

Scientific Electronic Archives

Issue ID: Sci. Elec. Arch. Vol. 11 (2)

April 2018

Article link

<http://www.seasinop.com.br/revista/index.php?journal=SEA&page=article&op=view&path%5B%5D=547&path%5B%5D=pdf>

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Epidemiological profile of cutaneous superficial mycoses in South, Brazil

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Abstract. Cutaneous superficial mycoses appear as lesions on the skin, hair and nails. The highest prevalence is of fungal infections caused by the fungi of the genus *Microsporum*, *Epidermophyton*, *Trichophyton*, *Candida* and *Malassezia*. These mycoses are common in tropical regions and are commonly neglected due to lack of patient knowledge, difficult diagnosis and lack of access to health facilities, which makes them a public health problem. In research, mycological examination of patients using Basic Health Units (BHU) was carried out in order to diagnose mycoses. **Results:** Through this action, it was possible to diagnose and refer to the appropriate treatment 5359 patients, seeking to improve their quality of life. From the results of the mycological exams of these patients during the period from 2011 to 2016, it was possible to trace the epidemiological profile of the State of Rio Grande do Sul and the most prevalent species, contributing to the accomplishment of measures in public health.

Keywords: cutaneous superficial mycoses, diagnosis, epidemiology

Introduction

Cutaneous superficial mycoses are infections caused by fungi that feed on keratin, epithelial or sebaceous debris and thus attack skin, hair and nails¹, usually causing desquamative lesions with rounded and erythematous borders.

Some species of these agents are part of the normal microbiota of individuals, such as those of the genus *Malassezia* and *Candida*. However, due to conditions that favor colonization disequilibrium, such as heat, humidity and low immunity, these fungi develop in excess causing infections². Others are acquired in the environment by direct contact, and require the same favorable conditions for their development as those in the individual.

Fungi causing surface mycoses are classified as filamentous, such as dermatophytes and others, and yeasts such as *Candida* spp., *Malassezia* spp. and others. In dermatophytes, the most prevalent agents are *Epidermophyton*, *Microsporum* and *Trichophyton*³, among that anthropophilic dermatophytes the most common in the world is *Trichophyton rubrum*⁴. In the yeasts, the most prevalent are the fungi of the genus *Malassezia* and *Candida*. In Brazil, *Trichophyton*

rubrum is also the fungal dermatophyte that causes superficial mycoses in the southern and northeastern regions^{5,6}.

Cases of superficial cutaneous mycoses are very common in the world, especially in places where bioclimatic conditions favor the development of fungi and where there is a greater contact between humans and animals². Brazil as a tropical and subtropical country has high rates of these infections, but because they do not constitute diseases of compulsory notification, it is the responsibility of epidemiological studies to update the prevalence of these agents⁷.

Due to the importance of the knowledge and epidemiological follow-up of these mycoses, the present study reports the frequency and prevalence of cutaneous superficial mycoses in the mycological exams of patients living in the state of Rio Grande do Sul through a partnership between Central Laboratory of the State / State Foundation of Production and Research in Health - Biological Research Institute (IPF / LACEN - RS) and the Laboratory of Clinical and Toxicological Analysis (LACT) of the Faculty of Pharmacy of UFRGS.

This project was approved by the CEP of UFRGS with number 1,253,551.

Methods

The samples were sent from the Basic Health Units (UBS) of the metropolitan region and interior of the State of Rio Grande do Sul to the Central Laboratory of the State / State Foundation of Production and Research in Health - Biological Research Institute (IPF / LACEN - RS) and the Laboratory of Clinical and Toxicological Analysis (LACT) of the Faculty of Pharmacy of UFRGS.

After collection, each sample was sent to the FEPPS Mycology Laboratory or the Faculty of Pharmacy. For manipulation, part of it was prepared on a blade with KOH solution (10 to 40%, with or without blue paint) and deposited on a cover slip for research by direct examination. The remainder of the sample was seeded in Sabouraud dextrose Agar with chloramphenicol and incubated at 25-30 °C for a period of 15 to 30 days.

After the incubation period, the growth was analyzed macroscopically and directed to the

identification of the fungus according to its micromorphology and, when necessary, additional tests were carried out, such as micro culture on a blade, urea test, among others.

Results and discussion

During the period from January 2012 to November 2016, 5359 patient samples were collected. However, 5304 biological samples were analyzed, and the others were discarded because the other samples were in inadequate conditions for processing. Of these, 1125 (21%) showed positive results for cutaneous superficial mycoses.

Of the 5304 samples, in 5122 the cultural examination was performed, where 3962 (77%) were negative and 1160 (23%) were positive for fungi (**Figure 1**). In relation to direct examination, 5304 biological samples were performed, 3448 (65%) negative and 1856 (35%) positive for fungi (**Figure 2**).

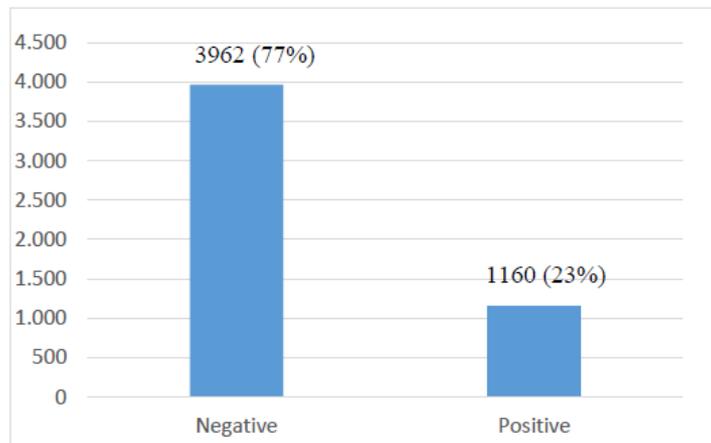


Figure 1 Results of tests of positive and negative cultures

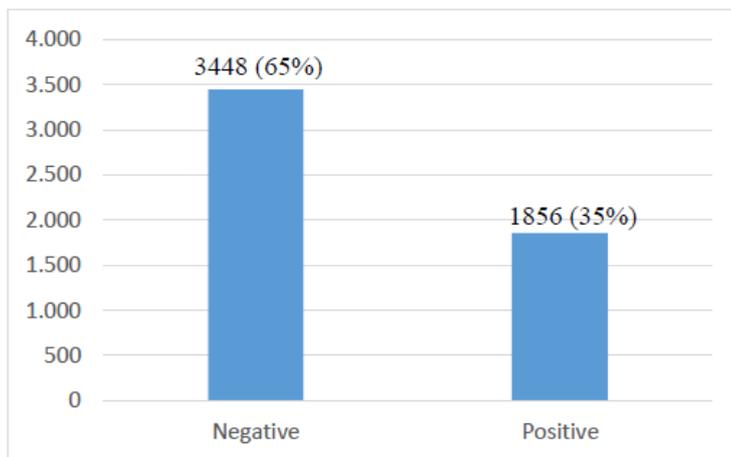


Figure 2 Results of direct tests of positive and negative

In relation to the causative agents of cutaneous superficial mycoses, in 1125 positive samples, were isolated the dermatophytes *Trichophyton rubrum* (616 - 54.8%), followed by *Candida* spp. (198-17.6%), *Malassezia* spp. (159-14.1%), *Trichophyton mentagrophytes* (96-8.5%),

Black fungus (16-1.4%), *Microsporium gypseum* (15-1.3%), *Fusarium* sp. (8-0.7%), *Microsporium canis* (7-0.6%), *Epidermophyton floccosum* (6 - 0.5%), *Scytallidium* sp. (2-0.2%) and *Geotrichum* sp. (2-0.2%) (**Figure 3**).

There was a higher incidence of mycosis in the nails (68%), followed by the skin (31%) and lastly in the scalp (1%). The female sex was the most affected by these mycoses (697 - 62.0%) compared to males sex (428

- 38.0%). The proportion of fungal agents had a variable result, as in the case of *Trichopyton mentagrophytes*, which affected more women (77.1%) and *Microsporium canis*, which affected more men (85.7%) (Figure 4; Table 1).

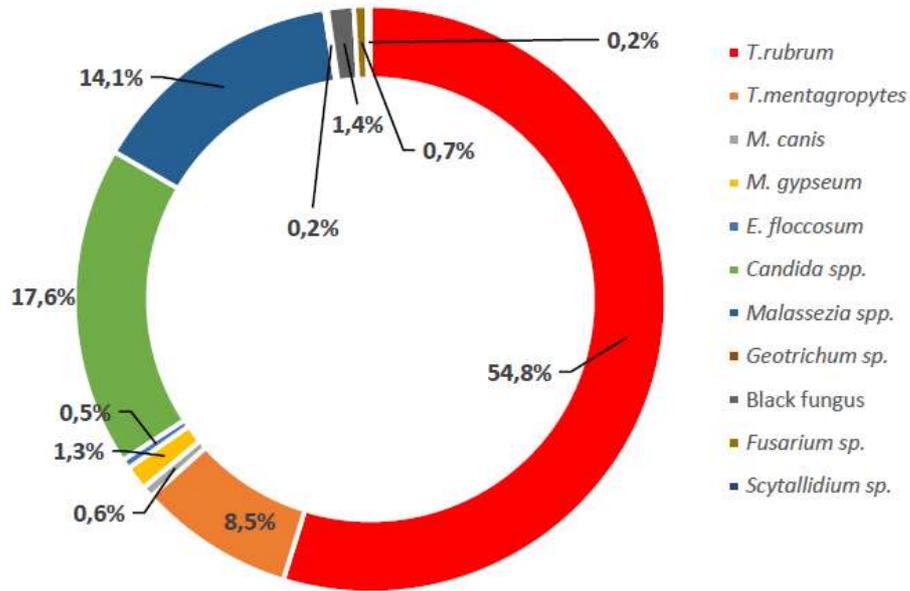


Figure 3 Causative agents of cutaneous superficial mycoses



Figure 4 Proportion of cutaneous superficial mycoses between genders

The extension and research project carried out in the present study, besides providing health care to the population, provided data indicating the prevalence of cutaneous superficial mycoses in Rio Grande do Sul, Brazil.

Subtropical and tropical regions, such as Brazil, are the most favorable to these fungal infections⁸, leading to high rates of patients with

cutaneous superficial mycoses, requiring the epidemiological survey of infected individuals, which was observed and confirmed in this study.

The study included 5,359 patients and analyzed 5,304 mycological exams, of which 1125 (21%) were positive for cutaneous superficial mycoses. The large number of patients in relation to the tests performed is explained by the impossibility

of analyzing all the samples, due to the scarce material collected or by contaminations present in the cultural mycological exam.

Table 1 Proportion of superficial mycosis agents between genders

Agents	% Female	% Male
<i>T.rubrum</i>	56,0%	44,0%
<i>T. mentagrophytes</i>	77,1%	22,9%
<i>M. canis</i>	14,3%	85,7%
<i>M.gypseum</i>	80,0%	20,0%
<i>E. floccosum</i>	100,0%	0,0%
<i>Candida</i> spp.	81,8%	18,2%
<i>Malassezia</i> spp.	49,1%	50,9%
<i>Geotrichum</i> sp.	100,0%	0,0%
Black fungus	50,0%	50,0%
<i>Fusarium</i> sp.	87,5%	12,5%
<i>Scytallidium</i> sp.	100,0%	0,0%
Total	62,0%	38,0%

The discrepancy between the positive results of direct examination (35%) and cultural examination (23%) is due to the difficulty of collecting the biological material, the low viability of the fungus due to previous treatments resulting in negative cultures or the contamination with fungi of the environment, factors that impede the adequate growth of the fungus responsible for mycosis in culture⁹. It is also due to the fact that the diagnosis of *Malassezia* spp. does not necessarily require a cultural examination, and the direct examination is sufficient.

Of these positive results, 66% were caused by dermatophytes, evidencing the higher prevalence of these agents in cutaneous superficial mycoses. The most frequent agent was *Trichophyton rubrum*, equivalent to 54.8% of the mycoses diagnosed and approximately 83% of the dermatophytes found. In a study conducted in the period 2007 to 2011 in the southern region of Brazil, the prevalence of this agent was evidenced, equivalent to 72.20% of the diagnoses¹⁰. These mycosis-causing agents are

among the most common in the world and their incidence varies according to climate and geographic characteristics¹¹.

Another causative agent of cutaneous superficial mycoses of high incidence in the study was *Candida* spp., with a percentage of 17.6% of diagnosed mycoses. Because it is a component of the normal human microbiota, immunological disequilibrium (caused by stress, old age, diseases, etc.) or favorable humidity and temperature conditions favor the exacerbated growth of yeast, causing infection¹². *Candida* spp. is transmitted by contact between healthy and immunocompromised individuals or as an endogenous source of infection, being the main cause of onychomycosis⁸.

Of the 5359 patients who were forwarded for mycological collection, 62.0% were women and only 38.0% men, this corroborates with research indicating that men culturally seek less health services than women¹³.

The proportion of positive results among species of cutaneous superficial mycosis agents was different between men and women. For the most prevalent fungus *Trichopyton rubrum*, of the 616 patients affected, 56.0% were women, showing little difference between genus. For the fungus *Microsporium canis*, 85.7% of the infected were male. In patients infected with *Candida* spp., 81.8% were women. The higher prevalence of women with candidiasis can be attributed to the fact that women are more exposed to domestic work using water and aggressive detergents and to the habit of attending manicures which favors the growth of this *Candida* spp.⁹.

The main sources of collection were nails and skin, with 1% scalp. The high incidence of onychomycosis, compared to other cutaneous superficial mycoses, can be explained by the humidity caused by the use of closed shoes and inadequate drying of the feet, which generates an environment conducive to fungal growth⁸. Onychomycosis may represent a greater risk with increasing age or in individuals affected by diseases such as Diabetes Mellitus, HIV among others, being an important factor in worsening the quality of life of these individuals¹⁴.

The present study achieves its objectives by the data obtained when verifying the frequency, prevalence and epidemiology of cutaneous superficial mycoses in the state of Rio Grande do Sul, Brazil.

Acknowledgements

This work was supported by Pró- Reitoria de Extensão da Universidade Federal do Rio Grande do Sul (UFRGS).

Conflict of Interest

The authors declare that there is no conflict of interest.

Financial Support

This study was funded by Pró- Reitoria de Extensão da Universidade Federal do Rio Grande do Sul (UFRGS).

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