# Etiology Of Onychomycosis In Elderly Patients

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**Citation**

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**Abstract**

**BACKGROUND**: In the world, cases of onychomycosis have increased, reaching 50% of all nail diseases. Although onychomycosis is a studied disease, the etiology of this disease in elderly patients has been poorly understood.

**OBJECTIVES**: The purpose of this study was to identify etiological agents responsible for onychomycosis in elderly patients and possible predisposing factors.

**METHODS**: n this study, 42 patients were diagnosed based on the clinical characteristics presented by the hosts, to the visualization in the sample of hyphae or yeasts in the direct microscopic examination and in the isolation of the causative agent via the culture in mycosel medium.

**RESULTS AND CONCLUSION**: In this study, 42 patients were diagnosed with signs and symptoms compatible with fungal infection. Direct examination using 15% KOH revealed that 86% of the population studied had an onychomycosis while the culture showed that 52% of these were related to non-dermatophyte molds, 24% to yeasts and 24% to dermatophytes; Trichophyton rubrum (14.71%) was the most frequent etiologic agent. Hypertension was the most frequent clinical characteristic related to mycosis, followed by diabetes and HIV.

## INTRODUCTION:

Mycoses are a group of infections produced by multicellular (mycelial) or unicellular (yeast) fungi, constituting the natural microbiota of the skin, with a wide distribution in the environment [1]. Among these, onychomycosis are superficial mycosis produced by different groups of pathogenic fungi for man (dermatophytes, yeasts, non-dermatophyte molds), which invade the nails [2]. Commonly caused by dermatophytes, onychomycosis has been not only one of the most abundant superficial mycoses, but also the frequent of all nail diseases, representing 50% of those. Previous studies showed that age, diabetes, immunosuppression are predisposing factors fungal infection [3][4], [5].

However, preventing these infections could be a powerful weapon to avoid spread and the generation of resistant strains; hence the need to make a presumptive diagnosis (differentiate the lesions to those that may cause some other disease or microorganism), differential (to show the possible related predisposition) and precise etiological in order to apply the specific therapy.

However, controlling the root of this disease could facilitate the appropriate allocation of treatments [6], [7] . The objective of this study was to determine the predisposing factors and identify the possible etiological agents of onychomycosis in elderly patients in Monterrey and Apodaca.

## METHODOLOGY:

The design of the study was observational and descriptive. The database for this study was constituted from the clinical records (Annex 1) of all patients with nail disorders (clinical cases), in the municipalities of Monterrey and Apodaca, Nuevo León, Mexico. he study was carried out in the Department of Microbiology of the Autonomous University of Nuevo León.

## DIAGNOSIS

The diagnosis was made based on the clinical characteristics of the guests (age, sex, concurrent disease, clinical type), to the visualization in the sample of hyphae or yeasts in the direct microscopic examination and in the isolation of the causal agent in the cultures.

1. Sampling

Sampling was done for convenience in patients presenting signs and symptoms compatible with fungal infection (thick and powdery nails, yellow color (image)), passing through a disinfection stage of the injured area, to reduce potential contamination of microorganisms that constitute the natural microflora of the skin and the environment. The purpose of the study was explained to the subjects and those who agreed to participate were given a signed consent form.

### Image 1

Clinical cases of total subungual onychomycosis (a, c, e), total subungual with onychogriphosis (b), distal subungual (d) and chronic total subungual (f).


2. Direct examination / direct diagnostic

The direct diagnosis was made with 15% KOH. Then, the suspect material was placed between a slide and covered object with 15% potassium hydroxide, for later visualization under a microscope, 5 to 10 minutes after exposure.

3. Diagnosis of certainty and identification of etiological agents

The cultures were used in mycosel agar, under environmental condition (28 ° C). Nail fragments were placed directly on the surface of the sterile medium. The incubation time depended on the etiological agent responsible for the infection, it was estimated at a time relatively between 7 to 30 days.

For the identification of the etiological agents, we rely on the macroscopic characteristics (color of the colony, appearance, color of the pigment formed) and microscopic (shape, arrangement, size, types of conidia formed) of each agent.

4. Statistics

The graphs were made in Excel 16.0® software, so quantitative data were used, and the frequencies were represented as a percentage.

## RESULTS:

### Table 1

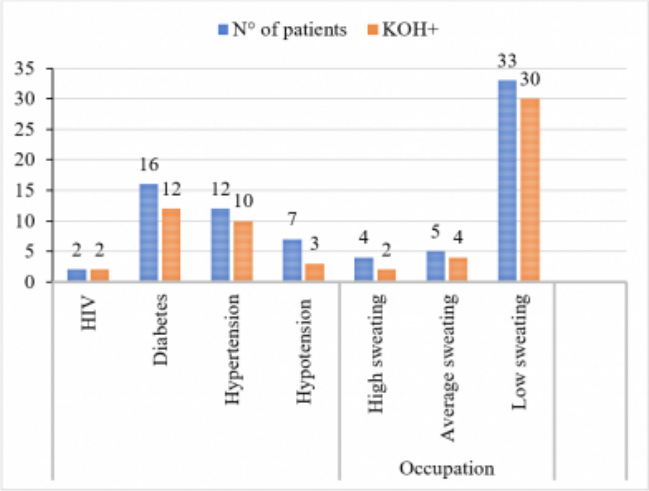
Isolated etiological agents and corresponding frequencies

| | Etiological agents | Frequency | % |
|---|---|---|---|
| Dermatophytes (n=8) | *Tricophyton rubrum* | 5 | 14 |
| | *Epidermophyton flocosum* | 1 | 3 |
| | dermatophytes | 2 | 6 |
| Yeast (n=8) | Yeasts | 6 | 17 |
| | *Trichosporon spp.* | 2 | 6 |
| Non-dermatophyte molds (n=18) | *Fusarium* spp. | 2 | 6 |
| | *Penicillium spp.* | 5 | 15 |
| | *Cladosporum spp.* | 2 | 6 |
| | *Paeciliomyces* spp. | 1 | 3 |
| | *Aspergillus* spp. | 4 | 12 |
| | *Acremonium* spp. | 1 | 3 |
| | Unknown | 3 | 9 |
| Total | | 34 | 100 |

In this study 42 patients were included who were presented with signs and symptoms compatible with fungal infection, 27 females and 15 males (64 and 36% respectively); of these, 36 resulted positive for the KOH test (85.7%) obtaining 25 cultures of fungal growth. With this information, four types of onychomycosis were diagnosed, including distal subungual, total dystrophic, subungual, and total dystrophic onychomycosis associated with onychogryphosis (image 1). The etiological agents found were divided into three groups, of which non-dermatophyte molds were more abundant, with a frequency of 52%, against 24% in dermatophytes and 24% in yeast and yeast fungi. However, the most frequent etiological agents were yeasts (17%), followed by Tricophyton rubrum (14.71%) and Penicillium spp. (14.71%) (table).

**Graph 1**

Distribution by risk factors of the number of patients and the fungal infection

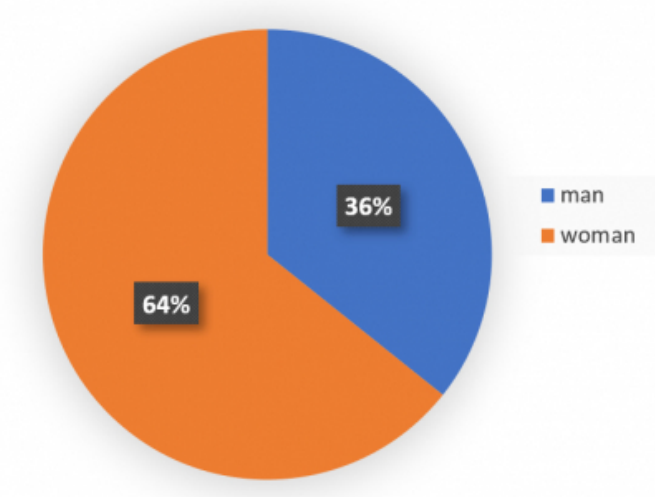



All the patients with HIV presented a mycotic infection (100%), while 75%, 83% and 43% of the patients with diabetes, hypertension, hypotension respectively presented the same.

Occupations were categorized as low sweating (78%), mby middle sweating (12%) and high sweating (10%), with a frequency of onychomycosis of 91% in people with low sweating. (graph 1)

**Graph 2**

Distribution of onychomycosis in elderly patients according to sex.




## DISCUSSION:

Mycoses are very frequent in tropical, subtropical countries due to the hot and humid climate, conditions that favor fungal development. The clinical manifestations of these infections can be influenced by several factors, including immunosuppression, occupation, age, sex, etc.[1].

In the present study, 86% of the population studied had an apparent fungal infection (as demonstrated by the KOH test), with a predominance in women, with a female: male ratio of 1.8: 1 (graph 2). These results are interesting because there is usually a higher proportion of male population with these types of infections, however, since this is associated partially with clothing and personal habits, this associations may fade with age due to a decrease in activity and the social conventionalisms of skin/nail care compared to younger, more socially present individual.

Thirty patients had at least one other clinical compromise and of these, 80% exhibited a positive direct diagnosis with a higher frequency in people with diabetes (43.24%). However, almost all patients with chronic degenerative disease had a high percentage of onychomycosis which means that these factors can influence the fungal infection in the nails. Indeed, diabetes provides an adequate condition for fungal genesis and proliferation in the body, causing hyperglycemia, damage to the peripheral microcirculation with secondary hypoxemia and attached skin trauma (nails) [8]. However, surface moisture caused by damage to the peripheral microcirculation in the feet can be an important predisposing factor to fungal infection.

Although non-dermatophyte molds were found more frequently in this study, they are considered opportunistic agents, which infect subjects in a compromised immunological condition [9], [10]; However, the high frequency of these in the context of this study may be related to the fact that the majority of patients had a clinical compromise; also the association of these species with dermatophytes and yeasts which are generally considered as primary agents, facilitates colonization of the infected area. Finally, it is important to underline that several studies have reported that opportunistic fungi can be directly related to superficial mycosis (onychomycoses).[2], [4], [11], since they are responsible for 2 to 20% of the isolates of clinical nail samples and their interpretation as a causal agent of nail changes is always complicated [2].

As expected and in similitude to the epidemiological study conducted in Mexico City in 2002, [12] we obtained T. rubrum (14.71%) can be hypothesized primarily by the intrinsic factors of the fungus, such as its resistance to antifungals [13]and easy dissemination in comparison with other dermatophytes; second, the introduction of griseofulvin as an antifungal agent in different tinea, which

led to the disappearance of previously common agents, such as M. audouinii and M. schoenleinii [14-16].

## CONCLUSION:

The present study could be the justification for the high presence and persistence of onychomycosis in elderly patients. It was found that more than 75% of patients with a chronic degenerative disease had a fungal infection and the most frequent etiological agent was T. rubrum. Where the conclusion that HIV, Diabetes and hypertension are factors that contribute to high fungal infection and its persistence in patients of this age.

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