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MICROBIAL CONTAMINATION OF TOUCH SCREEN MOBILE PHONES OF STUDENTS ENGAGED IN THE LABORATORY.

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ABSTRACT

The study was aimed at determining the microbial contamination of touch screen mobile phones of student engaged in the laboratory. A total of 30 samples were collected. Sterile swab sticks moistened with normal saline were firmly passed on the surfaces of the mobile phones screen and then inoculated on nutrient agar, *salmonella shigella* agar and sabouraud dextrose agar. The organisms revealed included *Staphylococcus* species (60%), *Salmonella* species (20%), *Bacillus* species (40%), *Penicillium* species (30%) and *Aspergillus* species (70%). They study showed that the mobile phones examined were contaminated with microbes. Most of which belongs to natural flora of the human body. Personal hygiene by sterilizing hands after working in the laboratory is recommendation to reduce the incidence of transmission.

Keywords: Microbial contamination, touch screen mobile phones, laboratory, contamination, control, hygiene, pathogens.

INTRODUCTION

The vast majority of mobile phones are hand held with all the achievements and benefits of the mobile phones. It is easy to overlook the health hazard it might pose to its many users. This is against the background that many users may not have regard for personal hygiene coupled with the location of cell center and the likely number of users per day. The constant handling of the phone by different users makes it open arrays of microorganisms, making it a harbor and a breeding ground for microbes especially those associated with the skin. different microorganisms are spread from user to user from mobile phones (Ehasie *et al.,* 2008)

Research has shown that the mobile phone constitutes a major health hazard with tens of thousands of microbes living on each square inch. They harbor more bacteria than a man's lavatory seat, the sole of shoe or the door handle. Microbiologist says that the combination of constant hand with the heat generated by the phone creates a prime breeding ground for many microorganisms that are normally found on the skin.

The human surface tissue (skin) is constantly in contact with environmental microorganisms and become readily colonized by certain microbial species (ogbini and Omu, 1998). The normal microbiota of the skin includes among others; coagulase negative *staphylococci*, *Diphtheroid*, *staphylococcus aureus*, *streptococci* spp. *Bacillus* spp. *Mallassesia furfur* and *candida* spp. other includes *Mycobacterium* spp. (occasionally). *Pseudomonads* and *Enterbacteriaceae* (occasionally) (Uaboi-Egbenni, 2003). The normal microbiota is harmless and may be beneficial in the normal location in the host in the absence of coincident abnormities. They can produce disease condition if introduced into foreign locations or compromise host.

AIM

The study was aimed at determining the microbial contamination of touch screen cell phone of students engaged in the laboratory.

OBJECTIVES

1. To Isolates microorganisms from touch screen cell phones of students.
2. To identify the isolated microorganisms.

MATERIAL AND METHODS

SAMPLE COLLECTION

A total of 30 swab samples were collected from the surfaces of the mobile phones screen of students working in the Microbiology laboratory of Imo State University. The mobile phones were hand held and a swab stick moistened with a normal saline was rotated all over the surface of both sides of the mobile phones.

Sample Inoculation

The samples were streaked aseptically onto plates of nutrient agar. Sabourand dextrose agar and *salmonella shigella* agar. The plates were incubated at 37^{o}c for 24hours for bacteria and at room temperature for 3 days for fungi. The colonies were sub cultured and identified.

IDENTIFICATION OF BACTERIAL AND FUNGAL ISOLATES

The isolates were identified based on their colonial morphology. Gram staining, lactophenol cotton staining and biochemical tests such as catalase, coagulase, oxidase, urease, citrate, indole and methyl red tests were carried out.

RESULTS

For the nutrient agar media. It was discovered that were growth in all the plates and the organisms in the plates

were isolated with the aid of a wire loop and introduced on the slides. The organisms were subjected to Gram's staining and viewed under the microscope to characterize their morphology. *Staphylococcus* sp with the characteristic purple color and grape-like clusters and *Bacillus* with the characteristic purple color and rod shape were the two organisms identified microscopically with the percentage 60% and 40% respectively.

A colony count was undertaken on the different plates and the two distinct colonies were further subjected to some biochemical tests to authenticate their identity.

On Sabouraud Dextose Agar plates, *Aspergillus* sp. and *Penicillium* sp were isolated with the percentage of 70% and 30% respectively. The *penicillium* sp appeared in the plates as large white round colonies within 24 hours culture, bluish-green powdery colonies with white black surface after 48 – 72 hours incubation. On the application of the lactophenol cotton blue and microscopy, the mycelium was seen to be septate and bears branched condiophores with round unbranched chain of conidia on the sterigmata on the plates.

Aspergillus spp was observed to develop greenish white round colonies which gradually turned to wooly greenish black surface and grey black surface. On the application of lactophenol cotton blue and microscopy, the mycelium is seen to be septate with short, dark septate conidiophores. The conidia are brown, large, club likes.

On the *Salmonella Shigella* Agar plates, *Salmonella* sp. was seen growing on some of the plates after 24hours of incubation. The organism appeared to be black in color. This was observed in 6 out of the 30 plates with a percentage occurrence of 20%. It was also observed that there was heavy growth of *staphylococcus* 132 in the medium containing samples of individuals that share their phones with another person in the laboratory. This occurred in 3 out of the 30 phones samples.

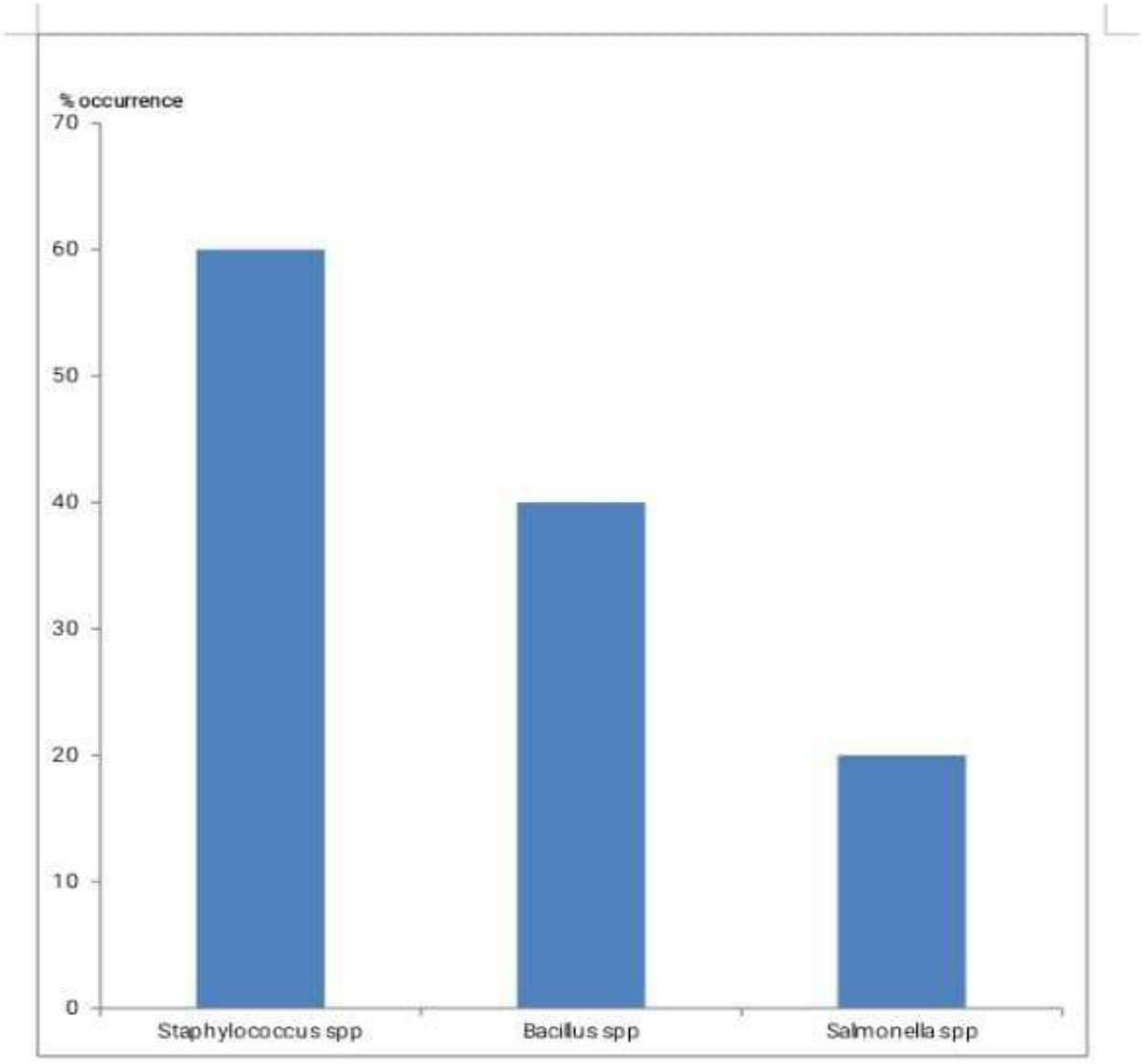

Fig 1: Percentage Occurrence of Bacteria Isolates

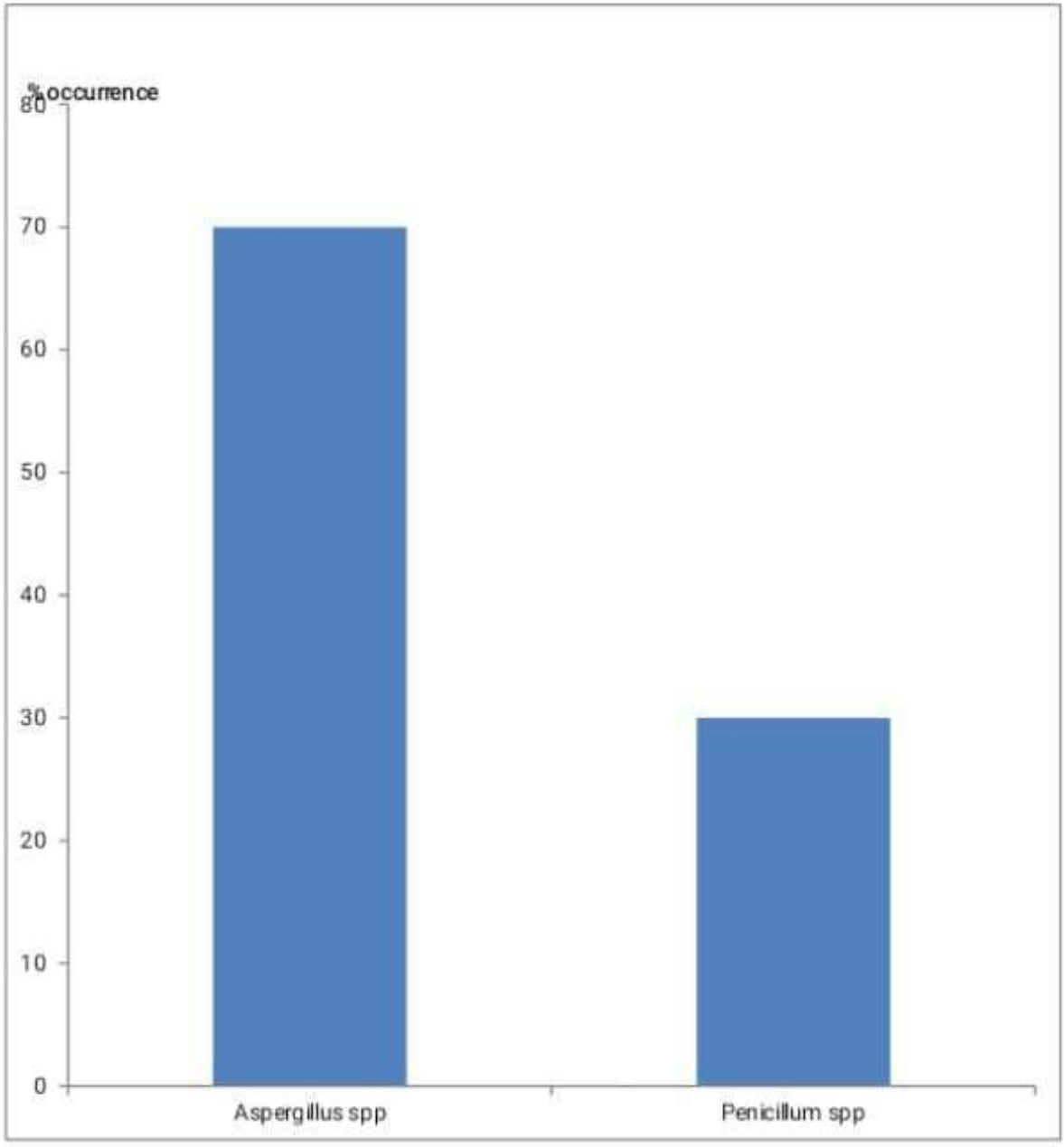

Fig 2: Percentage Occurrence of Fungi isolates

Table 3.2: Fungi isolate from Touch Screen Phones

Fungi isolate	No. (%)
Aspergillus spp.	70
Penicillium spp.	30

Table 3.3: Total Variable Count

Sample	N. A	SSA	Mean
	No. of colony	No. of colony	
1.	120		60
2.	240		120
3.	152		76
4.	108		54
5.	100		50
6.	140		70
7.	190		95
8.	8	40	60
9.	210		105
10.	98		49
11.	200		100
12.	210		146
13.	88		44
14.	96		46
15.	140		70
16.	100	62	61
17.	210		105
18.	230		115
19.	150		75
20.	160	74	117
21.	230		115
22.	81		40.5

23.	280		140
24.	140	88	114
25.	220	210	215
26.	180		90
27.	160		80
28.	130		65
29.	122		61
30.	201		100.5

DISCUSSIONS

In the world over, microbiological standards in hygiene are prerequisite for a healthy living. It is not uncommon however to observe shifts in hygienic practices that deviate from standards in developing and developed world. This investigation confirms such deviation as arrays of microbes are found associated with private and public mobile phones. Also important in the investigation are the factors of location and possible number of users.

The research findings indicate that *staphylococcus* sp., *Bacillus* sp. and *Salmonella* sp. are the main bacterial isolates frequently associated with mobile phones as shown in Fig 1. These organisms may probably have found their entry to phones through the skin and hand to hand mechanism. This is because the two *Staphylococcus* sp., *Bacillus* sp.) of the three isolated bacteria are subset of the normal microbiota of the skin as advanced by earlier researchers (Jawertz *et al.,* 2007). Frequent handling by many users of different hygiene profile having regular skin contact with the phones may have resulted in the frequency and degree of population of isolates. This has a lot of health implication.

Gram-positive cocci found on the mobile phones samples like the *staphylococcus* spp. are opportunistic pathogens which are normal flora of the skin, glands, nose, nasopharynx, gastro intestinal tract that can cause various infections in human. *Staphylococcus aureus* is the most important staphylococcal pathogen that causes boils, abscesses, wound infections, impetigo, toxic shock syndrome, pneumonia and meningitis. *Staphylococcus epidemics* can also cause serious wound infections. *Staphylococcus* harbored either by an asymptomatic carrier or person with disease can be spread by the hand expelled from the respiratory tract or

transported in or an animate or inanimate object like phones, rings, wristwatches etc (Borer *et al.,* 2005).

Proteus vulgaris and *Enterobacter aerogenes* exist as members of the normal intestinal flora of humans, these organisms including Salmonella have been isolated from feces and sewage. They can accidentally be transferred onto the skin through fecal contaminated inanimate or animate material for instances, due to improper and washing after using the toilet. Certain organisms such a *Streptococcus pyrogenes* and *Corynebacterium diphtheriae* which are inhabitants of the nasopharynx are often propelled from respiratory tract into the air during and individuals coughing, sneezing or vocalization (Borer *et al.,* 2005) and eventually settles on the skin of the hand and eventually transferred to the surface of the mobile phone surfaces. The presence of the gram-negative rod, *Salmonella*, indicates the possibility of the presence of fecal contamination on these public handsets. Gram negative sepsis is most commonly caused by *E. coli, Kiebsiella* sp., *Enterobacter* sp. (Bone, 1993).

Pseudomonas aeruginosa aside the fact that it is the epitome of opportunistic pathogen, it is a primarily nosocomial pathogens meaning that it could be transmitted through vehicle (for example surgical instrument, bedding and wrist watch) transmission. *Micrococcus* sp. is a normal flora skin; it can be dispersed into the air during human activities thereby incriminating the organism as one of those organisms likely to be found on mobile phones.

Dust is an important route of airborne transmission. At times a pathogen adheres to dust particles and contribute to the number of airborne pathogens when the dust is an important route airborne transmission. At times a pathogen adheres to dust particles and contributes to the number of airborne pathogens when the dust is resuspended by some disturbance (Prescott *et al.,* 2008). *Bacillus* species are ubiquitous in nature, they are also found in soil, dust and so inanimate materials like wristwatch often come in contact with dust particles containing spores of *Bacillus* species thereby contributing to the types of microorganisms in wristwatches and can lead to infection.

Bacillus subtilis with a 40% frequency occurrence has been identified as an important organism in food spoilage (Jay, 2000). This is no doubt would contribute immensely to food spoilage and food infections if infected hands are used in the preparation or eating of food.

Significantly present also are *Aspergillus* spp. and *Penicillium* spp. as presented in Fig 2 based on mycelia, colour and spores with 60% and 40% frequency of occurrence respectively. These add significantly to food spoilage and food infection through the production of toxins.

CONCLUSION AND RECOMMENDATIONS

The findings in this study have been able to show that personal items such as mobile phones are often colonized by microorganisms and serve as a potential source of infection. Therefore, it is important to encourage higher compliance of hand washing practices routine surface disinfection of personal items and observing major aseptic techniques while working in the laboratory.

The overall implication of this result is that the mobile phones which are meant to make communication easy and assessable by many, if not all, is gradually assuming the status of pathogenic agent of disease transmission and if care is not taken, it could be vehicle for transmission of biological weapon of mass destruction.

Besides soliciting for general hygiene improvement by all, there is need for cost of mobile phone to be reduced as well as the tariff. This is to enable individuals have access to personal mobile phone together with having the financial ability to make calls without resorting to public cell centers.

Although it seems impossible, in the light of these findings, we should be aware of limiting mobile phone usage as it has high risk for spreading infections. Developing active preventive strategies like routine decontamination of mobile phones with alcohol containing disinfectant materials might reduce cross infection. Another way of reducing of bacterial contamination on mobile phones might be the use of antimicrobial additive materials. We could easily avoid spreading bacterial infections just by using regular cleansing agents and rearranging our environment. In the future mobile phones could be produced by using protective material against the bacterial contamination.

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