

## Prevalence of Onychomycosis in Iceland: A Population-based Study

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Sir,

Onychomycosis is a common disease that is curable in a high proportion of cases (1). A British study has shown a prevalence of 3% (2) and a Finnish study an even a higher prevalence of 8% (3). Studies on selected populations have shown a higher prevalence in the elderly (2), in psoriatics (4), diabetics (5), swimmers (6) and immunocompromised patients (7).

Accurate assessment of the prevalence of onychomycosis is necessary if we are to estimate the size of the therapeutic problem and the extent to which it is treated. It is likely that a better understanding of the epidemiology and risk factors of this disease could lead to better preventive measures and therefore reduce both cost and morbidity.

Although the prevalence of onychomycosis has been studied previously, there are no mycologically controlled population-based studies in which the study subjects were selected randomly from a whole nation as in the present study.

### MATERIALS AND METHODS

Detailed questionnaires about signs and symptoms of onychomycosis were sent to 3992 persons  $\geq 16$  years randomly selected from the National Registry of Iceland, which includes information about all living Icelanders. Photographic examples of nails infected with dermatophytes, normal nails and other nail diseases were included in the Letter. The respondents were asked to compare these with their own nails. Included in the questionnaire were questions about nail status, duration and localization of nail disease, previous treatment and the patients' opinion on where the infection might have been contracted.

At the time of the study, there were 229,263 persons  $\geq 16$  years in the National Registry, so 1.74% of the Icelandic population  $\geq 16$  years were included in the study.

Persons reporting suspected nail changes were offered a clinical examination with mycological sampling. Direct examination of specimens was performed after nail scrapings had been immersed in 5% KOH solution containing dimethyl sulfoxide and chlorazol black E. Specimens were inoculated on Sabouraud's glucose agar containing chloramphenicol 0.05 g/l and on Mycobiotic agar. Plates were incubated at 30°C for 3 weeks and examined at weekly intervals.

### RESULTS

Of the 3992 subjects, 2486 (62.3%) responded to the questionnaire; this included 1117/1964 (56.9%) males and 1369/2028 (67.5%) females. When directly asked, 326/1817 (17.9%) believed they had, or previously had had onychomycosis. By studying the accompanying

photographs, 195 males (17.5%) and 187 females (13.7%) identified themselves as having onychomycotic nails (Table I). The prevalence of suspected onychomycosis for 10-year age intervals was calculated and the results can be seen plotted in Fig. 1.

165/373 (44%) respondents with the suspected diagnosis of toenail onychomycosis were examined with microscopy and culture. Of these samples, 90/165 (54.5%) were culture positive for a dermatophyte and 119/165 (72.1%) were either culture positive or had positive microscopy (positive mycology). The estimated prevalence of positive mycology in the Icelandic population is therefore 11.1% or 8.4% if only patients with a positive growth of a dermatophyte are considered.

During the 10 years prior to the study, on average 12.3 patients were infected per year, giving a yearly incidence of 0.49%. As can be expected, the mean duration of disease was highest in the higher age groups. In respondents  $\geq 60$  years of age, the mean duration of disease was over 20 years. Of 326 respondents asked where they considered they had contracted the infection, 166 (50.9%) implicated a

Table I. Prevalence of onychomycosis, based on patient's evaluation of photographs. (n = 2484, 1117 males, 1367 females)

Location	Males n (%)	Females n (%)	Both n (%)
Fingernails	10 (0.9)	13 (1.0)	23 (0.9)
Toenails	192 (17.2)	181 (13.2)	373 (15)
Both	7 (0.6)	7 (0.5)	14 (0.6)
Either	195 (17.5)	187 (13.7)	382 (15.4)

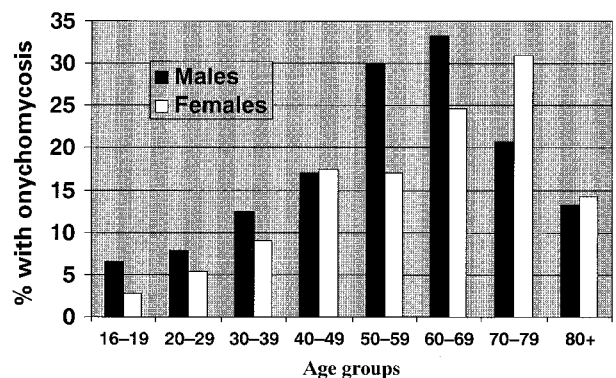


Fig. 1. Age distribution of subjects with suspected onychomycosis.

Table II. *Diagnoses made by physician in 231 subjects who considered they had nail disease*

Diagnosis	Number	%
Psoriasis	15	6.5
Eczema	19	8.2
Onychomycosis	150	64.9
Trauma	30	13
Bacterial infection	10	4.3
Other	7	3
Total	231	100

public swimming pool; other locations named were the workplace (11%), the home (8.3%) and the gym (7.7%).

When asked about nail changes in general, 836/2348 (35.6%) stated they had nail changes or a history of nail changes. There was no difference between males and females. Of these subjects, 98/793 (12.4%) had seen a dermatologist (missing data from 43 individuals), 164/783 (20.9%) had seen a GP (missing data from 53 individuals) and 231/836 (27.6%) had seen a physician (any physician). The physicians' diagnoses are given in Table II. These nail changes were mainly located in the toenails (62%), and were commoner in males. The average number of affected nails was 5.5 in the fingernails and 4.5 in the toenails.

When asked about oral treatment, 812/902 (90%) of the males and 1135/1180 (96.2%) of the females wanted to have such treatment for onychomycosis if available, safe and effective.

## DISCUSSION

Many studies on the epidemiology of onychomycosis are descriptive and have examined the samples of nail specimens sent to a mycological laboratory or patients attending an outpatient clinic. These studies have used positive microscopy and culture as a definition for onychomycosis but are not representative of the general population. There have been a few true cross-sectional studies. Examining 9332 people in the UK aged  $\geq 16$  years, Roberts (2) used photographs to identify subjects with onychomycosis and found a prevalence of 2.73% and an incidence of 0.48%. In Spain, Sais et al. (8) interviewed 10,007 people  $> 15$  years by telephone and found a prevalence of 2.6%. The HANES-1 study in the USA studied the prevalence of dermatological diseases in 20,749 individuals and found a prevalence of nail mycosis of 2.2%. In a Finnish study (3), Heikkilä & Stubb found a prevalence of 8.4%. The subjects were examined by a dermatologist and samples taken; however, the subject selection was not random.

The present study is population-based and the subjects are randomly selected from a whole nation, but the response rate is quite low (62.3%). This is a common problem with mailed questionnaire studies. We interviewed 50 non-responding participants by

telephone and did not find the frequency of onychomycosis based on photographs to be different in this group. We therefore believe that our study is representative of the Icelandic population. Alas, we were only able to examine about half of the patients with suspected onychomycosis. The respondents who were unavailable for examination lived mainly outside Reykjavik.

There are other difficulties when a prevalence of onychomycosis is being evaluated. Clinical judgment, or using photographs, is not sufficient alone. In a recent study on the efficacy of antifungal agents, 843 patients with the diagnosis of clinical onychomycosis were screened, but only 580 (69%) were found to have a positive culture (9). It is likely that some of these patients did not have onychomycosis and that in others the fungus simply failed to grow. This has clearly been demonstrated when patients with mycologically proven onychomycosis are resampled. Thus, on resampling, if nail clippings were used only 61% were positive, but if clippings were combined with curetting 89% were positive (10). Using only mycology to determine prevalence is therefore likely to give an underestimation of the prevalence of onychomycosis. In this study we used both methods. Based on the respondents' evaluations of photographs the prevalence was high, or 15.4% (Table I). When mycological samples were taken, the prevalence dropped to 8.4%. The true prevalence in Iceland is probably somewhere in between, which is then unusually high but similar to the Finnish study discussed previously. We can only speculate on the reasons for this high prevalence. Swimming is a very popular folk sport. We have already demonstrated that the prevalence of onychomycosis is higher in swimmers (6) and samples from the dressing rooms in a large Icelandic swimming pool show a high degree of contamination, particularly in men's dressing rooms (11). Also, a recent study has shown that dermatophytes can be isolated from healthy volunteers after visiting public baths (12). Another study found that 63.6% of the swimming class students were carriers (13). Other explanations could be the use of occlusive footwear, which is common due to cold climate and long winters. Genetic susceptibility is another possible explanation. The Icelandic population has been very isolated through the centuries and genetic homogeneity is believed to be high. Some authors believe that genetics plays a very important role in the susceptibility for a fungal infection of the feet (14).

Nail changes in general were common. In their study; 35.6% of the population had or gave a history of nail changes. This may seem a high figure, but a similar figure was found in healthy controls (15). Given that effective treatment for onychomycosis is available, and that over 90% of patients with nail problems want treatment, it is striking that only 18% of these patients

received oral treatment. It is of interest that patients diagnosed with onychomycosis were only offered oral treatment in 50% of the cases.

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## Leishmaniasis of the Lip

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Sir,

Leishmaniasis of the lips occurs mainly in young subjects (1–6). It is characterized clinically by the slow and progressive enlargement of one or both lips: macrocheilia is the final appearance (1–3, 5, 7). A nodule often present within the swelling undergoes an ulceration which may be covered by a crust (1, 2, 4–6). Bacterial superinfection is possible (5). The consistency of the entire lesion is parenchymatous-hard (2, 7). The swelling is often painful (4, 5). Patients with leishmaniasis of the lips are in good general health (1–3, 6); in particular, regional lymph nodes are never involved (1, 5–7). We present a rare case of cutaneous leishmaniasis on the lower lip in an Italian patient.

#### CASE REPORT

A 71-year-old man was admitted to our Institute because of swelling of the lower lip. The patient stated that he was in good general health and that he was not taking any medication. He also stated that the swelling had appeared approximately one year previously and that it had slowly enlarged to the current morphology and size. Two biopsies had previously been carried out at other hospitals, and in both cases a histopathological diagnosis of macrocheilitis was made. The patient was not treated.

Dermatological examination showed the presence of a swelling that involved the entire lower lip. The surface