

A Comparative Study of the Bacterial Contamination among the Mobile Phones of the Doctors and Laboratory Technicians in Jamnagar, Gujarat.

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Abstract: The aim of this study is isolation and identification of bacterial colonies found on mobile phones of various doctors and Laboratory technicians from the city of Jamnagar Gujarat and comparing the bacterial contamination thereby.

A total of 100 mobile phones were randomly selected in the month of December 2017. 50 samples were taken from doctors and 50 from Lab technicians and were streaked on agar plates to examine and isolate the bacterial colonies according to standard microbiological techniques. Data was analyzed based on Chi-test. 92.7% of bacterial contamination was found in the mobile phones of doctors whereas it was seen 2% more among those of laboratory technicians making it 94.7%. The bacterial isolates mainly seen were Staphylococcus Epidermidis (41.1%), Staphylococcus Aureus (36%), followed by Bacillus spp. (33.1%), Pseudomonas Aeruginosa (21.6%), Escherichia Coli (18.3%), Streptococcus spp. (15.9%), Proteus spp. (10.5%), and Klebsiella spp. (6.0%) whereas among the Laboratory technicians bacteria mainly seen were Escherichia Coli (39.3%), Staphylococcus Aureus (35.8%), Pseudomonas Aeruginosa (21.6%), Staphylococcus Epidermidis (21.1%), Proteus spp.(18.9), Klebsiella spp. (16.0%) and Bacillus spp.(17.0%).

Keywords: Mobile phones, Doctors, Laboratory Technicians, Nosocomial infections or Hospital Acquired Infections

1. INTRODUCTION

The first mobile phone call was made in 1973 which was improvised in shape, size and technology from the oldest 1983 Motorola model until now. (1) The mobile phone has now become a common device used very often for communication from rural to urban areas of the world, it has become one of the most necessary accessories for all persons and easily way to contact with the other. (2) It has given rise to the technology wherein the world has become a very small place. In Libya, World's First mobile phones were used in the registration for vote for official election. (3)

The mobile phone used between doctors, Laboratory technicians, patients and visitors were the devices carrying high risk of transmitting bacterial contamination and the infections transmitted through them inside the hospital and the community (2). The mobile phones prove to be the vectors for transmission of these communicable diseases as it provides optimum temperature for the natural flora and bacteria to grow on its surface. The moisture of our skin and optimum temperature of human body especially our palms make the culturing of bacteria easier. (4) Cross contamination occurs between doctors, visitors, Lab. Technicians and visitors. (5) The mobile phone is reservoir for many harmful pathogens which are responsible for the nosocomial infections or Hospital Acquired Infections (2) and become exogenous sources of infection for the family members. (6) Besides, they are also an important source of transmission of bacteria between hands, mouth, face, ears (skin) to the users and others who use the mobile phones of others. (5)

The hands and other instruments of the doctors and Lab technicians are easily cleaned using different types of sanitizing methods but the mobile phones are rarely disinfected. (2)

To reduce this contamination through bacteria or other microbes, the mobile phone devices must be disinfected at regular interval of times with 70% isopropyl alcohol wipes or ethyl alcohol wipes. (7) There is several suggestions from the researchers round the world like while at work, the mobile phones and hand hygiene must be strictly controlled. (Elsevier Health Sciences 2011).

To add further, the best behavior recommended is not to share mobile phones with any one which helps to reduce the transmission of the bacteria from person to person. (8) Moreover, the shape of the phone, size and the space between keys makes it most difficult to clean it. There were many cases reported which proved fatal and caused deaths by the contamination through hands in hospitals. (Elsevier Health Sciences 2011).

1.1. Objectives

The study was aimed to isolate and identify the bacterial colonies on the surface of the mobile phones of various doctors and Lab technicians of a general hospital in the city of Jamnagar (Gujarat) and compare the results.

2. MATERIALS AND METHODS

2.1. Samples collection

This study was carried out during the first half of the month of December 2017 (winter season). A total of 100 samples; 50 from doctors and 50 from Laboratory technicians from different general hospitals of Jamnagar (Gujarat) were collected randomly and were tested for bacterial contamination using standard microbiological techniques. We had taken the required permission from the Hospital authorities from wherever the samples were collected. The samples were collected using a sterile cotton swab stick moistened with normal sterile saline. These swabs were swiped over the surface of the phone, near its keys, the speaker, back, and ear phone. (9) A systematic questionnaire was designed to know various aspects about the mobile owner which is as follows:

2.2. Cultured of samples

All swabs collected were immediately cultured onto different media like Nutrient broth, Macconkey agar, and Blood agar (Oxoid, England) by soaking it on the surface of the media and were then incubated aerobically at 37°C for 24 hours.(9)

2.3. Identification of the bacterial isolates

To identify the bacteria on the samples, the bacterial colonies were isolated and subjected to Gram staining followed by morphological characterization. After recording these observations, further the isolates were tested by biochemical tests according to the standard microbiological techniques by Elmanama, A. A. 2007 (10) and Ramakrishnan, S., Sulochana, K.N. 2012(11)

3. RESULTS

3.1. Isolation and identification of the bacterial colonies:

Among 50 doctors and 50 Lab technicians, bacterial colonies were isolated from various parts of the mobile phones as mentioned in Table 1. The mobile phones showed 94.7% microbial contamination among the lab technicians which exceeded to that of doctors by 2%.

The bacteria mainly identified from the surface of the mobile phones of doctors were *Staphylococcus Epidermidis* (41.1%), *Staphylococcus Aureus* (36%), followed by *Bacillus spp.* (33.1%), *Pseudomonas Aeruginosa* (20.6%), *Escherichia Coli* (18.3%), *Streptococcus spp.* (15.9%), *Proteus spp.* (10.5%), and *Klebsiella spp.* (6.0%) whereas among the Lab. Technicians bacteria mainly seen were *Escherichia Coli* (39.3%), *Staphylococcus Aureus* (35.8%), *Pseudomonas Aeruginosa* (22.6%), *Staphylococcus Epidermidis* (21.1%), *Proteus spp.*(18.9), *Klebsiella spp.* (16.0%) and *Bacillus spp.* (17.0%). The rate of *Staphylococcus epidermidis* was seen highest among the mobile phones of doctors whereas among the Lab technicians it was *E. coli* was highest.

Table 1: Bacterial isolates from mobile phones of doctors and laboratory technicians from various hospitals of Jamnagar in Gujarat state of India.

Types of bacteria	Doctors N=50	Percentage of isolates	Laboratory technician N=50	Percentage of isolates
<i>S. epidermidis</i>	22	41.1	11	21.1
<i>Staphylococcus aureus</i>	18	36.0	17	35.8
<i>E.coli</i>	9	18.3	21	39.3
<i>Klebsiella spp.</i>	3	6.0	9	16.0
<i>P. aeruginosa</i>	10.8	21.6	9.9	20.6
<i>Bacillus spp.</i>	16.4	33.1	8.4	17.0
<i>Proteus spp.</i>	5.2	10.5	8.8	18.9
<i>Streptococcus</i>	7.8	15.9	5.2	10.8

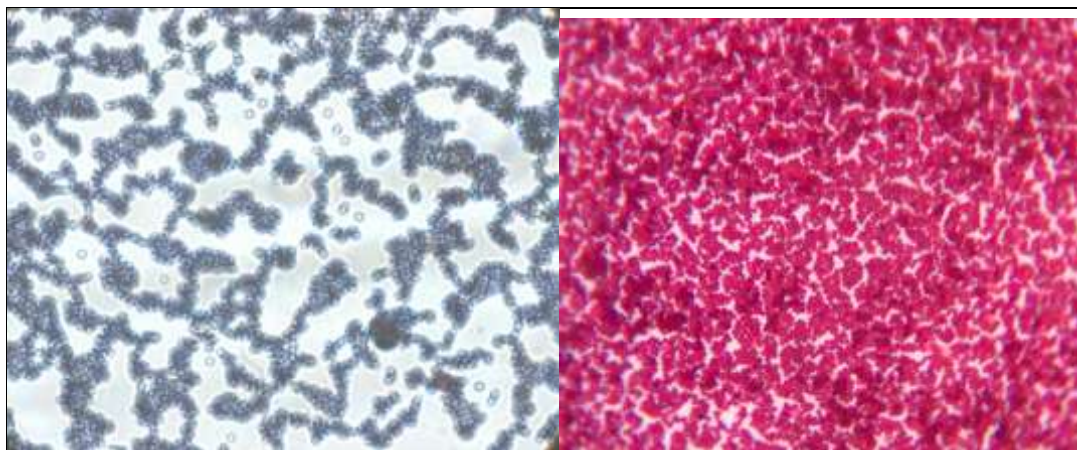


Fig 1: Gram positive bacteria under microscope

Fig 2: Gram negative bacteria under microscope

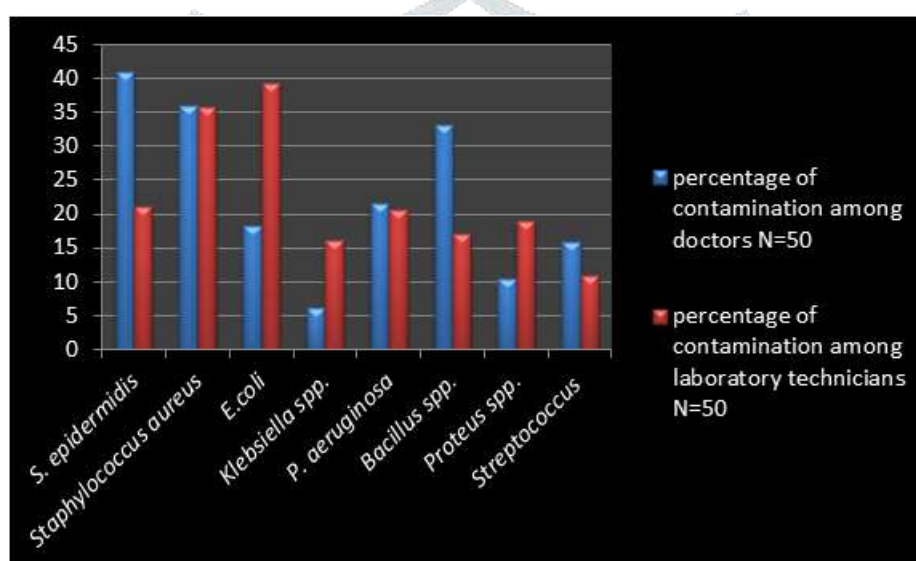


Fig 3: A pictorial representation of the comparison of the bacterial contamination on the surface of the mobile phones of doctors and Laboratory technicians.

4. DISCUSSION

The device used for communication (here mobile phones) of various doctors and Lab technicians are the prime source of transmission of Hospital Acquired Infections and community. (12)

The current study shows a very high prevalence of bacterial contamination on the mobile phones of both doctors as well as Lab technicians. This percentage is higher than the study conducted in Alexandria University students Hospital, Egypt (25%) Selim, H.S., Abaza, A.F. 2015 and lower than the results found in Saudi Arabia Hospitals (83.9%) Kumar, B.V. et al. 2014, Gondar town Hospitals, Ethiopia (98.3%) Gashaw, M. et al. (2014), the teaching Hospital Umberto I in Rome, Italy (86.0%) Orsi, G.B. et al. (2015).

These differences might be due to the hand hygiene observed by the doctors and lab technicians at particular hospitals, the time of usage of the mobile phones, the places where the mobile phones are kept, the place where the mobile phones are used etc.

Among different bacterial isolates, *S. aureus* which is normally responsible for Nosocomial infections and is found on skin was almost common among doctors as well as laboratory technicians which is in agreement with previous studies. (14)

The reason behind *S. aureus* to be common is that it grows on warm environment which is found on the surface of the mobile phones (15) and the skin which is a natural habitat for this bacteria, due to the moisture of the skin it becomes easier to transmit this bacteria among the mobile users and thus gives good atmosphere for the bacterial colonization. (4)

When compared the types of bacterial isolates found from the surface of the mobile phones of doctors and laboratory technicians, they were found to be almost similar which reveals that the transmission of these pathogens must be through the skin contact in

both the cases. In other similar studies carried out, Roy, S.S. et al. 2013, Enterobacteriaceae group particularly *Klebsiella* spp., *Proteus* spp. and *E. coli* were the main Colonies which had high frequency of association with the mobile phones of meat handlers (84%) followed by animal handlers (80%), fish handlers (60%), laboratory attendants (48%), veterinary surgeons (20%) and students (12%) mobile phones which is in agreement by current study that observed the colonies of *E. Coli* strains on the mobile phones of lab technicians. This indicates faecal contamination suggesting poor hand hygiene and handling of mobile phones among lab technicians and doctors. (15)

The colonies of *Bacillus* spp. were lower in rate in contrast to the present study. (15) These bacteria have tendency to produce spores and can resist the change in environment as well as chemical disinfectants. (16)

The present study indicates that the bacterial contamination on doctors and laboratory technicians are more or less similar types that may be transmission to the patients and visitors and among them also, it may also be the reason for the spread of nosocomial infection.

Through this study, it is highly recommended for the stake holders to state the guidelines for disinfecting the device, to limit the usage of mobile phones during working hours, to strictly maintain the hand hygiene and to avoid using the mobile phones at bacteria prone places.

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