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Dermatophytosis in Makkah Region: Current Status

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Abstract: Dermatophytosis is a common infection involving hair, skin or nail/caused by related fungal species belonging to three genera, *Microsporum*, *Epidermophyton* and *Trichophyton*. This study was done to have a general idea about dermatophytosis status in Makkah region and their main causative agents. Clinical specimens were collected from 63 patients attending different dermatology clinics in the main public and specialized hospitals in Makkah city. The study was carried out in the period of February to November 2011. The collected specimens were processed by direct examination using KOH preparation and by culture on SDA. Dermatophytes species were identified based on cultures morphology and microscopy. In addition, the laboratory records of 103 dermatophytes suspected cases seen at King Khalid National Guard Hospital during the period between 2009 and 2011 were retrieved and analyzed. Trichophyton was the most common etiological agent in this study (13 out of 63 and 8 out of 103). The second most common species were belonging to the genus *Microsporum*.

Key words: Dermatophytosis, Sabouraud's dextrose agar, lacto phenol cotton blue, region, genus

INTRODUCTION

This term dermatophyte refers to three specific genera of fungi *Epidermophyton*, *Trichophyton* and *Microsporum*. These three genera have an especially strong association with fungal infections of the skin, hair and nails. Indeed, the association has historically been so strong that diseases due to these three genera have often been given their own names, even though clinically identical diseases might be caused by fungi of other genera. Dermatophytes infected keratinized tissues and digest keratin by the mean of keratinase enzyme. They transmitted by direct or indirect contact with lesion of human, contaminated floors, shower stalls, locker rooms benches, barber clippers, combs, hair brushes and clothing. Spores enter through breaks in the skin and moist areas and germinate into filamentous growths. In addition, the infection can be also acquired from contact with soil of infected animals.

Dermatophytes are grouped into three categories on the basis of host preference and natural habitat: anthrophilic species are primary associated with human and rarely infect animals, zoophilic species are essentially animal pathogens, although, they may cause infection in human, geophilic sspecies are primary soil inhabiting and only rarely encountered as agents of ring worm with the exception of *Microsporum gypseum* (Greenwood *et al*., 2002; Emmons, 1934).

The dermatophytes are a group of closely related fungi which mainly reproduce asexually but also have a perfect species classified in the family Arthrodermataceae of the order Onygenales in the division Ascomycota (Simpanya, 2000).

Dermatophytosis are among the most prevalent superficial mycoses in the world, affecting almost 25% of world's population (Foster *et al*., 2004; Kawai, 2003; Faergemann and Baran, 2003; Mitchell *et al*., 1994). Hot and humid climate in tropical and subtropical countries make dermatophytosis a common fungal skin infection. Data concerning the prevalence of infection with dermatophytes in Saudi Arabia are scares and there is no available mycological data regarding dermatophytes incidence in Makkah region. The aim of this study was to determine the patterns of dermatophyte infections in this region.

MATERIALS AND METHODS

The prospective study: Skin, hair and nail samples were collected from 63 patients suspected having dermatophytosis from the main governmental hospitals in Makkah city. These hospitals included Al Noor Hospital, Heraa Hospital, King Faisal Hospital and King Abdulaziz Hospital. In addition, a total of 103 hospital patient's data who were previously diagnosed with dermatophytosis during the period between 2009 and 2011 were retrieved from King Khalid National Guard hospital medical records. All patients according to their age were grouped into four categories, children (1-10 years), adolescents (11-20 years), adults (21-45 years) and those >45 years old.

Nail samples were collected by clipping from any discolored, dystrophic or brittle parts of the nails and by scrapping materials from underneath the nail. Scales from skin lesions were taken by scraping outwards with a blunt scalpel from the edges of the lesions where most viable fungi were likely to be found. In case of scalp lesions, infected hair specimens were collected with sterile forceps. All specimens were divided into two portions, one for direct microscopy and the other for culture (Kawai, 2003; Faergemann and Baran, 2003; Mitchell *et al*., 1994).

Specimens were examined microscopically using 10% Potassium Hydroxide mounts (KOH) for the presence of fungal hyphae and/or spores. Positive and negative specimens were cultured onto Sabouraud's dextrose agar containing cycloheximide and chloramphenicol as selective agents. Inoculated plates were incubated at 37°C for 4-6 weeks. (Richardson and Warnock, 2000). Cultures were identified by colony configurations and microscopically by sections mounted into Lacto Phenol Cotton Blue. These slides were examined under light microscope for the presence of micro and macro-conidia characteristic for dermatophytes. Before the start of the study and collection of specimens, an ethical clearance was obtained from the Hospital Internal Review Board.

The retrospective study: In the retrospective study, the King Khalid National Guard Hospital laboratory records of patients' materials collected from patients suspected of having dermatophytosis were analyzed. The records included in the study were comprised the results of 103 specimens consisting of 21 hair, 66 skin and 16 nail specimens. In order to protect the patients' privacy no personal data were retrieved and only clinical data were used in the analysis.

RESULTS

The prospective study: The 63 specimens were collected from four hospitals in Makkah region. More than half of patients' materials (52.4%) were collected from Al Noor Hospital (4 hair, 26 skin and 3 nail specimens) followed by King Abdulaziz Hospital (25.4%) which were consisting of 4 hair, 8 skin and 4 nail specimens. Heraa Hospital provided almost 20% of the specimens (2 hairs and 10 skins) and only 2 specimens were obtained from King Faisal Hospital.

The number of positive specimens was only 16 out of 63 suspected materials (25.4%). The distribution of males and female patients in the studied population was almost similar (33 (52.4%) males versus 30 (47.6%) females); however, the positive specimens were slightly higher in the male patients in comparison to the female patients (30-20%, respectively). Adolescents' patients had the highest number of positive specimens (n = 6; 60%) compared with the other age groups (Table 1).

Most of patients were Saudi nationals (n = 56, 88.9%) and the non-Saudi patients were only 7 patients (11.1%), however there was no significant different in the number of positive cases in both groups.

Dermatophytes were positive only in skin specimens (14 out of 45) and in hair (2 out of 11) specimens. None of the nail specimens (n = 7) revealed positive direct examination or culture for dermatopyhtes. In the studied materials, the result of direct examination and the result of culture were in a complete agreement and sensitivity of both techniques for the diagnosis of dermatophytes was equal. The three genera of dermatopyhtes, *Trichophyton* (13 isolates), *Microsporum* (2 isolates) and *Epidermophyton* (only 1 isolate) were recovered in this study.

The retrospective study: Out of 103 analyzed laboratory records 13 cases (12.6%) were to be positive for dermatopyhtes. Males were consisting 57.3% of the patients with 9 out of 59 positive specimens (15.3%). In the remaining 44 female cases (42.7%), positive specimens were found in only 4 patients (9.1%).

In this historical patients records, children had the highest number of positive specimens (n = 5; 27.8%) compared with the other age groups (Table 1). As with the prospective group of patients, Saudi nationals were the majority of the patients (n = 85; 82.5%) and again there was no difference in the infection rate between Saudi and non-Saudi patients.

Table 1: Dermatophytes positive and negative specimens in materials collected from suspected cases of dermatophytosis in the city of Makkah

	Prospective study			Retrospective study		
Groups	Positive	Negative	Total	Positive	Negative	Total
Children (1-10)	3 (18.8%)	13 (81.2%)	16	5 (27.8%)	13 (72.2%)	18
Adolescents (11-20)	6 (60%)	4 (40%)	10	3 (15%)	17 (85%)	20
Adults (21-45)	4 (15.4%)	22 (84.6%)	26	3 (6.7%)	42 (93.3%)	45
Olds (46 and older)	3 (27.3%)	8 (72.7%)	11	2 (10%)	18 (90%)	20
Total	16	47	63	13	90	103

Results presented according to the different age groups

Table 2: Comparison between prospective and retrospective studies done for suspected cases of dermatophytosis in Makkah region

Cases	Prospective	Retrospective
Number of specimen	63	103
Most infected gender	Males	Males
Most infected age group	Adolescents	Children
Most infected (Saudi and versus non-Saudi)	No difference	No difference
Most common specimen	Skin	Skin
Sensitivity of direct examination (%)	100	92.3
Specificity of direct examination (%)	100	80
The most common etiological agent	Trichophyton	Trichophyton
Prevalence of dermatophytes (%)	25.4	12.6

In this historical group, dermatophytes was also positive only in skin (10 out of 66) and hair (3 out of 21) specimens and again, none of the nail specimens (n = 16) were positive for direct examination or culture for dermatopyhtes. It was found that sensitivity of direct examination for the diagnosis of dermatophytes in this historical group of patients 92.3% with specificity up to 80%. *Trichophyton* and *Microsporum* were found to be the only genera of dermatophytes isolated (8 and 5 isolates, respectively) from this historical group of patients. Table 2 compare between the two studied groups.

DISCUSSION

Superficial mycoses, dermatophytes are responsible for many of the most common fungal infections in recent years. During the period of this study, samples were collected from 63 patients (prospective study) and 103 cases were collected from King Khalid National Guard hospital data base (retrospective study) which were diagnosed as having a superficial fungal infection. Microscopic identification was performed and causative agents were identified by cultural morphology.

The number of positive specimens for dermatopyhtes was between 25.4 and 12.6% in the prospective and retrospective groups. Although, the study materials were collected the same region but still this small variation can be justified. Unlike the historical group which was part of the routine hospital research, the prospective study was done as a part of a research project with the involvement of more expert mycologist which apparently resulted in increased fungal detection and cultivation rates. Slightly higher rates of infection were found in the male patients in comparison to the female patients.

Adolescent patients had the highest number of positive specimens (60%) in the prospective group while in the retrospective group the highest positivity was found in the children group (27.8%). However, this difference in positive rates within the two groups had little statistical importance due the small numbers of patients in the different age groups. Future studies need to be done with larger number of patients in order to proof or reject this possible association in the population.

It's not unexpected to have most of the patients from the Saudi Nationals, since only few non Saudi residents have the privilege to be treated in governmental hospitals in which the study was conducted.

Different dermatophyte genera were isolated from skin and hair specimens but not from nail specimens. One reason why dermatophytes were not recovered from nail specimens could be due to the fact that onychomycosis can be caused by fungi other than dermatopyhtes such as Candida and non-dermatophytic moulds, like Scopulariopsis and Aspergillus (Greenwood *et al*., 2002; Emmons, 1934).

Identification up to the species level was not done in this study but as expected, Trichophyton was the most prevalent dermatophyte responsible of ringworm infection in the region, followed by Microsporum (Simpanya, 2000). Species determination in dermatophytes is important, since most of the species have a natural habitat and therefore are linked to possible source of infection. Unfortunately, the clinical microbiology laboratory in the hospitals where the study was done, does not identify dermatophytes up to the species level. Routinely, dermatophytes are identified by demonstrating macro-conidia from slow growing fungi growing on Sabouraud's dextrose agar containing cycloheximide. The Genus *Microsporum* can be easily distinguished from *Trichophyton* with macro-conidia (if present). However, in the case of *Trichophyton*, species determination is not only dependent on morphology of micro and macro conidia only but on many additional tests such as dermatophytes test medium, cycloheximide tolerance test, as well as hair perforation are needed.

Further studies need to be carried out in this important region to determine the exact distribution of dermatophytes species. Since, Makkah is characterized by heavy and diverse human population, the use of conventional mycological diagnosis only in not sufficient for the understanding of the epidemiology of dermatophytes infection. Molecular identification and re-definition of the exact taxonomic position of clinical isolates of dermatophytes in an area such as holy Makkah is mandatory (Emmons, 1934; Gemmer *et al*., 2002; Chimelli *et al*., 2003; Ellabib *et al*., 2002; Kannan *et al*., 2006).

Human travel influences the distribution of endemic fungi. For instance, *Microsporon audouinii* has replaced *Trichophyton tonsurans* as the causative organism in the United States. Comparison of the past and present epidemiology is therefore very important. Unfortunately, available historical data is also missing in species identification and therefore this type of comparison of changes in the epidemiology cannot be done in the current study but this issue needs to be considered in future studies.

In Islamic countries, the slaughter of animals during Eid may increase the rate of infections caused by zoophilic dermatophytes. In the holy city of Makkah, there would be a similar incidence because of the large number of animals slaughtered during the Hajj season. However, no data has been found to establish a link between increased incidence of zoophilic dermatophytes infections and these seasons of pilgrimage. Further studies in man and animals are needed to study any possible correlation.

CONCLUSION

Further studies with larger sample size need to be done in order to establish the true prevalence and the species distribution of dermatophytes in this important region.

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