due to *T. rubrum* in an immunosuppressed renal allograft recipient were reported by Osman et.al. and Novick et. al.^{11,12} Four familial cases of dermatophytosis were observed which probably were transmitted by direct personal contact.

It is recognized that culture of dermatophytes from nails is difficult.¹³ We also failed to culture 66 of 86 microscopically positive nails. Our results are similar to those reported by Walshe and English, and by Ardehali.^{14,15} In contrast to the report by Ardehali, the most frequent fungal isolates in this survey were *T. rubrum* and *T. mentagrophytes*. Ardehali believed that the most common dermatophytes causing *T. unguium* in Iran, was *T. schoenleinii*.¹⁵ As with dermatophyte infection, mould infections are much more common in toenails than in fingernails.² According to this study, in all the cases toenails were affected. In most cases the big toenail of females (four cases) were involved. The most common mold isolated was *Aspergillus* species. A case of onychomycosis caused by *A. fumigatus* is reported by Rosenthal et.al.¹⁶ and four cases of onychomycosis caused by *A. terreus* are presented by Obsberg et.al.¹⁷

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REFERENCES

1. Onsberg P, Stahl D, Veien NK: Onychomycosis caused by *Aspergillus terreus*. Sabouraudia 16: 39-49, 1978.
2. English MP: Nails and fungi. Br J Dermatol 94: 697-701, 1976.
3. Zaiaz N: Onychomycosis. Arch Dermatol 105: 263-75, 1972.
4. Ramesh V, Reddy BSN, Singh R: Onychomycosis (Review). Int J Dermatol 22(3): 148-52, 1983.
5. Kubeck K: Epidemiology of mycotic flora in the nail plate. Cesk. Dermatol 53 (5): 332-5, 1978.
6. Achten G, Wanet Rouard J: Onychomycosis in the laboratory. Mykosen (1): 125-7, 1978.
7. Rippon JW: *Tinea unguium*. In: Medical Mycology, the Pathogenic Fungi and the Pathogenic Actinomycetes. Philadelphia: W.B. Saunders, 190-3, 1982.
8. Ganor S, Pumpianski R: Chronic *Candida albicans* paronychia in adult Israeli women. Br Dermatol 90:77-83, 1974.
9. Fusaro RM, Goetz FC: Common cutaneous manifestations and problem of diabetes mellitus. Post Grad Med 49: 84-7, 1971.
10. Kamalam A, Thambiah AS: A study of 3891 cases of mycoses in the Tropics. Sabouraudia 14: 129-48, 1976.
11. Osman AB, Chaffai M, Ayed K, Khalfat A: Dermatophytic disseminace a *Trichophyton violaceum*. A propos D deux cas familiaux. Bulletin De LA Société Française De Mycologie Medicale XIV 2:281-4, 1985.
12. Novick NY, Tapia L, Bottone EJ: Invasive *Trichophyton rubrum* infection in an immunocompromised host. Case report and review of the literature. Am J Med 82(2): 321-5, 1987.
13. Gentles JC: Laboratory investigations of dermatophyte infections of nails. Sabouraudia 9:149-52, 1971.
14. Walshe MM, English MP: Fungi in nails. Br J Dermatol 78:198-207, 1966.
15. Ardehali M: Dermatophytic agents of *Tinea unguium* in Iran. Int J Dermatol 21(5): 322-3, 1973.
16. Rosenthal SA, Stritzler R, Villafane J: Onychomycosis caused by *Aspergillus fumigatus*. Report of a case. Arch Dermatol 97:685-7, 1968.
17. Onsberg P, Stahl D, Veien NK: Onychomycosis caused by *Aspergillus terreus*. Sabouraudia 16:39-46, 1978.