

Occurrence of *Staphylococcus aureus* on Environmental Fomites in Ile Ife, Osun State

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ABSTRACT

Staphylococcus aureus, a Gram positive coccus has been recognized to be an important pathogen both in the Community and in the Hospital. The aim of this study was to determine the occurrence of *Staphylococcus aureus* on environmental fomites and to determine the antimicrobial susceptibility of the isolates recovered to various antibiotics. A total number of 50 samples were obtained from different sources in Obafemi Awolowo University, Ile-Ife, Osun State. These samples were collected from selected area of the University environment such as Banking area, Student's hand mobile phones, door knobs, commercial bus driver's steering and stair rails. The samples were analysed using standard conventional methods and materials in order to isolate, identify and carry out the antimicrobial susceptibility testing. Subsequent Culturing using nutrient broth was carried out. Nutrient agar, Mannitol Salt agar was used for the isolation process. Biochemical test such as Catalase test, Coagulase tests, DNase test, Antibiotic Sensitivity test were carried out to identify the isolates. Strict Sterilization process was ensured while working on the cultures and the materials used. The antibiotic susceptibility test was conducted using Kirby and Bauer disc diffusion method and the results was determined using the clinical and laboratory standard institute (CLSI) 2016 guide. The total number of 34 (68%) Staphylococcal isolates were recovered from 50 samples when streaked on Mannitol salt agar (MSA). And 19 (38%) isolates were confirmed to be *Staphylococcus aureus*. The highest rate of isolation of *Staphylococcus aureus* isolates were obtained from samples collected from student hand mobile phones, followed by samples collected ATM touch boards and commercial Bus steering. 100% of the *Staphylococcus aureus* isolates were susceptible to Streptomycin, followed by 78.95% of Ciprofloxacin and 73.68% seprtrin. All isolates were resistant to Amplicox and Amoxicilin. About 57.89% were susceptible to Zinnacef, 26.32% were susceptible to Gentamycin.

From the study, it can be inferred that environmental fomites serve as breeding and transmission site for proliferation of *Staphylococcus aureus* which may play an important role in human colonization and infection in Ile-Ife, Osun State.

Keywords: *Staphylococcus aureus*; Infections; Antibiotic resistant; fomites; Antibiotics

INTRODUCTION

Epidemiology of *Staphylococcus aureus*

Staphylococcus aureus is a worldwide recognized pathogenic organism which has a vital role it plays in causing food borne illness and its transfer within and out of the community. Transmission of *Staphylococcus aureus* is rather easy, it can be transmitted via various sources majorly fomites, human hands. Strains like the methicillin-resistant *Staphylococcus aureus* (MRSA) are also prevalent in all various parts of the world causing about 3% *Staphylococcus aureus* infections [1,2,3]. One of the major sources and spread of community *Staphylococcus aureus* infections are fomites [4,5]. Fomites are objects (inanimate) that harbour and are capable of transmitting organism from an infected person

to another person [6]. The role of fomites in the transmission of infection has been debated for many years, however, there is increasing evidence that contaminated inanimate surfaces and especially those frequently touched by hand can contribute to the spread of health-care associated pathogens [7]. In the developing world, mortality associated with severe *Staphylococcus aureus* infections far exceeds that in developed countries [8,9]. Recent studies have identified *Staphylococcus aureus* as the main etiological agent of many infections in sub-Saharan Africa [10]. A number of investigations have reported that *S. aureus* is among the most frequently encountered bacterial species in microbiology laboratories in Nigeria [11,12,13]. In this study, we investigated occurrence of *Staphylococcus aureus* on environmental fomites in Ile Ife, Osun State Nigeria.

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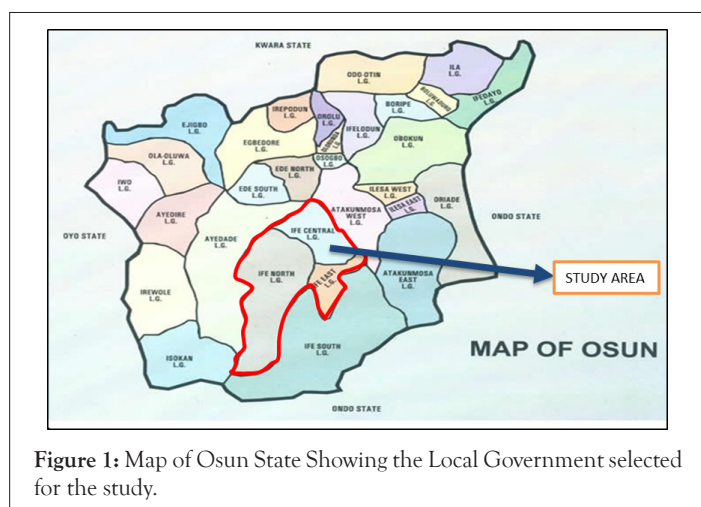
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MATERIALS AND METHODS

A total number of 50 samples were swabbed from different sources such as door handles (10), ATM touch board (10), Stir-case rail (10), and Hand mobile phones (10) and Bus steering (10) in Obafemi Awolowo University environment, Ile Ife Osun state in Figure 1.



mobile phones, door knobs, Commercial bus driver steering etc. Ile-Ife is an ancient city located in Latitude 7.5165°N, Longitude 4.5286°E.

Isolation, identification and characterization

A loop full from turbid nutrient broth containing the sample was streaked out on Mannitol Salt Agar (MSA), until pure colonies were isolated (which showed bright golden yellow colour of fermentation on MSA after 48 hours of incubation) and then sub-cultured on Nutrient Agar (for further test) into petri dishes. Gram staining, microscopy, morphological identification, catalase test, coagulase test, DNase test, Oxidase test, sugar fermentation analysis and antimicrobial susceptibility trends of the isolate were conducted.

RESULTS

A total number of 34 (68%) Staphylococcal isolates were recovered from 50 samples when streaked on Mannitol Salt Agar (MSA). Nineteen (38%) isolates were confirmed to be *Staphylococcus aureus*. The highest rate of isolation of *Staphylococcus aureus* isolates was obtained from samples collected from student hand mobile phones, followed by samples collected from ATM touch boards and Commercial Bus steering. (Table 1) shows the percentage occurrence of *Staphylococcus aureus* isolates from fomite sources and (Table 2) shows the biochemical tests result of *Staphylococcus aureus* isolates show in Figure 2.

Sample population

Obafemi Awolowo University is located in Ile-Ife, Osun state, south western Nigeria. Samples were collected from selected area of the university environment such as Banking area, Student’s hand

Table 1: Showing the percentage occurrence of *Staphylococcus aureus* isolates from fomite sources.

S.no	Fomite sources	Number of Staphylococci	Percentage of occurrence (%)	No of <i>S. aureus</i>	Percentage of occurrence (%)
1	Door Knobs (10)	7	70	3	30
2	Mobile Phones (10)	9	90	6	60
3	ATM touch boards (10)	7	70	4	40
4	Bus steering’s (10)	4	40	4	40
5	Stir-case rails (10)	7	70	2	20
Total (50)		54	-	19	-

Table 2: Showing biochemical test results of *Staphylococcus aureus* isolates.

Isolates codes	Catalase	Coagulase	Dnase	MSA
Torimiro Student’s hand phone 2 (TLP2)	+	+	+	F
Awojobi student’s hand phone 2 (ALP2)	+	+	+	F
Adeyemo student’s hand phone (ADP)	+	+	+	F
First bank lecture theatre door knob (FOT)	+	+	+	F
Shittu student’s hand phone (SLP)	+	+	+	F
Union bank Moremi Hall ATM touch board (UBM)	+	+	+	F
Skye bank SUB ATM touch board (SBS)	+	+	+	F
Commercial Bus steering 5 (CBS5)	+	+	+	F
Skye bank banking area ATM touch board (SBB)	+	+	+	F
Commercial Bus steering 7 (CBS7)	+	+	+	F
Awojobi student’s hand phone 1 (ALP1)	+	+	+	F
Commercial Bus steering 1 (CBS1)	+	+	+	F

Access bank white house ATM touch board (ABW)	+	+	+	F
Torimiro Student's hand phone 1 (TLP1)	+	+	+	F
Commercial Bus steering 4 (CBS4)	+	+	+	F
Odudua Hall stair-case rail (OHR)	+	+	+	F
Department of Microbiology door knob (DOD)	+	+	+	F
Chemistry department stair-case rail (CDR)	+	+	+	F
Odudua Hall door knob (OHD)	+	+	+	F

Note: 'F' indicates fermenters.

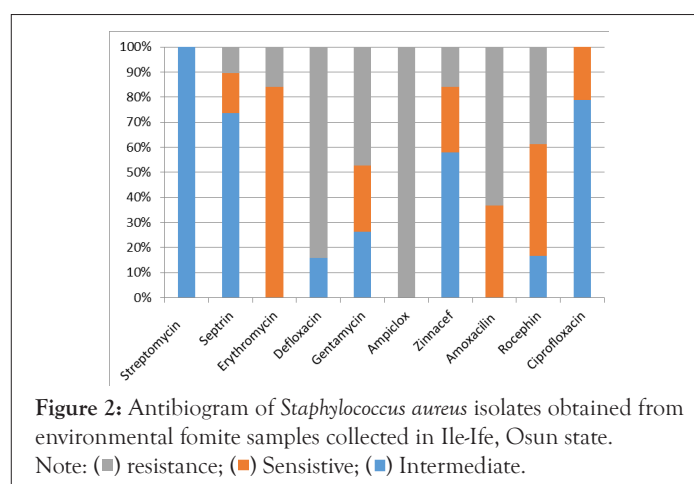


Figure 2: Antibiogram of *Staphylococcus aureus* isolates obtained from environmental fomite samples collected in Ile-Ife, Osun state. Note: (■) resistance; (■) Sensitive; (■) Intermediate.

DISCUSSION

This study revealed the occurrence of *Staphylococcus aureus* on environmental fomite in Ile Ife, Osun state. A total number of 19 (38%) of *Staphylococcus aureus* isolates were recovered from the 34 (68%) Staphylococcal isolates that was obtained from 50 samples collected in Obafemi Awolowo University environment, Ile Ife Osun state. *Staphylococcus aureus* were isolated from all the samples but at different frequencies. From the ten (10) Stair-case rail samples, *Staphylococcus aureus* was recovered from 2 (20%) samples. From the ten (10) door knobs samples, *Staphylococcus aureus* was recovered from 3 (30%) samples. From the ten (10) ATM touch board samples, *Staphylococcus aureus* was recovered from 4 (40%) samples. From the ten (10) Commercial bus steering samples, *Staphylococcus aureus* was recovered from 4 (40%) samples. From the ten (10) Student mobile hand phone samples, *Staphylococcus aureus* was recovered from 6 (60%) samples. This is in accordance with the study carried out by Abdelraouf 2015 in the Faculty of Health Sciences, Islamic University-Gaza, *Staphylococcus aureus* was the most predominant isolate obtained from the touch screen mobile phones used by the university students and employees. Also in accordance with the study carried out by Nwankwo and Offiah, 2016 in the Department of Microbiology, College of Natural Science, Michael Okpara University of Agriculture Umudike, Nigeria which recorded that of all the organisms obtained from 68 samples collected from Automated Teller Machine of various Banks, 17.6% was confirmed to be *S. aureus* (Nwankwo and Offiah) and also correspond with the work of Rachel 2015 in the study of bus interiors, *Staphylococcus aureus* was one of the two predominate organisms isolated from samples collected from bus interior. The most occurrences of *Staphylococcus aureus* was on cell phone and this is because there has been an increase in the use of mobile phones among the students, and this use of phones is common in certain area of the environment where

the percentage presence of this bacteria is likely high, such as Laboratories and toilets. Mobile phones may harbour these pathogenic bacteria because they are commonly handled regardless of the sanitation of hands and hardly disinfected. The use of such mobile phones can serves as a potential vehicle in the transmission of infectious pathogens including multidrug-resistant pathogens such as Methicillin resistant *Staphylococcus aureus* (MRSA). It can be reduced from 100% of the *Staphylococcus aureus* isolates were susceptible to Streptomycin, followed by 78.95% of Ciprofloxacin and 73.68% septrin. All isolates were resistant to Amplicox and Amoxicilin. About 57.89% were susceptible to Zinnacef, 26.32% were susceptible to Gentamycin.

CONCLUSION

From the study, it can be inferred that environmental fomites serve as breeding and transmission site for the proliferation of *Staphylococcus aureus* in Ile-Ife Osun State. Since *Staphylococcus aureus* is one of the major members of the skin normal flora and with its ability to also form biofilm, may play an important role in human colonization and infection. The source of this bacterial isolates obtained from the environmental fomite samples may be from lecturers, students, and other persons who utilize these devices.

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