

SHORT COMMUNICATION

Dermatophyte Prevalence in Tools of 43 Hairdressing Salons in Copenhagen

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Dermatophyte infection of the scalp (tinea capitis) mainly affects pre-pubertal children. Adults might be asymptomatic carriers. Infection caused by anthropophilic dermatophytes can cause epidemics, as conidia from an infected patient are easily spread to others. The prevalence of asymptomatic carriage differs geographically, ranging from 0.1–49.0% (1).

In Denmark, the anthropophilic dermatophytes *Trichophyton violaceum* and *T. tonsurans* caused approximately 45% of the dermatophyte infections at the beginning of the 20th century. The prevalence of these species declined in the 1930s, when *Microsporum canis* became the most commonly identified pathogen of tinea capitis. Recently, *M. canis* has been superseded as the most common cause of tinea capitis by the endemic anthropophilic dermatophyte *T. violaceum*¹. This trend has also been observed in other Nordic countries, primarily among immigrants from endemic areas, e.g. Africa and the Middle East (2–6).

Hairdressing salons have consistently been found to be a reservoir of anthropophilic dermatophytes (6–9). We therefore conducted a study of hairdressing salons serving a mixed population of immigrants and native Danes.

METHODS

Based on data from a Turkish study by Uslu et al. (8) the prevalence of anthropophilic dermatophytes in hairdressing salons was estimated to 5% (positive samples in 2 out of 32 hair salons sampled). A calculation was performed to determine the sample size needed to observe at least one event given the probability of occurrence equals the prevalence. Setting prevalence to 5%, and the probability of occurrence to 90%, $n=43$ would be a sufficient sample.

Hence, we conducted an explorative study on a random sample of 43 urban hairdressing salons in mixed high- and low-income areas of greater Copenhagen. In each hairdressing salon 1 comb, 1 haircutting tool and a random 10 × 10 cm area of the floor close to the area in which customers were served were sampled for dermatophytes using sterile cotton swabs moistened with sterile distilled water, as described by Uslu et al. (8). Sampling was performed immediately after consent had been obtained, thus giving no time for salons to incidentally or purposefully clean fomites before sampling. The samples were cultured on site, on 2 plates of Sabouraud-glucose-agar (SGA);

one with and one without cycloheximide and chloramphenicol (SSI, Diagnostika, Hillerød, Denmark).

The SGA were incubated at 25°C for up to 6 weeks (2). Identification to species level was performed according to the micro- and macro-characteristics of the cultures (10, 11).

A questionnaire regarding the total number of costumers, the frequency of children, ethnicity of the majority of customers, and tool cleaning methods and habits was designed. The questionnaire was planned to be completed after specimen sampling.

Informed consent was obtained in writing from the owners of the hairdressing salons. Participation was voluntary and data were anonymized before analysis. The secretary of the local research ethics committee waived the need for ethical approval, as no biological material could be traced to a particular individual.

No information other than the consecutive number of the type of sampling and the result was recorded. It was not possible for the researchers or others to trace the results to the sampling site. However, hairdressing salon proprietors were offered the opportunity to contact the research group anonymously by stating their allocated number in order to receive their results.

RESULTS

A total of 43 hairdressing salons in the Copenhagen area participated in the study. A total of 172 samples from hairdressing tools (57 combs and 57 scissors) and 58 floor samples were cultured. In all salons hair was noted on the floor as well as on hairdressing tools. One geophilic dermatophyte (*T. terrestre*) was cultured from a floor sample. No anthropophilic or zoophilic dermatophytes were cultured from hairdressing tools.

None of the 43 hairdresser salons completed the entire questionnaire. The most common reasons were being busy with customers, or language problems, making interviews impossible. The general impression was that there was no regular cleaning of hairdressing tools other than sweeping of hair debris from the tools.

DISCUSSION

A thorough examination for pathological dermatophytes in 43 hair salons in urban Copenhagen yielded no findings of anthropophilic dermatophytes. One culture of *T. terrestre*, a geophilic dermatophyte, was isolated from a floor sample of one salon. This “positive control” indicated that sampling methods, culture and analysis were sound.

The number of anthropophilic species isolated in Denmark has been increasing during the last 2–3 decades¹ (2). The present study was unable to demon-

¹Saunte DM, Jensen RH, Svejgaard EL, Arendrup MC. Dermatophyte infections in Denmark during the last 10 years. S28.3. 19th EADV Congress, 6–10 October, 2010, Gothenburg, Sweden.

strate the presence of anthropophilic species within the hairdressing salons and thus was unable to support the theory that the salons represent an important source of transmission. It could be argued that hairdressing salons might not be relevant vectors for dermatophytes in Denmark. Furthermore, it is worth mentioning that the most frequent means of contagion is by contact with close relatives and classmates (1, 3, 12).

However, studies in other countries have consistently found hairdressing salons to be important vectors of infection due to contamination of tools (6, 8). Previous studies have used contamination of hairdressing salons as an indicator of the burden of tinea capitis in society, particularly where the fungi are prevalent and occur in epidemics (13).

As a limitation, the sample size calculation and, subsequently, the size of the study, should be addressed. One could argue that as only few anthropophilic dermatophytes are isolated from symptomatic patients in Denmark each year¹, the prevalence in this population must be very low. However, generalizing from symptomatic patients, to hairdressing tools and salon floors where mostly asymptomatic carriers might leave their debris is not simple, especially as the number of asymptomatic carriers is expected to be higher than the prevalence of tinea capitis (7, 14). There are no recent studies of the prevalence of tinea capitis and asymptomatic carriers in urban Denmark. We therefore felt inclined to use the prevalence of studies with similar methodology, although ethnically somewhat geographically removed, with the risk of performing a less conservative sample-size calculation (8). Although we targeted areas with a large population of immigrants and ethnic hairdressing salons the estimated prevalence may have been too high, resulting in an insufficient number of samples. Nonetheless, the current study yields valuable information and a future larger study would be relevant, including the interview with the prepared questions regarding customers and cleaning habits. The hairdressers rarely refused the sampling in sight of their customers. However, they often excused themselves due to lack of time or language difficulties when we asked to do a short interview. We considered contacting the hairdressers before visiting/sampling, but were concerned that a “warning” would lead to cleaning of the tools and floor before our visit. Cooperation with the hairdressers’ association could legitimize the project and ease the sampling process in a future study.

The background of the negative outcome of this study may be that anthropophilic dermatophytes are uncommon in the population and the segments of the population visiting the salons sampled. Tinea capitis is predominantly a disorder of pre-pubertal children and is common in inner-city cosmopolitan communities (15). One may speculate that the children who are prone to infection have their hair cut at home by relatives, as it is quite expensive to have a haircut in Denmark.

In conclusion, hair salons are not a common or significant source of dermatophyte infections in Denmark.

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