

# Epidemiology of Dermatomycosis in the Eastern Croatia – Today and Yesterday

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## ABSTRACT

*The aim of our investigation was to compare the distribution of dermatomycosis species in Eastern Croatia between two different periods: first period from 1997–2001 year, and second period from 1986–88 year. The outpatients from Department of Dermatovenerology University Hospital »Osijek« with confirmed diagnosis infection Tinea, were selected on the basis of age, gender, localization and dermatomycosis species. During the first period (1997–2001) among 75,691 outpatients Tinea infection was confirmed in 558 (0.73%), while in the second period among 47,832 outpatients there were 126 (0.26%) cases with Tinea, what showed significant increase of fungal infections among population this region. According the age and gender in both periods predominant population were under of the age 16 (40.14%: 41.26%), and female population was predominant (58.60% and 57.14%) in comparison to males (41.39% and 42.85%). The most frequent localization of lesions in period I were cutis glabrae (47.31%), palms and soles (31.36%), capitis (17.38%) and unguis (9.31%) and isolated species were as followed: Trichophyton (39.06%), Microsporum (31.72%) and Candida (28.13%) species. In period II the most frequent localization were palms and soles (40.47%), cutis glabrae (36.50%), capitis (12.69%) and unguis (10.31%). The isolated species in this period were: Trichophyton (80.15%), Candida (12.69%) and Microsporum (4.76%) species. From the data collected during two different periods we can observe 1) increase of fungal infection generally in our region; 2) significant changes in causative species (increase of Microsporum and Candida species infection, but Trichophyton spp still remain the first causative agent); and 3) changes in the localization of lesions.*

**Key words:** dermatomycosis, epidemiology, Croatia.

## Introduction

Dermatomycosis are of worldwide distribution. The prevalence and distribution of dermatophyte species are different in different parts of world. Variations in prevalence of fungal genus from different places of world probably reflect the existence of particular environmental situations defined by biotic and abiotic factors that influence the settlement of endemic mycosis. Some species are limited to certain geographic areas, so they are relatively uncommon elsewhere, such as *Trichophyton concentricum* in the South Pacific, *Microsporum nanum* in Cuba or *Trichophyton megnini* in Sardinia and Portugal<sup>1</sup>. *Trichophyton violaceum* is endemic in certain parts of Eastern Europe, Africa, Asia, and South America but not in North America. *Trichophyton rubrum* is the most common cause worldwide of tinea pedis nail infection and tinea corporis<sup>2</sup>.

Our knowledge of ecology and epidemiology of dermatomycosis and the factors influencing their transmission has helped us understand better the natural history of them. Periodic epidemiological analyses of these diseases are thus required to ensure their efficacies control. In USA and in Europe, especially in the Mediterranean, the incidence of *Microsporum canis* infection has been on a steep increase during the recent years. In some countries (Italy and Slovenia), *M. canis* is the most often isolated dermatophyte. In Slovenia, a dramatic increase in the incidence of *M. canis* infection has been observed recently, both in absolute figures and as compared to the rest of isolated dermatophytes<sup>3,4</sup>.

In Croatia Trichophytoses had previously prevailed, with extremely rare, sporadic cases of *Microsporum* spp. infection, an epidemic of *Microsporum canis* infection was recorded in the Rijeka area from 1974<sup>5,6</sup>. The data of Central Mycological

Laboratory of the University Department of Dermatology and Venerology Zagreb showed an increase in the prevalence of *M. canis* infection over the last twenty years, especially during last decade<sup>7,8</sup>.

In order to establish an epidemiological distribution in region of Eastern Croatia the authors examined the outpatients with confirmed diagnosis of Dermatomycosis during two periods (1997–2001 and 1986–88) and compared their results.

## Patients and Methods

During two periods (first 1997–2001 and second 1986–88) at the Department of Dermatovenerology University Hospital »Osijek« were examined 75,691 outpatients in first period and 47,832 outpatients in second period. Patients with clinical diagnosis Mycosis were selected by age, gender, localization of lesions and dermatophyte species. The contact with animals and place of living (city/country) has been noticed too.

The most frequent species, such as: *Trichophyton* spp., *Microsporum* spp., *Epidermophyton* spp. and *Candida* spp., has been observed. The diagnosis was verified by standard mycological analysis including: direct demonstration by microscopy of preparation prepared with 20% potassium hydroxide (the preparations consisted of scales, scrapings infected hair and altered parts of nails); and culture on Sabouraud agar with addition of antibiotic and cycloheximide at 25 °C for 2–4 weeks (the samples were referred to the Central Mycology Laboratory, University Department of Dermatology and Venerology in Zagreb).

The main aim of our study was to investigate whether the epidemiological situation concerning dermatophyte species had changes in our region comparing two investigated periods.

The difference between proportions of two independent samples are tested (with significance level of 0.05).

**Results**

Out of a total of 75,691 outpatients examined during first period (1997–2001) 558 (0.73%) were with confirmed fungal infection. In second period (1986–88) among 47,832 outpatients mycological positive were 126 (0.26%) persons (Table 1).

According to age, during both periods the most infected patients were under the age of 16 (P1 = 40.14%: P2 = 41.26%); with increasing the age a number of patients decrease, and after age of 60 there were only 8.6% affected persons during period I and 4.76% during period II (Figure 1).

According the gender in both periods are recorded a prevalent of female patients (female: P1 = 58.60%, P2 = 57.14%; male: P1 = 41.39%, P2 = 42.85%).

In first period, distribution of patients according to most frequent localization of lesions was: cutis glabrae 47.31%, palms and soles 31.36%, capitis 17.38%, unguis 9.31%; and in second period: palms and soles 40.47%, cutis glabrae 36.50%, capitis 12.69%, unguis 10.31% (Figure 2).

At first period *Trichophyton* spp. was isolated at 218 (39.06%) patients, and in second period 101 (80.15%) patients. *Microsporum* spp. was isolated in 177 (31.72%) patients in first period and in second period in 6 (4.76%) patients. *Candida* spp. was isolated in first period in 157 (28.13%) patients and in second pe-

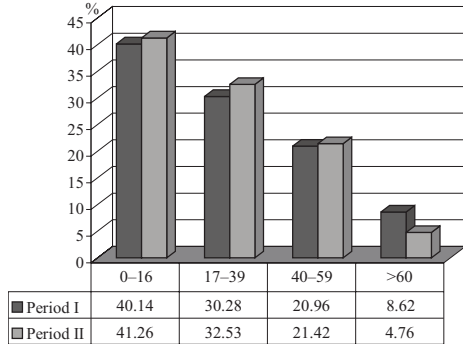


Fig. 1. Distribution of patients according to age (%).

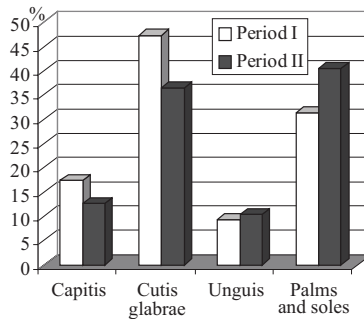


Fig. 2. Distribution of patients according to localization of lesions (%).

riod in 16 (12.69%) patients. *Epidermophyton* spp. was isolated in first period only in 6 (1.07%) patients and in second period in 3 (2.38%) patients (Figure 3).

Contact with infected animals has been recorded in 45.97% patients during the first period (5.37%-dogs, 11.29%-cats, 37.45%-other animals like rabbits, pigs, cows etc.), and 53.96% of patients from

**TABLE 1**  
PREVALENCE OF DERMATOMYCOSIS IN TWO PERIODS

	Total number of patients	Confirmed mycosis	
		N	%
Period I 1997–2001	75,691	558	0.73
Period II 1986–1988	47,832	126	0.26

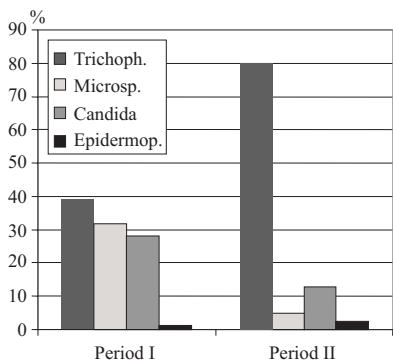


Fig. 3. Distribution of patients according to species (%).

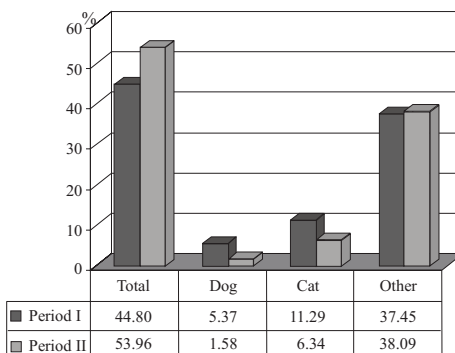


Fig. 4. Distribution of patients according to contact with infected animals (%).

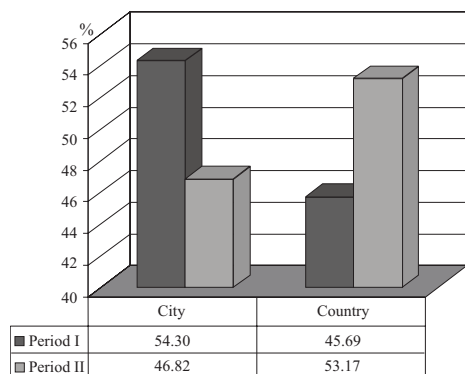


Fig. 5. Distribution of patients according to place of living (%).

second period (1.58%-dogs, 6.34%-cats, 38.09%-other animals) (Figure 4)

According to place of living in first period were recorded 54.30% city residents and 45.69% country residents; and in second period were 46.82% city residents and 53.17% country residents (Figure 5).

There was statistically significant difference ( $p < 0.05$ ) in prevalence of dermatophytosis; I period 0.73% and II period 0.26%. According to localization of lesions there was statistically significant difference between palms and soles in two different periods, but there was no

statistical significant difference between *Tinea capitis* in two periods ( $p > 0.05$ ). Statistically significant different ( $p < 0.05$ ) was between *Trichophyton* spp., *Microsporum* spp. and *Candida* spp. in both of periods. According to contact with animal's distribution of patient showed no statistically significant difference between two periods ( $p > 0.05$ ). According to place of living there was statistically significant difference at country residents between two periods ( $p < 0.05$ ), but at city residents there was no statistically significant difference ( $p > 0.05$ ).

## Discussion

The results of our investigations showed a statistically significant increase of outpatients with *Tinea* infection looking for two periods (1997–2001 and 1986–1988), and a remarkable change of dermatophyte species in the region of Eastern Croatia.

While, during the years 1986–88 *Microsporum* spp. infection were very rare in our part of country, only in 4.76% of all dermatophytoses, in period from 1997 to 2001 account already 31.72% of all patients with *Tinea*. Although the first sporadic cases of *Microsporum* spp. infection

in Croatia were reported by Čajkovac as early as 1969<sup>6</sup>, an epidemic of *Microsporum canis* infection was recorded in the Rijeka area from 1974<sup>5</sup> but during the period from 1990–1999 predominant dermatophyte in this region was recorded again *Trichophyton mentagrophytes* (53.55%) followed by *Microsporum canis* (37.54%). The increasing prevalence of *Microsporum* spp. infection was recorded in the Brod and Posavina region during the 1993–2000 periods, where *Microsporum* spp. was isolated in 64.13% of all dermatomycoses<sup>9</sup>. Seventy percent of patients belong to urban population, and cats and kittens were the most common source of infection. A majority of patients were children; however, adults were also affected<sup>9,10</sup>. In our study, 40.14% affected persons were children too, under 16 years of age. The similar result was recorded in Zadar area<sup>11</sup>.

On contrary the results from Karlovac showed *Trichophyton mentagrophytes* to be the most common etiologic agent found in 43.6% cases, followed by *Microsporum canis* in 29.0%, and *Candida* spp. in 21.6% cases<sup>12</sup>. The same results have been given from Čakovec, Međimurje<sup>13</sup>.

In neighboring Slovenia, the first cases of microsporosis in the Celje area were recorded in 1990, when only two patients were reported. But, 1993, an epidemic microsporosis was announced in the area, with 76 news patients<sup>14</sup>. The data from Department of Dermatovenerology, Ljubljana showed dramatically increasing in the prevalence of microsporosis from 1984 year. From that time on 370 to 722 new cases were diagnosed and treated at the Department each year. Two thirds of them were children under 14 years of age. In the years from 1995 to 1999, *Microsporum canis* was the cause of *Tinea capitis* in 92% and of *Tinea corporis* in 69% cases<sup>15</sup>.

In our region of Eastern Croatia *Microsporum canis* has been isolated in 75%

patients with *Tinea capitis*, and 37% patients with *Tinea cutis glabrae*, while *Trichophyton mentagrophytes* has been isolated in 25% patients with *Tinea capitis*, and in 48% patients with *Tinea cutis glabrae*.

In the Republic of Macedonia, *Microsporum canis* was isolated as an etiologic factor in 91 (61%) of 149 patients with verified *Tinea capitis*<sup>16</sup>.

At the Department of Dermatovenerology in Sarajevo (Bosnia and Herzegovina) during the prewar, war and postwar periods, dermatomycosis was the fourth, second and third most common disease, respectively. In fungal cultures, the most frequent findings were *Microsporum canis*, *Trichophyton mentagrophytes*, and *Epidermophyton floccosum*<sup>17</sup>, what's correlate with our results in postwar period (1997–2001).

On contrary, the authors from Vienna (Austria) compared the mycological cultures of the years 1994 and 1999, and they isolated the most frequently species *Trichophyton rubrum*, accounting for 61.6% and 55.0%, followed by *Trichophyton mentagrophytes*, which was detected in 7.1% and 7.3% of cases. *Microsporum canis* as a relatively rare causative agent (5% vs. 4%) was isolated from special localization such as neck and face, forearm and thigh, according to the site of contact with the infected animal. *Tinea capitis* were very infrequent diagnosis in the present investigation<sup>18</sup>.

Around others parts of Europe epidemiological situation about fungal infection has been reported as followed: *Microsporum* spp. infections are recorded on the first place in Italy<sup>19</sup>, Hungary<sup>20</sup> and Greece<sup>21</sup>. Cats were identified as the commonest source of the infections; in Hungary the disease in many cases, appeared on all members of families. A main factor in spreading of pathogen was apparently healthy Persian cats. In our investigation

during last years we noticed two families with microsporosis, where the Persian cat from Hungary was a source of infection.

The prevalence of *Trichophyton* spp. infection is predominant in Central and North Europe: Poland<sup>22</sup>, Slovakia<sup>23</sup>, Czech Republic<sup>24</sup> and Netherlands<sup>25</sup>. In previous studies a prevalence of *Tinea capitis* was very low, predominant place of infections were nails and feet, and predominant *Trichophyton* species was *Trichophyton rubrum*.

In our investigation a causative agent according the body's area were noticed as followed: *Trichophyton* and *Microsporum* spp. were most frequent isolated at clinical features Dermatormycosis cutis glabrae (face, neck, trunk and extremities); *Trichophyton* and *Candida* spp. at Dermatormycosis of palms, soles, interdigitalis et unguis. *Epidermophyton* spp. has been noticed very rare in both periods (dermatormycosis interdigitalis pedis et inguinalis). While *Tinea capitis* and cutis glabrae are more frequent before the age of 16, mycosis palmo-plantaris and onychomycosis become more common in adults. Similar results observed some other authors<sup>9,26–28</sup>.

Comparing the place of living in our study during the first period the most af-

ected outpatients has been from city, where the causative agent *Microsporum* spp. were recorded frequently, while at the previous period when *Trichophyton* spp. were the most causative agent there were a much more patients from country. Contacts with animals were no statistically significant between two periods, but among last year a contact with cats and dogs were reported in a much more of patients from the city.

Although there is remarkable increasing prevalence of the infection with *Microsporum* and *Candida* spp. during last decade, *Trichophyton* spp. is still now the first causative agent among patients with fungal infection in region of Eastern Croatia.

The future epidemiological pattern of fungal infection cannot be predicted with certainty, but high degree of infectivity and the predominance of the disease in children make fungal infections especially with *Microsporum canis* species quite a serious epidemiologic problem in many countries of Europe. Eradication requires elimination of the natural source of the infection, represented mainly by stray animals. Cooperation between dermatologists, epidemiologists and veterinaries is needed for successful prevention.

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## EPIDEMIOLOGIJA DERMATOMIKOZA U ISTOČNOJ HRVATSKOJ – DANAS I JUČER

### S A Ž E T A K

Cilj našeg istraživanja je bio utvrditi učestalost rasprostranjenosti gljivičnih infekcija u Istočnoj Hrvatskoj kroz dva različita razdoblja: I. razdoblje od 1997.–2001. godine i II. razdoblje od 1986.–88. godine. Pacijenti, koji su ambulantno pregledani na Odjelu za kožne i spolne bolesti, Kliničke bolnice u Osijeku, s potvrđenom dijagnozom gljivične infekcije, obrađeni su na osnovu dobi, spola, lokalizacije lezije i uzročnika oboljenja. Za vrijeme prvog razdoblja (1997.–2001.) između ukupno 75691 pregledanih pacijenata dijagnoza Tinea bila je potvrđena u 558 (0.73%) pacijenata, dok je u drugom razdoblju od 47832 ambulantno pregledanih pacijenata bilo 126 (0.26%) pacijenata sa potvrđenom gljivičnom infekcijom. Ovo pokazuje značajan porast gljivičnih infekcija u populaciji naše regije kroz petnaestogodišnje razdoblje. Među oboljelima najviše je zahvaćena populacija mladih ispod 16 godina života, a u odnosu na spol veća učestalost bolesti utvrđena je među pripadnicima ženskog spola. Najčešća lokalizacija u prvom periodu bila je koža lica, trupa i udova; zatim koža dlanova i tabana; vlasitište i nokti; a najčešće izoliran uzročnik bio je: Trichophyton, Microsporum, te Candida spp. U drugom periodu najčešće su bili zahvaćeni dlanovi i tabani, zatim koža lica, vrata, trupa i udova, vlasitište i nokti. Najčešće izolirane vrste bile su: Trichophyton, Candida, Microsporum spp. Iz gore navedenih podataka u dva različita razdoblja vidljivo je: 1) značajno povećanje gljivičnih infekcija u našoj regiji; 2) značajne promjene u vrsti uzročnika (povećanje infekcije uzrokovane Microsporum spp. i Candida spp.); i 3) promjene u lokalizaciji lezije.