# ISOLATION AND IDENTIFICATION OF PATHOGENIC MICROORGANISMS ASSOCIATED WITH BARBERS' EQUIPMENT IN WUKARI, TARABA STATE, NIGERIA

Supported by tetfund TERTIARY EDUCATION TRUST FUND

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**Received:** October 21, 2019 **Accepted:** February 16, 2020

**Abstract:** There is a growing concern that barbers' equipment such as clippers, clipper steps, combs/brushes may contain pathogenic microorganisms which serve as causative agents of infections associated with barbing salons. This study aimed at isolation and identification of pathogenic microorganisms associated with barbers' equipment, forty (40) barbing shops were visited out of about 300 barbing shops found in Wukari. A total of one hundred and twenty (120) samples were collected. Using standard microbiological techniques these samples were examined and a total of three (3) potentially pathogenic bacteria and five (5) fungi were isolated. Bacterial isolates include *Staphylococcus* sp, *Streptococcus* sp, and *Bacillus* sp. Fungal isolates include *Aspergillus* sp, *Trichophyton* sp, *Malasseza* sp, *Mucor* sp and *Microsporum* sp. These organisms were least prevalent on clippers compared to every other equipment examined with a total of forty six (46) microorganisms isolated from clippers and a total of seventy two (72) on both clipper steps and combs, which makes one assume that more attention is usually given to clippers than other equipment during sterilization. However, the presence of pathogenic microorganisms on all the equipment indicates poor hygienic practices among barbers in Wukari metropolis. *Bacillus* sp, isolated from this study was the most resistant bacterial isolate while *Streptococcus* sp was the most susceptible. Appropriate measures should be taken to reduce microbial load from barbing instruments and reduce risk of infections.

**Keywords:** Isolation, pathogens, Barbers' equipment, Wukari

## Introduction

Barbers have been described as persons who engage in the practice of barbing, with such practices including the performance of the following: shaving or trimming the beard or cutting the hair of humans, giving facial or scalp massage with oils, creams, lotions or other preparations, either by hand or mechanical appliances, singeing, shampooing, arranging, dressing or dyeing the hair or applying hair tonic, applying cosmetic preparations, antiseptics, powders, oils, clays or lotions to scalp, face or neck or upon the head of a human being for any purpose whatsoever except for the treatment of disease or of physical or mental ailments (Andrew and Rossana, 2016).

Barbers are important professionals in the community and their shops are mostly owned, maintained and financed by individuals of that community (Enemour *et al*., 2012). It has been shown that barbing operations includes hair cutting, face and scalp massaging, dying, shampooing of hair (Janjua and Nizamy, 2004). Salons are personal service establishments that provide services which may present potential health concerns to their client including the risk of infection (caused by microorganisms) and sometimes injury (Adeleye and Osidipo, 2004; Barn and Chen, 2011). These health risks may vary depending on the kind of the service, the tool and equipment that are used, physiological state of the client and the kind of service provided (Stout *et al.,* 2011) which can be transmitted between clients if proper infection control procedures are not implemented.

Microorganisms are living things that are ordinarily too small to be seen without magnification (Kathleen and Arthur, 2002). Microorganisms are ubiquitous, existing even on skin surfaces and are continually introduced into the environment which could easily spread between client and operators via contact with unwashed hands, soiled equipment or contact with blood and body substances (De Souza and Shibu, 2004).

Since barbering practices involve the use of equipment such as clipper and razor, they may pierce the skin accidentally and transmit pathogenic microorganisms as well as causing injury. The blood and other body fluids do not have to be visible on instruments, equipment or working surfaces before infections can be transmitted. Other primary infections associated with barbing practices include skin infection of the scalp, neck, and face such as impetigo and fungal infection such as ringworm and *Tinea capitis* (Brown 2006; Amodio *et al.,* 2010; Barn and Chen, 2011). Louse infestation has also been reported to be associated with barbing salons and transmitted by contact (Ruddy *et al.,* 2001). A significant population of the community enjoys the service of barbers, their shops and professional practices serve as sources of transmission of various infections directly or indirectly with some bacterial infection occurring without breaking the skin (Salami *et al.,* 2006).

Healthcare is one of the most important aspects of all human endeavors aimed at improving the quality of life, since sound health is absolutely necessary for strength and prosperity of a nation. Health has been declared as the fundamental human right. Despite this recognition, there is a denial of this right to millions of people especially in the developing countries (Enemour *et al.,* 2012). In the developing countries it is known that infectious disease cause about 25% of all human death and account for 11 million deaths yearly (Kumar and Clark, 2005). Many of the infectious diseases are preventable or treatable but have continued to be successful due to lack of personal and environmental hygiene, ignorance and poor political commitment from the government. In developing countries, infections remain the main cause of death in humans and are mostly associated with poverty and overcrowding while in developed countries the prevalence of infection are reduced by increasing prosperity, universal immunization and appropriate antibiotics usage. Important routes of transmission of bacteria, fungal or viral infection include airborne, faecal-oral spread, vector borne and direct spread either through person to person contact or by direct inoculation (WHO, 2006).

Different microbiological reports have supported the view that barbershops are contributing to the spread of infectious diseases and allergic conditions including scabies, ringworm infection and dermatitis. A cross-sectional examination in 2001 among one hundred and fifty (150) barbers reported that cross infection happened in barbershops (Zahraoui-Mehadji *et al*., 2004).

Reportedly isolated bacteria from barber shops have been shown to cause various pus-forming diseases in humans such as boils, carbuncles, folliculitis, impetigo contagiosa, scalded-skin syndrome. Isolation of organisms from the equipment and tools used in salons indicate that sterilization methods usually employed by the operations are not effective if at all they sterilize items between clients. Apart from bacteria, fungi have also been isolated from barbers' equipment and this means that hygienic practices in most barbing salons are far below expected standards (Mbajiuka *et al*., 2014).

Actually, a lot of works have been carried out to assess the possible pathogens associated with related objects such as toilets, money and hand wash, but only a few exist, especially in Nigeria, to assess the pathogenic microorganisms associated with barbing equipment.

## Materials and Methods

### *Study area*

This study was carried out in Wukari metropolis in Wukari Local Government Area of Taraba State. Wukari is a large town and the headquarters of Wukari Local Government Area of Taraba State.

Wukari is the home of Federal University Wukari and Jubilee University (Kwararafa University). It has a state veterinary hospital and other private clinics. The major languages spoken are Junkun, Tiv, Hausa and Fulani. The predominant occupations of the people are agriculture, commerce and civil service.

### *Sample collection*

Sample from clippers, clipper step, and hair brushes was collected from forty (40) barbing shops in Wukari. Samples were obtained using a moistened sterile swab stick. After taking each swab, the swab stick was placed back into the casing to avoid contamination and was labeled appropriately. All samples collected were transported to the laboratory without any delay for culture and treated according to standard microbiological methods.

### *Culture*

Samples collected with moistened sterile swab stick were diluted into five (5) quadrants (diluting 1 ml of the diluted sample in 9 ml of sterile distilled water). Using a wire loop, the diluted sample was obtained and inoculated on three different media (Nutrient agar, Mannitol Salt Agar, MacConkey agar and Sabouraud Dextrose agar) using steak method. The inoculated plates were incubated at 37ºC for 24 h. A single colony from grown culture was isolated and sub-cultured on a nutrient agar to obtain a pure culture.

Inoculation on the Sabouraud Dextrose agar was done using spot inoculation, and was allowed to stay at room temperature for 120 h.

### *Identification and characterization*

Based on cultural characteristics (colony color, size, height, shape and texture), the colonies observed in both Nutrient agar, Mannitol Salt Agar and the MacConkey agar were either rhizoid or circular based on shape, large, medium or small based on size, milk or pink based on colour, dried or mucoid based on texture and flat or raised based on height.

### *Subculturing*

From the 24 h culture plates, some plates were selected and subcultured in order to obtain pure colonies. Pure colonies were then characterised on the basis of gram staining and biochemical reactions.

### *Lactophenol blue test*

This test was carried out to observe the mold mycelia and identify fungi. A sterile wire loop was flamed and allowed to cool before it was used to place a drop of lactophenol stain on a sterile grease free glass slide, then a dissecting needle was used to transfer the fungal growth to the slide containing lactophenol blue stain. The fungal growth was then teased on the slide using two dissecting needles before being covered with a cover slip. Excess stain was removed by pressing under blotter and the preparation was examined under the microscope.

## Results and Discussion

Table 1 below shows the cultural, microscopic and biochemical characteristics of the isolates. Pathogenic microorganisms such as *Staphylococcus aureus*, S*treptococcus sp*, *Bacillus sp*, *Aspergillus sp*, *Mucor sp* and *Rhizopus* sp were isolated (Table 2).

**Table 1: Cultural, microscopic and biochemical characteristics of bacterial isolates**

| Colony morphology | Microscopy | Biochemical tests | | | | | | Isolates |
|---|---|---|---|---|---|---|---|---|
| | | Catalase | Coagulase | Oxidase | Glucose | Lactose | Sucrose | |
| Milkish, moist, with raised surface | Gram positive, Round, in singles or clusters | + | + | - | + | + | + | *Staphylococcus* sp. |
| Milkish, raised surface colony | Gram positive, Rod, in singles and pairs. | + | - | - | + | - | + | *Bacillus* sp. |
| Whitish, dried and flat surface | Gram positive, Round in chains, either in pairs or more | - | + | - | + | + | + | *Streptococcus* sp. |

+ = Positive; - = Negative

**Table 2: Characteristics of fungal isolates**

| Colony morphology | Microscopy | Isolated fungi |
|---|---|---|
| White growth spreading and covering the petri dish with length of 6 cm. | Septate hyphae, non-spore forming and colorless | *Malesseziasp.* |
| White hairy growth spreading and covering the entire petri dish. 8.5 cm | Undetected under the microscope | *Mucor*sp. |
| Black powdery growth spread all over the entire petri dish. | Spore forming, non septate hyphae | *Aspergillus* sp. |
| Whitish growth with a deep yellow color beneath, taking a mushroom structure. | Long hyphae, non septate | *Trichophyton*sp. |
| Whitish growth with a golden yellow color on the surrounding, spreading and covering the petri dish by 6 cm | Septate hyphae | *Microsporum*sp. |

Table 3 describes the distribution of the isolates (both fungi and bacteria) on the equipment examined. It was shown that *Staphylococcus* sp. and *Aspergillus* sp were the predominant organisms on the clippers, *Streptococccoccus* sp, *Trichophyton* sp and *Malesessa* sp were also isolated from clippers.

Other genera including *Mucor*, *Trichophyton*, *Malassezia* along with Staphylococci, Streptococci and *Aspergillus* were found on both clipper step and hair brushes/combs while *Bacillus sp*. was found only on hairbrushes/combs.

**Table 3: Distribution of the organisms in the samples**

| Organisms | Clipper | Clipper step | Brush/ Comb |
|---|---|---|---|
| *Staphylococcus* sp. | + | + | + |
| *Streptococcus* sp. | + | + | + |
| *Bacillus* sp. | - | - | + |
| *Aspergillus* sp. | + | + | + |
| *Mucor*sp. | - | + | + |
| *Malesseziasp.* | + | + | + |
| *Trichophyton*sp. | + | + | + |
| *Microsporum*sp. | + | + | + |

+ = Positive; - Negative

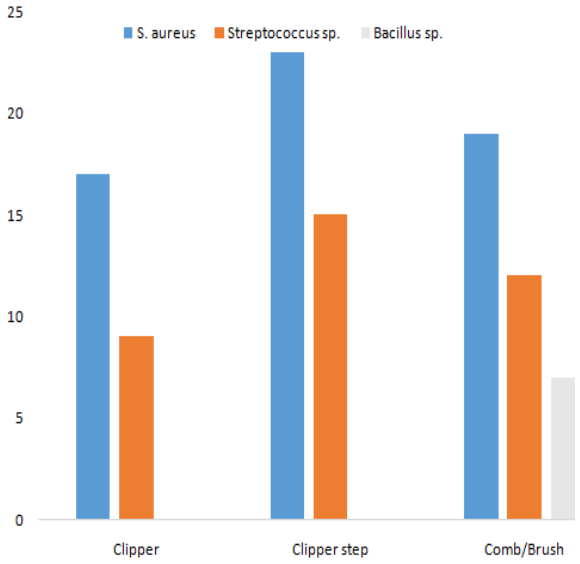


**Fig. 1: Frequency of occurrence of bacterial isolates**

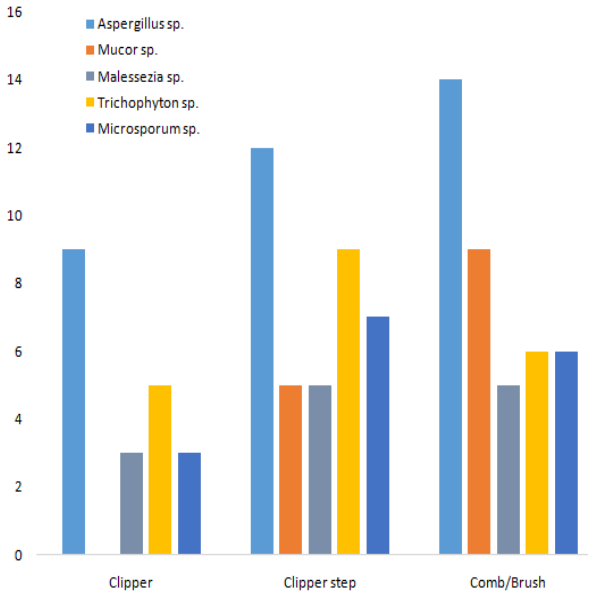


**Fig.2: Frequency of occurrence of fungal isolates**

Figures 1 and 2 show the occurrences of the isolates. *Staphylococcus* spp. and *Aspergillus* sp. were the most abundant, followed by *Trichophyton* sp, *Mucor* sp, *Malesseza* sp, *Streptococcus* sp and *Bacillus* sp.

**Table 4: Susceptibility of bacterial isolates to antibiotics**

| Isolates | *Stap. sp.* | *Bacillus sp.* | *Strep. sp.* |
|---|---|---|---|
| Ciprofloxacin | R | R | R |
| Gentamycin | S | S | S |
| Septrin | S | R | S |
| Streptomycin | R | R | S |
| Rifampicin | S | S | S |
| Chloramphenicol | S | S | S |
| Ampiclox | R | R | R |
| Amoxacilin | S | R | S |

R= Resistant; S= Sensitive; ***Stap. sp.*** = *Staphylococcus sp.*; ***Strep. sp.*** = *Streptococcus sp.*

Bacteria susceptibility to various antibiotics is shown in Table 4. All isolates showed similar pattern of sensitivity to antibiotics except *Bacillus* which was resistant to Amoxicilin and septrinin which others were sensitive to.

This present study is unique in that a metropolitan setting was used as the study area while educational settings were used by Enemour *et al*. (2012) and Mbajiuka *et al*. (2014). The isolates, *Staphylococcus*sp and *Streptococcus* sp obtained in this present study were also reportedly isolated in Kogi State university from instruments used by barbers (Enemour *et al*., 2012) and Michael Okpara University of Agriculture, Umudike, Abia state (Mbajiuka *et al*., 2014). The only difference in both studies is the isolation of *Enterobacter*sp, and not *Bacillus*sp, by Enemour *et al*. (2012) while *Bacillus*sp was isolated from this present study. However this is not strange given that both *Bacillus sp* and *Enterobacter*sp, are soil microorganisms and might have gained access to barbers instruments as a result of poor storage.

Mbajiuka *et al*. (2014) isolated *Staphylococcus* sp, *Streptococcus* sp and *Micrococcus* sp. These bacterial species have been shown to cause various persisting disease in humans such as boils, carbunicles, folliculitis and impetigo. Furthermore the type of fungal species isolated in this present study was of same type isolated by Enemour *et al*. (2012), who reported the isolation of *Aspergillus* sp, *Mucor*sp, *Trichophyton*sp, and *Microsporum*sp. Additionally, Enemour *et al*. (2012) and Mbajiuka *et al*. (2014) isolated *Rhizopus*sp which was not isolated in this present study. Mbajuika *et al*. (2014) nevertheless did not isolate *Trichophyton* and *Microsporum*sp, but *Aspergillus* and *Mucor* sp.

In terms of the distribution of the isolates on various equipment, this study showed that the most contaminated of all the equipment was brush/combs, followed by clipper step. It is obviously so because most barbing shops do not employ any standard sterilization procedure to brush/combs and clipper steps, they rather concentrate on sterilization of clipper which on its own is also grossly inadequately and insufficient to prevent microbial contamination. *Staphylococcus* sp was the most abundant of all bacterial isolates while *Bacillus* sp. was the least abundant because *Staphylococcus*sp exist as normal flora on the skin while *Bacillus*sp is found in soil. Among the fungal species, *Aspergillus*sp was the most abundant while *Malesseziasp* was the least abundant.

The antibiotic sensitivity test as performed in this study was to ascertain the effectiveness of antibiotics in the treatment of the infections transmitted by barbers' equipment. The bacterial isolates demonstrated varied patterns of susceptibility to antibiotics which should be one of the major reasons to maintain sanitary and hygienic conditions in barbing equipment. *Bacillus*sp, isolated from this study was the most resistant bacterial isolate. It showed resistance to five different antibiotics out of the eight used. With this poor sensitivity to antibiotics, infections with this organism could be lethal since treatment required will basically be futile. The most susceptible bacterial isolate was *Streptococcus*sp. It was sensitive to six (6) out of the eight (8) used antibiotics.

**Conclusion**

The high prevalence of microorganisms on barbing equipment shows that no standard sterilization methods have been employed on barbing equipment and hence, the poor hygienic practices of barbers in Wukari. It can also be concluded that more attention is given to clippers than other instruments during sterilization resulting in the high contamination rate of other barbing equipment.

**Conflict of Interest**

Authors declare that there is no conflict of interest related to this paper.

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