

Occurrence of Fungal Contamination due to Unhealthy Haircutting during Hajj

Omar B Ahmed¹, Atif H Asghar², Bassam H. Mashat³, Ibrahim HA Abd El-Rahim⁴, Hegazy AI⁵

Department of Environmental & Health Research, the Custodian of the Two Holy Mosques Institute for Hajj & Umrah Research, Umm Al-Qura University, P.O. 6287, 21955 Makkah Al-Mukaramah, Saudi Arabia.

Abstract: During hajj, some pilgrims shave or shorten their hairs in streets or in unlicensed salons which lack health and safety standards. This study was undertaken to determine the occurrence of fungal contamination of hair samples in pilgrims who practice this kind of haircuts. About 150 hair specimens collected in pre-sterilized Petri dishes. Each hair specimen was cultured into two Sabouraud's dextrose agars, one of them was fortified with chloramphenicol and cycloheximide. The result showed that 103 samples were found positive for fungal growth. The number of non-dermatophytes was 88 (85.4%) mainly *Aspergillus* (66), *Penicillium* (19), while the dermatophytes number was 15 (14.6%) mainly *M. audouinii* (5) followed by *T. terrestris* (4) species. The highest dermatophytes number (3) was seen in three nationalities Egyptian, Nigerian and Pakistani, while the highest age group number was seen in people with age < 20 years old (5) followed by people with age group > 60 years old (4). It was concluded that unsafe or unhygienic haircuts can be a potential risk for dermatophytic fungal infection. It is worth noting that the numbers of healthy salons need to be increased.

Keywords: Dermatophytes, Haircuts, Pilgrims, Fungal culture, Hajj

1. Introduction

Every adult Muslim, who has the physical and financial means, is required to travel to Makkah to perform Hajj, at least once in his/her lifetime. During hajj, shaving or having their haircut is ritually obligated. Men may have their hair completely shaved or shortened. Some pilgrims practice self haircuts or go street haircuts or unlicensed salons which practice haircutting without following the health and safety standards, causing health problems and other environmental issues such as biological pollution (Arulogun and Adesoro, 2009). Both pilgrims and barbers are at risk of infection, whether viral, fungal or bacterial. The hair waste generated by those irregular barbers would typically be left without disposing and is accumulated either as open dumps or thrown away in open spaces. This kind of waste if inhaled in large amounts can result in several respiratory issues. Oil and other organic matter sticking to the hair will rot over time. This rot will usually become a source of foul odor as well as a breeding environment for pathogens (Gupta, 2014). It is possible that some people could have contracted some type of fungal infection from contaminated scissors or shavers (Chanda and Khan, 2004; Wazir et al., 2008). There are approximately 1.5 million different species of fungi on Earth, most of them are not dangerous but only about 300 of them are harmful to health and known to make people sick (Garcia-Solache and Casadevall, 2010). Superficial fungal infections are localized to skin, hair, and nails and are distributed worldwide especially in the tropical countries. They are common worldwide and believed to affect 20% to 25% of the world's population, and the incidence continues to increase (Havlickova et al., 2008). Crowded living and mass gathering are conditions that can promote this kind of infection. For example, "ringworm" or "tinea capitis" is an infection of hair and scalp caused by dermatophytes. Both anthropophilic and Zoophilic dermatophytes can cause it. Dermatophytes are divided into three genera, *Trichophyton* (T), *Microsporum* (M) and *Epidermophyton* (E) each with various species. Some species are distributed worldwide, such as *T. rubrum*, *T. mentagrophytes* var. *interdigitale*, *M.*

canis, and *E. floccosum*. Others may be restricted to only geographic areas, such as *T. schoenleinii* (Eurasia, Africa), *T. soudanense* (Africa), *T. violaceum* (Africa, Asia, and Europe), and *T. concentricum* (Pacific Islands, Far East, and India) (Hawksworth, 2001; Ameen, 2010). This study was performed to determine the occurrence of dermatophytic and other fungal contamination in pilgrims due to unhealthy haircutting during hajj in Makkah, Saudi Arabia.

2. Material and Methods

This study was undertaken in Makkah during hajj 1434H (October 2013) at the Adha Feast day. About 150 hair specimens were collected from 150 male pilgrims from different nationalities in pre-sterilized Petri dishes and tightly closed. Demographic data including age and nationality were collected using a questionnaire with informed consent. Each Petri dish was labeled indicating the date of collection. Each hair specimen was cultured into Sabouraud's dextrose agar (SDA) fortified with chloramphenicol (0.05 mg/ml) and cycloheximide (0.5 mg/ml) after treatment with 10% KOH for 1-2 minutes. A duplicate inoculation of the specimen was also cultured on SDA and kept in culture room at a temperature of $25 \pm 2^\circ\text{C}$. The cultures were examined each 2 - 3 days for 3 - 4 weeks for the development of any fungal growth. The isolates were examined visually and microscopically for morphology of fungi using lactophenol cotton blue by slide culture technique (Mc Ginnis, 1980; DeHoog & Guarro, 1995; Ellis, 2002). If mixed growth of fungi occurred, a dilute suspension of the material was transferred on SDA Petri dishes in triplicates. After an incubation of 24 h, the single germinating spores with initial hyphal growth were removed using a sterilized long needle and transferred to fresh slants of SDA medium.

3. Results

Out of 150 hair specimens collected from 150 pilgrims who cut hairs in unlicensed barbershops, 103 (68.7%) samples

were found positive for fungal growth, some of them showed mixed growths. The non-dermatophytes positive samples was 88 (85.4%) mainly *Aspergillus* (66) (Figure 1), *Penicillium* (19), *Cladosporium* (8), *Mucor* (5), *Rhizopus* (4) species. The dermatophytes number was 15 (14.6%) (Table 1). Among dermatophytic isolates, *M. audouinii* was the most common species (5) (Figure 2) followed by *T. terrestre* (4). The data in Table 1 also reveals the growth of different

dermatophytes on people of different nationalities and ages. Dermatophyte isolates were found to be distributed across 8 different nationalities. The highest ratio (3) was seen in three nationalities; Egyptian, Nigerian and Pakistani. Regarding the age, the highest ratio (5) was seen in people with age group < 20 years old followed by people with age group > 60 years old (4).

Table 1: Frequency of dermatophytes and their ratio on people of different nationalities and ages.

| Species 15 | <i>M. audouinii</i> | <i>M. gypseum</i> | <i>T. interdigitale</i> | <i>T. mentagrophytes</i> | <i>T. terrestre</i> | <i>T. tonsurans</i> | | |
|-------------|---------------------|-------------------|-------------------------|--------------------------|---------------------|---------------------|--------|---------|
| | 5 | 1 | 1 | 2 | 4 | 2 | | |
| Nationality | Egyptian | Saudi | Nigerian | Sudanese | Indonesian | Pakistani | Yemeni | Turkish |
| | 3 | 1 | 3 | 1 | 2 | 3 | 1 | 1 |
| Age | < 20 | 20-30 | 31-40 | 41-50 | 51-60 | > 60 | | |
| | 5 | 2 | 2 | 1 | 1 | 4 | | |



Figure 1: non-dermatophyte fungi (*Aspergillus* sp.)



Figure 2: Dermatophyte fungi (*M. audouinii*)

4. Discussion

The Adha (Sacrifice) Feast is one of the two yearly holy feasts (Eids) for Muslims around the world. In the first day of this feast, pilgrims in Makkah should exit ihram by getting their heads completely shaved or their hair slightly shortened. Both shaving and shortening are permissible for men, though shaving is preferable. Despite the availability of salons, where sanitary conditions are available, many pilgrims go to have their hair cut in streets (unknown barbers) or in unlicensed salons, which lack minimum health requirements. Bad practices can result in some injury to the

scalp and will promote the spread of fungi from one person's hair to another. Items such as razors, scissors, combs, clippers and barbers themselves are considered as possible carriers for the diseases (Silverberg et al., 2002). The present study addresses the prevalence of fungi from hair samples taken from 150 pilgrims who shaved or shortened their hair through those unknown barbers or in unlicensed salons. The result showed that 103 samples were found positive for fungal growth. *Aspergillus* and *Penicillium* were found to be the most predominant non-dermatophytes fungi. These organisms were also detected in similar studies (Moharram et al., 1988; Enemuor et al., 2013). Fungi are everywhere and no geographical area is free from these organisms. In present study 14.6% of the positive isolates were dermatophytes. This is an indication that ringworm or dermatophytosis can also be spread via these barbershops. In similar study, Sekula et al. (2002) found high fungal contamination, including dermatophytes, in 75% of the studied salons. From these findings, it is clear that hygienic practices in these salons lack minimum health requirements and too far below expected standards. In the present study, *M. audouinii* was the most common species followed by *T. terrestre*. Many studies showed that the incidence of *M. audouinii* was higher in the natural hair (Moore and Suite (1993); Silverberg et al., 2002). The prevalence of dermatophytic species varies among different regions and changes in the existing living and hygiene conditions. In this study, dermatophyte isolates were found to be distributed across 8 different nationalities. The highest dermatophyte number is seen in three nationalities; Egyptian, Nigerian and Pakistani. According to our data these nationalities were found practice this type of haircutting in high numbers. Dermatophyte distribution is influenced also by age (Srejaard et al., 1982). In this study, the highest ratio (5) was seen in people with age < 20 years old followed by people with age > 60 years old (4). Almost always tinea capitis occurs in small children (Oyeka and Okoli, 2003). A decrease in the incidence of dermatophytic infection with age may be due to the post pubertal changes (Philpot, 1997). The exception is the development in immunocompromised adults. In conclusion unsafe or unhygienic practices when barbering or shaving may affect the health of pilgrims and can be a potential risk for dermatophytic and fungal infection. It is worth noting that the number of healthy

salons that follow regulations, guidelines and best practices during hajj, need to be increased.

References

- [1] Ameen M (2010). Epidemiology of superficial fungal infections. *Clin Dermatol.* 4;28(2):197-201.
- [2] Arulogun O S and Adesoro M O (2009) . Potential risk of HIV transmission in barbering practice among professional barbers in Ibadan, Nigeria. *Afr Health Sci.* Mar 9(1): 19–25
- [3] Chanda SK, Khan KH (2004). Sharing of razor blade in salons and risks of spreading HIV in Bangladesh. Poster exhibition. The 3rd IAS conference on HIV pathogenesis and treatment, 10.5: 02
- [4] DeHoog ,G.S. and Guarro, J. (1995). Atlas of clinical fungi centre albureau voors chimmel cultures. universitar Rovira invirgili , Netherlands. pp. 720.
- [5] Ellis, D. H. (2002). An introduction to medical Mycology. [www. Mycol. Adelaide. Edu. Au.](http://www.Mycol.Adelaide.Edu.Au)
- [6] Enemuor SC, Ojih MI, Isah S and Oguntibeju OO (2013). Evaluation of bacterial and fungal contamination in hairdressing and beauty salons. *Afr. J. Microbiol. Res.*7(14),1222-1225.
- [7] Garcia-Solache MA, Casadevall A (2010). Global warming will bring new fungal diseases for mammals. *mBio*1(1).
- [8] Gupta A(2014). “Human Hair “Waste” and Its Utilization: Gaps and Possibilities,” *Journal of Waste Management*, vol. 2014,Article ID 498018, 17 pages, 2014.
- [9] Havlickova B, Czaika VA, Friedrich M (2008). Epidemiological trends in skin mycoses worldwide. *Mycoses*, 51(4):2-15.
- [10] Hawksworth DL (2001). The magnitude of fungal diversity: the 1.5 million species estimate revisited. *Mycol Res* 2001;105:1422-1432.
- [11] Mc Ginnis, M.R. (1980). Laboratory hand book of medical Mycology Academic press, New York. p. 356.
- [12] Moharram AM1, Abdel-Gawad KM, Mohamed el-Maraghy SS (1988). Ecological and physiological studies on fungi associated with human hair. *Folia Microbiol (Praha)*. 1988;33(5):363-71.
- [13] Moore M.K, Suite M. (1993). Tinea capitis in Trinidad. *J. Trop. Med. Hyg.* 96(6): 346-348
- [14] Oyeka CA, Okoli I. Isolation of dermatophytic and non dermatophytic fungi from soil in Nigeria. *Mycoses* 2003; 46:336-338
- [15] Philpot C M “Some aspects on the epidemiology of tinea. *Mycopathologia* 1997; 3: 62.
- [16] Sekula SA, Havel J, Otillar LJ (2002). Nail salons can be risky business. *Arch. Dermatol.* 138:414-415.
- [17] Silverberg N.B, Weinberg J.M, De Leo V.A. (2002). Tinea capitis: focus on African American women. *J. Am. Acad. Dermatol.* 46(Suppl 2): 120-124.
- [18] Srejaard E, Onsberg P, Rosman N, Sylvest B. Dermatophytes and dermatophytosis in Denmark. *Mykosen* 1982; 25 (5): 263-269.
- [19] Wazir MS, Mehmood S, Ahmed A, Jadoon HR (2008). Awareness among barbers about health hazards associated with their profession. *J. Ayub Med. Coll. Abbottabad*, 20: 35-38.