Superficial mycoses in the City of Manaus/AM between March and November/2003*

*Micoses superficiais na cidade de Manaus, AM, entre março e novembro/2003**

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Abstract: BACKGROUND - Restricted superficial mycoses are fungal infections that appear on the skin superficial layers and their adnexa. However skin superficial mycoses represented by dermatophytoses and candidiasis can invade the corneal layer. This type of mycosis has a high incidence in the Amazon region.
OBJECTIVES – To study the restricted superficial mycoses under the epidemiological and mycological point of view.
PATIENTS AND METHODS - Patients presenting clinical suspicion of superficial mycoses submitted to mycological examination from March to November 2003 at the Clinical Mycology Laboratory/CPCS-INPA.
RESULTS - Three hundred and ninety-four examinations were carried out throughout the period and 256 were positive. The mycoses with higher incidence were onychomycosis (135) and pityriasis versicolor (98). The most often isolated agents were *Malassezia spp*. (77) and *Candida spp*. (72). Tinea capitis was more frequent in pre-school children (3) and onychomycosis in adults (94). Mycoses were more prevalent in women (91). All socioeconomic classes were affected, with a predominance in class C (37).
CONCLUSION – Onychomycosis and pityriasis versicolor affected mostly adults and Tinea capitis occured mainly in children. Superficial mycoses were more predominant in women. *Malassezia spp*. and *Candida spp*. were the most often isolated agents.
Keywords: Fungi; Incidence; Mycoses

Resumo: *FUNDAMENTOS - Micoses superficiais estritas são infecções fúngicas que se localizam nas camadas superficiais da pele e seus anexos. As micoses superficiais cutâneas representadas pelas dermatofitoses e candidíases podem ultrapassar a camada córnea da pele. Na região amazônica possuem incidência elevada.*
OBJETIVOS - Estudar as micoses superficiais, estritas e cutâneas, diagnosticadas sob o ponto de vista epidemiológico e micológico.
PACIENTES E MÉTODOS - Pacientes com suspeita clínica de micoses superficiais submetidos a exame micológico no período de março a novembro de 2003 no Laboratório de Micologia Médica/CPCS/INPA.
RESULTADOS - Foram realizados 394 exames, tendo 256 apresentado diagnóstico positivo. As micoses mais incidentes foram onicomicoses (135) e pitiríase versicolor (98). Malassezia spp. (77) e Candida spp. (72) foram os agentes fúngicos mais isolados. Tinea capitis apresentou maior ocorrência nos pré-escolares (3), e onicomicoses em adultos (94). O sexo feminino foi o mais acometido (91). Todas as classes sociais foram infectadas, com predominância da C (37).
CONCLUSÃO - Onicomicoses e pitiríase versicolor acometeram sobretudo adultos. A tinea capitis ocorre principalmente, em crianças. As micoses superficiais apresentaram mais incidentes nas mulheres. Malassezia spp. e Candida spp. foram os agentes mais isolados.
Palavras-chave: Fungos; Incidência; Micoses

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INTRODUCTION

Restricted superficial mycoses are fungal infections usually confined to the skin superficial layers and their appendages.[1] The following are frequent characteristics of superficial mycoses: transmission through direct contact; minor local infection, absence of serum antibodies.[2] The etiological agents involved are yeast (*Malassezia spp*., *Trichosporon sp*.) and filamentous non-dermatophyte fungi (*Piedraia hortae* and *Phaeoannelomyces werneckii*).[3,4]

Filamentous dermatophyte fungi and yeast of the genus *Candida* are the causative agents of superficial mycoses and are capable of digesting keratin present in the skin and its appendages, and are sometimes associated with inflammatory response in the host organism.

Dermatophytes are represented by three genera - *Trichophyton*, *Microsporum* and *Epidermophyton*. According to their habitat, these fungi are classified into anthropophilic, geophilic and zoophilic.[3] Geophilic fungi grow on keratin present in the soil and derived from human and/or animal keratin or its debris. Zoophilic fungi are parasites of animal keratin, and anthropophilic fungi digest human keratin.

Candida spp., yeast that is part of the normal human flora, causes superficial skin infections.

Malassezia spp. is a lipophilic yeast living on the skin and scalp as part of the normal flora and causes only superficial mycoses.[3] Despite the absence of keratinolytic activity, *Malassezia* is found on the skin or around hair shafts and relies on epithelial debris or excretion products as sources of energy for its development.[5]

Filamentous non-dermatophyte fungi, which were previously regarded as contaminants, are now reported as causative agents in some cases of superficial mycoses. These fungi are represented by the genera *Alternaria, Aspergillus, Acremonium, Cladosporium, Penicillium, Scopulariopsis*, among others.[6] and can be found in association with yeast and dermatophyte fungi – in this case they are considered mere contaminants.[7]

The study of both types of mycoses is important due to the frequent diagnosis in dermatology clinics. Moreover these mycoses are highly contagious and might develop into epidemics in some population groups, as for example, *tinea pedis* in military personnel and athletes.[8,9]

Regarding the incidence of skin diseases in the Amazon region, mycoses rank first, with a high percentage. The fact that the most important skin diseases in the Amazon region are dermatophytoses and *pityriasis versicolor*, is a unique characteristic of this region.[10]

Ecological factors – high temperature and air humidity, dense forest vegetation and high rainfall rate – result in optimal conditions for fungal dispersion and development. Other factors that favor the high incidence and dissemination of mycoses are poor socioeconomic development of the Amazon population associated with promiscuous behavior, sweating, prolonged contact with domestic animals, hygiene conditions, among others.[10-12]

The abusive use of antibiotic, cytostatic drugs and narcotics, as well as immunosuppressive diseases are some factors associated with the raising incidence of superficial mycoses in the last decades.[13,14]

Since notification of mycoses is not mandatory, the exact extension of the problem in the Amazon region is unknown. Thus, as a measure of epidemiologic prevention it is important to perform periodical surveys on the frequency of mycoses and their etiological agents in respect to socioeconomic, geographic and climate factors. The aim of this study was to investigate, from an epidemiological and mycological point of view, cases with a positive diagnosis for mycoses, using gender, age and social class as parameters.

PATIENTS AND METHODS

Between March and November 2003, 394 patients suspected of superficial mycoses underwent dermatological examination. Doctors from the public and the private health sector referred patients to the Medical Mycology Laboratory. *Pityriasis versicolor*, onychomycosis due to dermatophyte fungus and *Candida spp., tinea corporis, tinea pedis, tinea capitis* and *tinea cruris* were studied. Material collected from patients was divided into two groups: one was treated with 40% potassium hydroxide and DMSO (dimethyl sulfoxide) and was used for direct microscopy examination. Potassium hydroxide and DMSO were used to bleach the samples, enabling observation of fungal structures. The second group was inoculated at room temperature (27-29ºC) into Mycobiotic agar and Sabouraud agar supplemented with chloramphenicol. When pityriasis versicolor was suspected, samples were inoculated into Sabouraud agar supplemented with olive oil.[1] Test tubes were kept at 35-37ºC, and observed daily during 15 days. Following culture development, the genera of the fungi were determined according to macro and micromorphological characteristics described by Lacaz.[1] Results were subjected to a descriptive analytical study based on the chi-square statistical analysis (χ^2) with a significance level of $\alpha=0,05$.

RESULTS

In this study we performed 394 tests with 256 (64.97%) positive diagnoses. Nevertheless, out of the positive tests, 228 (89.06%) presented positive results in the direct examination and culture, whereas 28 (10.94%) had positive results only in the direct examination. Onychomycosis and *pityriasis versicolor* presented a higher frequency of positive diagnosis: 101; 39.45% and 71; 27.73%, respectively. These conditions were followed by *tinea pedis* (36; 14.06%), *tinea corporis* (31; 12.11%), *tinea capitis* (12; 4.70%) and *tinea cruris* (five; 1.95%) (Graph 1).

Yeast were more frequently observed (165; 72.37%), mostly represented by *Malassezia spp*. (77; 33.77%) and *Candida spp*. (72; 31.57%), followed by filamentous dermatophytes (55; 24.12%), mainly *Trichophyton rubrum* (22; 9.65%), and filamentous non-dermatophytes (8; 3.51%), with higher occurrence of *Scytalidium dimidiatum* (4; 1.75%) (Table 1).

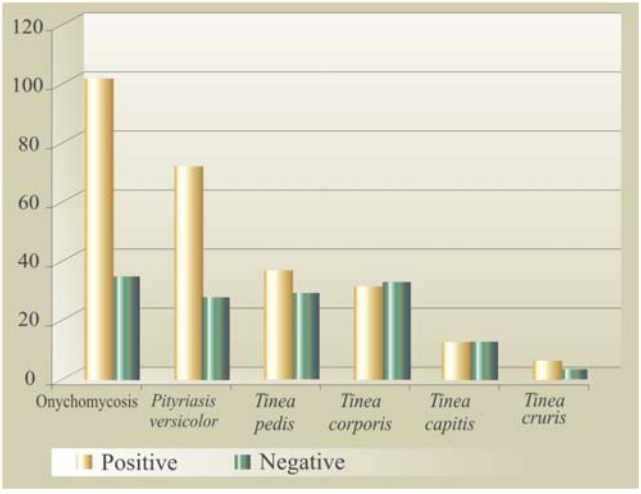
Regarding yeast fungi, *Malassezia spp*. was more frequent in cases of pityriasis versicolor (66; 85.7%), but was also noticed in cases with clinical suspicion of *tinea corporis* (8; 10.38%), *tinea capitis* (2; 2.59%) and *tinea cruris* (1; 1.29%). *Candida spp*. was the most common agent of onychomycoses (52; 72.2%). Regarding filamentous dermatophyte fungi, *Trichophyton rubrum* was more frequently associated with onychomycosis (10; 45.45%), and was also observed with *tinea pedis* (7; 31.82), *tinea corporis* (4; 18.2%) and *tinea cruris* (1; 4.54%). In relation to filamentous non-dermatophyte fungi, *Scytalidium dimidiatum* was noticed in onychomycoses (3; 75%) and *tinea pedis* (1; 25%) (Table 1).

Tinea capitis (three; 37.50%) was more frequently diagnosed in pre-school children, whereas onychomycosis was more common in adults (94; 47.24%) (Table 2).

Women were more frequently affected by superficial mycoses (165; 64.45%), mainly onychomycosis (76; 46.06%) of toenails. On the other hand, pityriasis versicolor presented higher incidence in men, (29; 31.87) (Graph 2).

The chi-square test χ^2 revealed no significant association between superficial mycoses and the seasons of the year ($p>0.05$). Regarding social class, mycoses were more frequent in people of the social class C (97 - 37.89%) cases

GRAPH 1: Incidence of superficial mycoses diagnosed from March to November 2003, at the Medical Mycology Laboratory/Inpa



DISCUSSION

The high incidence of onychomycosis observed in this study, was not noticed in the cities of Sao Paulo and Goiania, where *tinea pedis* predominated.[15,16] In contrast, in this study, tinea pedis was the third most frequent superficial mycosis. This low incidence - also observed in other cities with warm climate, such as João Pessoa,[17] is due to the fact that in these cities people wear open shoes. On the other hand, in cities where the climate is cold, people wear close shoes creating a warm and humid environment, which favors the development of dermatophytes.[13]

The high incidence of *pytiriasis versicolor*, which was also observed in a previous study conducted in the city of Manaus, confirms that this is the most frequent mycotic infection in the state of Amazonas.[18,19] A high incidence of *pytiriasis versicolor* was also observed in the state of Paraiba, where 78% of the study population presented positive results for *pytiriasis versicolor*.[20]

The high isolation rate of *Candida spp*. from nail lesions was also observed in the cities of Asuncion - Paraguay - and Rio de Janeiro, and confirms that this is the most frequent etiological agent of onychomycoses.[3,4]

The predominance of *T. rubrum* among dermatophytes, especially in onychomycoses and *tinea pedis* was reported by Terragni et al., 1993, and Mezzari et al., 1998,[21,22] and confirm *T. rubrum* as the most cosmopolitan fungus.

Similar to previous studies carried out in the cities of Manaus and Fortaleza,[11,13,14] we also observed a higher incidence of *Trichophyton tonsurans* as the causative agent of *tinea capitis*. This fungus appears to be well adapted to the high temperature and relative humidity found in the Northern and Northeastern regions of Brazil. In the states of the Central-western, Southeastern and Southern regions T. tonsurans is considered a foreign dermatophyte.[23,24]

Superficial mycoses caused by filamentous non-dermatophyte fungi are extremely rare, except for those observed in cases of onychomycoses (1-

TABLE 1: Fungi isolated in different types of mycoses

Fungi	P.v.		*Tinea cruris*		*Tinea capitis*		*Tinea corporis*		*Tinea pedis*		Onicomicose		Total	
	N.	%	N.	%	N.	%	N.	%	N.	%	N.	%	N.	%
Candida spp.	1	1.38	3	4.16	-	-	4	5.6	12	16.66	52	72.2	72	31.57
Candida albicans	-	-	-	-	-	-	4	33.33	-	-	8	66.67	12	5.26
Malassesia spp.	66	85.7	1	1.29	2	2.59	8	10.38	-	-	-	-	77	33.77
Trichosporon spp.	-	-	-	-	-	-	-	-	3	100	-	-	3	1.31
Unidentified yeast	-	-	-	-	-	-	1	100	-	-	-	-	1	0.43
Yeast													165	72.37
Trichophyton spp.	-	-	-	-	-	-	-	-	2	33.33	4	66.67	6	2.63
T. rubrum	-	-	1	4.54	-	-	4	18.2	7	31.82	10	45.45	22	9.65
T. mentagrophytes	-	-	-	-	-	-	1	10	5	50	4	40	10	4.38
T. tonsurans	-	-	-	-	8	66.67	4	33.33	-	-	-	-	12	5.26
M. canis	-	-	-	-	2	100	-	-	-	-	-	-	2	0.88
M. gypseum	-	-	-	-	-	-	-	-	-	-	1	100	1	0.43
E. floccosum	-	-	-	-	-	-	-	-	2	-	-	-	2	0.88
Dermatophytes													55	24.12
S. dimidiatum	-	-	-	-	-	-	-	-	1	25	3	75	4	1.75
Aspergillus spp.	-	-	-	-	-	-	1	100	-	-	-	-	1	0.43
Cladosporium spp.	-	-	-	-	-	-	-	-	-	-	1	100	1	0.43
Curvularia spp.	-	-	-	-	-	-	-	-	-	-	1	100	1	0.43
Exophiala spp.	-	-	-	-	-	-	-	-	-	-	1	100	1	0.43
Non-dermatophytes													8	3.51
Total	67	29.39	5	2.2	12	5.26	27	11.84	32	14.03	85	37.28	228	100

Key: P.v.: Pitiriase versicolor; T: *Trichophyton*; M: *Microsporum*; E: *Epidermophyton*; S: *Scytalidium*; n.i.: não identificada.

TABLE 2: Superficial mycoses in different age groups

Mycoses	Age group (years) Preschool 0 - 5		School age 6 - 11		Adolescent 12 - 18		Adult 19 - 59		Elderly ≥60		Total	
	N.	%	N.	%	N.	%	N.	%	N.	%	N.	%
Onychomycosis	1	12.50	-	-	2	12.50	94	47.24	4	36.36	101	39.45
Pityriasis versicolor	2	25	10	45.45	7	43.75	50	25.13	2	18.18	71	27.73
Tinea corporis	2	25	3	13.64	4	25	20	105	2	18.18	31	12.11
Tinea pedis	-	-	-	-	1	6.25	32	168	3	27.27	36	14.06
Tinea cruris	-	-	2	9.09	-	-	3	1.51	-	-	5	1.95
Tinea capitis	3	37.50	7	31.82	2	12.50	-	-	-	-	12	4.7
Total	8	3.13	22	8.59	16	6.25	199	77.73	11	4.30	256	100

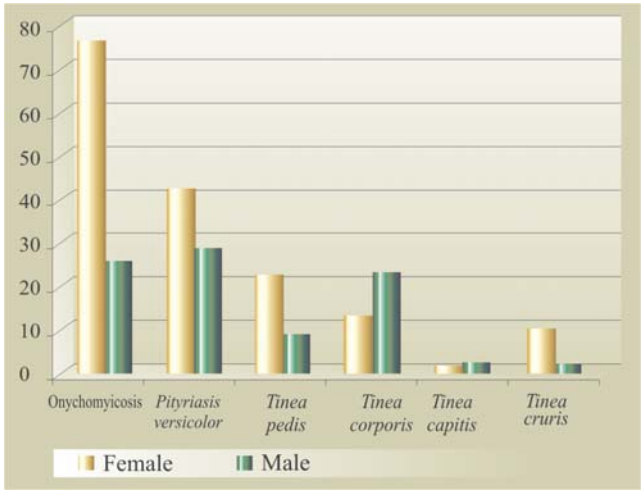
10%).[25] *S. dimidiatum* was frequently observed in onychomycoses. This is due to the fact that this fungus is transmitted from soil or vegetal matter, with no inter-human transmission. Moreover, *S. dimidiatum* is capable of metabolizing keratin from the nails at a lower rate than dermatophytes.[7]

Children were less affected by onychomycoses due to the fast growth rate of the nail, reduced superficial area for spore invasion and, reduced probability of trauma. On the other hand, onychomycoses are more frequent in the elderly population due to reduced growth rate of the ungueal plate and an increase in trauma rates.[4]

A previous study reported the high incidence of *pytiriasis versicolor* in the city of Manaus. Pytiriasis is rare in children due to the lipophilic nature of the fungus.[18]

The prevalence of *tinea capitis* in children was

GRAPH 2: Superficial mycoses per sex



also reported in other studies carried out in the cities of Fortaleza, Goiania and Rio de Janeiro,[13,14,25,26] confirming that this is the most frequent mycosis in children. The high incidence of *tinea capitis* in children is due to the fact that children are more exposed to risk factors, such as poor hygiene, and crowded schools and daycare centers. Also, direct contact with animals and playing in the sand contribute to a higher occurrence of this condition in this age group.

Because temperature and relative air humidity show little variation throughout the year, it was not possible to determine the relation between superficial mycoses and the seasons of the year.

CONCLUSIONS

In this study we noticed that onychomycosis and *pytiriasis versicolor* are the most common mycoses in the Amazon region and that *Candida spp*. and Malassezia spp. were the most frequent etiological agents. Women are more frequently affected than men - onychomycosis is the most frequent superficial mycosis in females and *pytiriasis versicolor* in males. *Tinea capitis* was more frequently observed in children, whereas onychomycosis and *tinea capitis* were more common in adults. Superficial mycoses were present in all social classes. The seasons of the year did not influence the incidence of superficial mycoses. ❑

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