



Research Article

Isolation and Identification of Dermatophytes Associated with Barbing Instruments in Ungogo Local Government Area, Kano State

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ABSTRACT

Dermatophytosis is a common superficial infection that affects people irrespective of regional differences all over the world. The aim of this research was to isolate and identify dermatophytes associated with barbing instruments in Ungogo Local Government Area of Kano State. In the methodology, swabs and scrapings associated with barbing saloons were collected as samples. Direct microscopy was done using 10% potassium hydroxide (KOH) and the samples were also cultured on Sabouraud Dextrose Agar (SDA) for the isolation of the associated dermatophyte species. The result revealed an overall occurrence of 53(13.8%) positivity rate with four different dermatophytic species (with *Trichophyton rubrum* (41.5%), *Trichophyton mentagrophytes* (24.5%), *Microsporum canis* (17.0%), and *Microsporum tonsurans* (17.0) identified. The result also indicated that hair combs (66.0%) were more contaminated with dermatophytes than clippers which had (34.0%). Contamination of instrument per species showed that *T. rubrum* had more occurrence on hair comb (63.7%) than clippers (36.4%); *T. mentagrophyte* also occurred more on hair comb (67%) than on clippers (33.3%). Similarly with *T. tonsurans* and *M. canis* were more isolated from hair comb than clippers. Dermatophytosis can easily be spread between individuals in barbing saloons, via the barbing instruments; *Trichophyton*s and *Microsporum* species are of particular concern in the study area.

Keywords: Barbing instruments; Dermatophytosis; Dermatophytes; Isolation and identification; Public Health

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INTRODUCTION

As a disease, dermatophytosis is one of the commonest fungal infections that attacks the nail skin, and human hair across the globe. It causes great morbidity especially in children residing in developing countries (Haro *et al.*, 2023a). Among the filamentous fungi, dermatophytes are the most common cause of diseases, with an infection rate of up to 20%-25% worldwide. Dermatophytes usually infect the hairs, the nails, and skin, causing multiple superficial dermatophytosis, such as tinea pedis, tinea capitis, tinea corporis and onychomycosis among others. In case of immunocompromised individuals, dermatophytes sometimes invades the dermal tissue and eventually the deep organs and these infections

may progress to life-threatening situation if not properly managed (Deng *et al.*, 2023).

The dermatophytes are a unique group of filamentous fungi that invade keratinous tissues of animals and humans thereby causing diseases. They are recognized by their ability to invade the superficial layers of the epidermis, especially, the stratum corneum and the high appendages reach in keratin concentration (the hair and nails) of the infected host. But they rarely proliferate or survive in deeper tissues of the host (Adefemi *et al.*, 2011).

Trichophyton rubrum and *Trichophyton interdigitale* are the most prevalent agents of dermatophytosis (Numan *et al.*, 2024). The genera *Trichophyton*, *Epidermophyton* and *Microsporum*, contain other

dermatophytes which based on differences in adaptations to specific situations, these genera and their species can be classified further into anthropophilic, zoophilic, and geophilic animals according to hosts and ecological habitats (Numan *et al.*, 2024).

Some species that are anthropophilic include *Trichophyton rubrum* and *Epidermophyton floccosum* which tend to adapt to humans and cause chronic infections with mild clinical symptoms, whereas zoophilic dermatophytes from animals, include *Trichophyton mentagrophytes*, *Trichophyton canis* and *Trichophyton benhamiae*. The geophilic species from soil, like *Microsporum gypseum*, are less adapted to human epidermis condition. The capability of species to invade cornified tissues of human and other animals leads to disintegrating nails, damaged hairs, and scaly skin, because of their keratinophilic and keratinolytic activities of dermatophytes which are their two major traits. But this infection is limited to the cornified layers because its inability to infiltrate immunocompetent hosts' mucosal surfaces, deeper tissues and organs (Numan *et al.*, 2024).

Among the fungal infections, the most common cases across the globe are cutaneous mycoses, mostly caused by dermatophytes which occupy the epidermal layer and live on the keratin of nails, hair and skin. These infections occur in various regions of our body, such as our feet, hands, groin and extremities among others (Jeya Priya *et al.*, 2023).

Dermatophytosis is a superficial fungal skin infection, one of the most common fungal diseases all over the world which leads to serious morbidity, particularly in developing countries of the world. Dermatophytosis has a specific designation depending on the anatomical site affected, such as tinea capitis (on the head), the tinea corporis, (on the trunk or nonhairly body parts of the body) or tinea pedis (on feet/digits or athletes' foot). Tinea capitis is one of serious public health concern among children in developing world. It is common in children with incidence increasing in summer (the rainy season between May and August) and declining in the winter time (dry season). High temperature and humidity are favourable factors that leads to increased incidence of the disease (Haro *et al.*, 2023b).

MATERIALS AND METHODS

Study Area

The study was conducted at Ungogo Local Government Area Kano, Kano State. It has an area of 204Km² and population of 369,657 based on the

official 2006 National Population and Housing Census (Ado, 2009).

Study Population/Objects

Some information about sterilization practices of the barbers, which involved a questionnaire or interview to assess cleaning protocols in saloons were obtained from the workers. The barbing instruments included in this study were clippers, razors, scissors, hair combs, and other tools that come into direct contact with the scalp or skin of customers.

Determination of Sample Size

The sample size was obtained using the formulae

$$n = \frac{Z^2 p(1-p)}{d^2}$$

n = desired sample size

Z = confidence level which is at 95% i.e 1.96

P = prevalence of the parameter = 50.5% = 0.505 (Njila *et al.*, 2017)

d = desired accuracy = 5% = 0.05

$$n = \frac{1.96^2 \times 0.505(1-0.505)}{0.05^2}$$

n = 384 samples

Collection of Sample

Swab or scrapping samples were collected from barbing instruments (clippers, razors, scissors, combs) after they have been used on clients and before any cleaning or sterilization has taken place. Samples were also taken from multiple barbing salons, ensuring representation across Ungogo Local Government Area (Menegbe *et al.*, 2022). The samples were transported to the laboratory for processing and mycological examination.

Direct Microscopy Using Potassium Hydroxide

A wet mount of a portion of each specimen was prepared in one to two drops of 10% potassium hydroxide on a clean grease-free microscopic slide. The preparation was allowed to stand for about 5 minutes for the digestion of keratin to occur, it was examined under low (10×) and high (40×) objectives of the light compound microscope for the presence of fungal elements (hyphae and conidia) bodies (Menegbe *et al.*, 2022).

Isolation and Identification of Fungi

The collected specimen were placed directly onto the surface of the Sabouraud Dextrose Agar (SDA) using sterile forceps or an inoculation loop, which were pressed slightly to ensure good contact between the specimen and the agar, which were incubated in slanted position at 25–30°C in an inverted position for 7-14 days to prevent condensation from dripping onto the medium (Ahmad *et al.*, 2020).

Data Analysis

The data obtained and the results generated were analyzed for frequency and percentages using SPSS version 20.0

RESULTS

In the result, a total of three hundred and eighty-four (384) samples were collected from combs and clippers in which 53 (13.8%) yielded growth and 331 (86.2%) yielded no growth (Table 1). The distribution of isolates identified showed 35(66.0%) were

obtained from combs, and 18 (34.0%) were obtained from clippers (Table 2). Distribution of the dermatophyte species according to the type of barbing instruments revealed *T. rubrum* had the highest of 14(63.7%) in comb while clipper 8(36.4%); *T. tonsurans* had 6 (67%) in comb while clipper had 3 (33.3%); *M. canis* were 5 (56%) in comb while clipper had 4 (44.4%); *T. mentagrophytes* had 8 (67%) in comb while clippers had 4 (33.3%) (Table 4).

Table 1: Distribution of Dermatophyte Contamination rates among Clippers and Combs

Instruments	Number of Sample	Number positive (%)	Number negative (%)
Clippers	192	18(9.4%)	174(90.6%)
Combs	192	35(18.2%)	157(81.8%)
Total	384	53(13.8%)	331(86.2%)

Table 2: Occurrence of the Dermatophyte Isolated from Barbing Instruments

Isolates	No. of Isolates	Percentage (%)
<i>T. rubrum</i>	22	41.5
<i>M. canis</i>	9	17.0
<i>T. mentagrophytes</i>	13	24.5
<i>M. tonsurans</i>	9	17.0
Total	53	100

Table 3: Distribution of the Isolates According to Type of Barbing Instrument

Instruments	<i>T. rubrum</i>	<i>T. tonsurans</i>	<i>M.canis</i>	<i>T.mentogra</i>
Comb	14(63.7%)	6(67%)	5(56%)	8(67%)
Clipper	8(36.4%)	3(33.3%)	4(44.4%)	4(33.3%)
Total	22.0	9.0	9.0	13.0

Key: T= *Trichophyton*, M= *Microsporum*

DISCUSSION

The findings of this study revealed that clippers had 18 positive samples, representing 9.4% of the total 192 clippers assessed, while 174 (90.6%) were negative, but combs showed a higher contamination rate with 35 positive samples accounting for 18.2% of the 192 combs evaluated, while 157 (81.8%) turnouts to be negative. These findings are consistent with those reported by Kutawa *et al.* (2021), who noted that combs and other barbing salon instruments often serve as reservoirs for pathogenic microorganisms due to improper sterilization practices. Their study reported a contamination rate of 60.0% among hair care tools, which is much higher than 13.8% observed in our work. Similarly, Ogba *et al.* (2017) found a contamination rate of 34.7% among barbering instruments in Calabar South Local Government Area of Cross River State, particularly in clippers, brush and combs. They emphasized that combs were more likely to harbor microbes due to repeated use without adequate disinfection, which

supports the higher contamination rate observed in combs (18.2%) compared to clippers (9.4%) in this study.

In this study, a total of 53 dermatophyte isolates were identified from contaminated grooming instruments. Among these, *Trichophyton rubrum* was the most frequently isolated species, accounting for 22 isolates, which represented 41.5% of the total. This was followed by *Trichophyton mentagrophytes* with 13 (24.5%), while both *Microsporum canis* and *Microsporum tonsurans* had equal frequencies of 9 (17.0%). The predominance of *T. rubrum* in this study aligned with findings by Ogba *et al.* (2017), who reported that *T. rubrum* as the most common dermatophyte frequently associated with tinea corporis and tinea pedis. Similarly, Mbata and Nwajagu,(2008), in a study conducted in Northern Nigeria, observed that *T. rubrum* was the predominant dermatophyte isolated from barbering salon tools, which closely mirrors the prevalence observed in the current study. This also agrees with

the report of Takwale *et al.* (2001) whom reported *Microsporum canis* and *Trichophyton mentagrophyte* were the most prevalent organisms causing Tinea capitis in Northern Nigeria. This finding is in contrast, to the reported of Kutawa *et al.* (2021), who documented *Rhizopus stolonifera* as the predominant isolates in their study tagged: characterization of fungi associated with barbing tools in Dutsin-ma Metropolis, of Katsina State-Nigeria. It is also not in agreement with the study of Thappa, (2002) and Enemuor *et al.*, (2012) who reported *Rhizopus* spp, *Mucor* spp and *Aspergillus* spp as the most predominant species causing Tinea capitis in the South East. The study also revealed that, out of the total of 53 dermatophyte isolates recovered from grooming instruments, 35 (66%) were obtained from combs, while 18 (34%) were isolated from clippers. This indicates that combs served as the primary source of contamination, contributing twice as much as clippers to the overall dermatophyte burden. These findings are in agreement with those of Kutawa *et al.* (2021), who reported a higher fungal contamination rate in combs compared to clippers, attributing this to the more frequent and direct contact of combs with the scalp and hair, often without adequate disinfection between uses. Similarly, Ogba *et al.* (2017) observed that combs are more prone to dermatophyte contamination due to the accumulation of hair debris, scales, and sebum, which create a conducive environment for fungal spores to thrive. This shows that the sterilization method of the clippers by the application of methylated spirit followed by flaming is more effective than washing with detergents and 10% hypochlorite which is applicable to the brushes and combs. The 34.0% recovery rates of dermatophytes from clippers depict incomplete sterilization leading to mere reduction in microbial load.

CONCLUSION

The findings of this study demonstrate a significant presence of dermatophytes on grooming instruments, particularly hair combs, which accounted for a higher proportion of fungal contamination compared to clippers. *Trichophyton mentagrophytes*, *M. canis*, and *T. tonsurans* distribution pattern suggests that hair combs, due to their direct contact with the scalp and frequent reuse without adequate disinfection, serves as a major vehicle of transmission of dermatophytes in barbing salons.

Based on the outcome of this study the following recommendations were made: Barbers should be

educated and mandated to use effective sterilization methods such as sterilizer or disinfectant solutions (e.g., 70% alcohol, sodium hypochlorite) after each use of grooming tools. Awareness campaigns should be carried out to educate both barbers and the public on the risks of dermatophyte transmission and the importance of maintaining personal hygiene and instrument sterilization. Where feasible, the use of disposable hair combs and clipper guards should be encouraged to minimize the risk of cross-contamination between clients.

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