

## Onychomycosis: Rationalization of Topical Treatment

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**Key words:** onychomycosis, toenails, treatment

### Abstract

**Background:** Fungal infection of the nail affects millions of people worldwide and has an estimated prevalence of more than 10% of the general population.

**Objectives:** To determinate the prevalence of fungal infection in toenails, in order to decide the treatment policy for onychomycosis.

**Methods:** We evaluated 331 patients with suspected clinical toenail onychomycosis affecting at least two toenails. Mycological examination of the affected nails was performed; both the KOH test and fungal culture were used.

**Results:** Of 331 patients with suspected clinical toenail onychomycosis, 78.2% of the patients had at least three infected nails. The first toenail was the most affected. *Trichophyton rubrum* was by far the most common dermatophyte cultured from all samples.

**Conclusions:** Most of the patients had at least three affected toenails. Topical treatment is not effective or practical, and systemic treatment should therefore be considered.

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Fungal infection of the nail affects millions of people worldwide; it has an estimated prevalence of more than 10% of the general population in Western countries and affects approximately 40% of elderly patients [1-3]. The aim of this study was to determinate the prevalence of fungal infection in toenails, in order to help the physician to decide the treatment policy in onychomycosis.

### Patients and Methods

During 2006, 331 patients with suspected clinical toenail onychomycosis affecting at least two toenails underwent mycological examination of the affected nails by both KOH (potassium hydroxide) test and fungal culture. Nail samples obtained from each site were divided into two; one was used for direct KOH examination and the second for fungal culture using Sabouraud's dextrose agar (Novamed, Jerusalem, Israel), which contains chloramphenicol or streptomycin and penicillin to prevent contamination. Identification of the fungus is done on the basis of morphological characteristics of the different fungi. Contamination was ruled out using the criteria suggested by English in 1976 when dermatophyte, considered to be the likely pathogen,

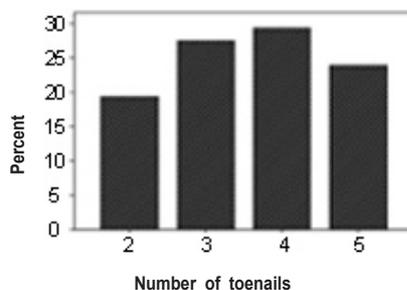
was isolated. In cases of moulds and yeasts, confirmation of diagnosis was based on the presence of mycelia, arthrospores or yeast cells on direct microscopic examination. Final confirmation of moulds infection requires isolation of the mould in large number in the culture.

### Statistical analysis

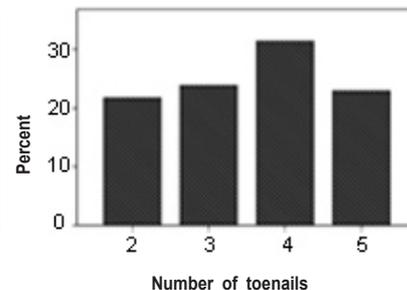
*t*-tests were used for comparison of means of the continuous variables (e.g., age, duration of fungal infection, number of involved toenails, etc). To assess the distribution of categorical parameters (e.g., gender, microscopy results, etc.) chi-square tests were used. Coded data were analyzed using SPSS (Chicago, IL) for Windows software, Version 12.

### Results

A total of 331 patients – 175 (52.9%) males and 156 (47.1%) females – between age 25 and 68 (mean 44.4 years) were examined. There were no statistically significant differences between the patients' gender and the duration of the fungal disease. There were also no differences between the number of clinically involved toenails and the patient's gender. The duration of the fungal infection ranged from 4 to 40 years with a mean duration of 16.7 years. The percentages of involved left and right toenail are given in Figures 1 and 2 respectively; 78.2% of the patients had at least three infected nails. The first toenail was the most affected, 80% from the left foot and 69.7% from the right foot. Second, third and fourth toenails showed similar involvement (about 50%), while the fifth toenail was the least affected. The microscopy analyses results for each toenail are summarized in Table 1. *Trichophyton rubrum* was by far the most common dermatophyte cultured from all samples.



**Figure 1.** Percentage of involved left leg toenails.



**Figure 2.** Percentage of involved right leg toenails.

**Table 1.** Summary of the toenails microscopic analyses

Toe #	#1L	#1R	#2L	#2R	#3L	#3R	#4L	#4R	#5L	#5R
No. (+)	221	200	116	109	123	92	108	111	88	101
(%) (+)	80.1	69.7	56.9	54.8	53.2	43	53.7	52.6	31.9	36.7
Total tested	276	287	204	199	232	214	201	211	276	275

+ = positive KOH test; L = left, R = right.

## Discussion

Onychomycosis is a common disease accounting for up to 50% of all nail disorders [1-3]. Obtaining confirmation of fungal infection prior to initiation of antifungal treatment is accepted as the gold standard in clinical practice since systemic antifungal agents have potential serious side effects; moreover, the treatment is expensive and in addition there is the medico-legal aspect [4].

In our study two nails were involved in only 22% of the patients, the remaining 78% of the study patients had at least three affected toenails and 31.4% had four affected nails.

Topical agents have generally been perceived as ineffective, mainly because of poor penetration into the nail [5-7]. Hay et al. [6] reported a 22% complete cure rate in patients using tioconazole nail solution twice daily for 12 months. Usually topical treatment is recommended to patients who suffer from onychomycosis affecting only a few nails and especially in cases whose disease duration is shorter and who have minimal fungal involvement of the distal part of the nail. Despite its low cure rate, it can be used as a treatment option for those patients who would not or cannot tolerate oral therapy. Systemic antifungal drugs are very effective, but they also increase the risk of side effects [8,9].

As we have showed in our study most of the patients had at least three affected toenails; therefore, topical treatment is not effective or practical and systemic treatment should be

considered. Factors that influence the choice of therapy include the presentation and severity of the disease, the patient's current medications, previous therapies for onychomycosis and their effectiveness, and physician and patient preference.

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