

## Frequency of MRSA Isolates in Mobile Phones, Ears and Hands of Healthcare Workers

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Received date: February 3, 2018; Accepted date February 8, 2018; Published date: February 15, 2018

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### Abstract

**Background:** Mobile devices and hand of Healthcare Workers may contaminate with bacteria and become a source of infection.

**Objective:** This study was conducted to identify the types of bacteria in mobile phones, ears, and hands of healthcare workers (HCWs) in Kosti teaching hospital and to determine the frequency of MRSA among *Staphylococcus aureus* isolates from these specimens.

**Materials and Methods:** This was a cross-sectional, hospital and laboratory based study, was carried out in Kosti Teaching Hospital. A total of 120 swab samples were collected from mobile phone, hand and ear of healthcare workers. All the swabs were cultured directly on blood agar, MacConkey agar and chocolate agar. Identification of isolates was done based on colonial appearance, Gram stain, and conventional biochemical tests. All *Staphylococcus aureus* isolates were subjected to antibiotics susceptibility testing using disc diffusion technique. Data were analyzed by statistical package for social sciences (SPSS) software version 17 and presented in form of tables.

**Results:** The frequency of positive culture among mobile phone, ear, and hand swabs were 95% (57/60), 100% (30/30) and 96.7% (29/30), respectively. The frequency of MRSA was 98.6%.

**Conclusions:** Mobile phone, ear and hand of Healthcare Workers were the source of nosocomial infections. Good basic hygiene measures are extremely important, not only for hospital staff but also for patients and visitors, and it has a positive impact in infection control.

**Keywords:** Healthcare; MRSA; Phone; Healthcare Workers; Nosocomial infections

### Introduction

Mobile phones have become an important part of our lives, though they offer plenty of advantages, they are profile breeding site for infectious pathogens in hospitals and communities. Mobile devices uses in hospitals are of particular interest, as they have been implicated in the spread of hospital acquired infections [1,2]. Microbial contamination is commonly found on the mouth piece, although indirect contamination from person to person has decreased with the decline in the use of public payphones, cell phones with buttons and keyboards and other personal mobile phones in general has been found to be even more conducive to bacterial contamination [3,4]. Nosocomial infections pose a serious threat to hospitals all over the world. HealthCare workers (HCW) play a crucial role in spread and transmission of bacteria to hospitalized patients. Strict hygiene standards to prevent hospital acquired infection are of paramount importance in a hospital setting [5-7]. Therefore, the presence of a pathogen on a surface at any concentration may be a risk for transmission, and this is reflected in proposed guidelines for microbiological hygiene standards. In recent years, some studies have been conducted on the potential role played by hands and the mobile phones belonging to health workers and inpatients in the transmission

of important nosocomial pathogens [8,9]. Absence of hygiene may result of colonization of ears, hands, and other part of health workers body with microorganisms and they become a source of infection for others. *Staphylococcus aureus* is a one of most common cause of nosocomial infection. Methicillin resistant *Staphylococcus aureus* (MRSA) has increased spread as a result of drug abuse [10,11]. MRSA is resistant to many commonly uses antibiotics includes penicillin and cephalosporins group. Unfortunately MRSA isolates which susceptible only for glycopeptides antibiotics are becoming multidrugs resistant [11,12]. The increase of contamination of mobile phones and hands of health workers with these bacterial (MRSA) strains can associate with increase of numbers and spread of nosocomial infection as a result of decreased susceptibility of these isolates to antibiotics. This study was conducted to identify the types of bacteria in mobile phones, ears, and hands of healthcare workers (HCWs) in Kosti teaching hospital and to determine the frequency of MRSA among *Staphylococcus aureus* isolates from these specimens.

### Materials and Methods

This was a cross-sectional, hospital and laboratory based study, carried out in Kosti city, White Nile state, Sudan. During the period of August to October 2017 a total of 120 swab samples were collected from mobile phones, hands and ears of healthcare workers in Kosti Teaching Hospital. Each swab was rotated over the surface of both

sides of the tested mobile phone keypad, screen phones or Hand or Ear of healthcare workers. 60 samples were collected from mobile phones, 30 samples from hands and 30 samples from ears of healthcare workers. All the swabs were cultured directly on blood agar, MacConkey agar and chocolate agar (Himedia). All cultured plates were incubated aerobically at 37°C for 24 hours. The primary isolates were subcultured on nutrient agar (Himedia). Identification of isolates was done based on colonial appearance, Gram stain, and conventional biochemical tests [7]. All identified isolates were subjected to antibiotics susceptibility testing by disc diffusion technique according to Clinical and Laboratory Standards Institute (CLSI) 2011 guidelines using Oxacillin (OX) 1 µg disc to detect MRSA [8].

### Antibiotics susceptibility testing

Each isolate was grown on nutrient agar and incubated at 37°C for 24 hours, then using sterile wire loop, 3-5 well isolated colonies were emulsified in 3-4 ml of sterile physiological saline, and bacterial suspension equivalent to 0.5 McFarland was prepared. Each suspension was inoculated on Muller Hinton agar (Himedia) using sterile cotton swab. Using sterile forceps the Oxacillin (OX) 1 µg disc (Bioanalyse) was placed on the surface of agar. Then each plate was incubated aerobically at 37°C for 18 hours. The diameter of each inhibition zone around each disc was measured in millimeter and the result was interpreted as sensitive or intermediate or resistant according to the interpretative chart [8].

### Ethical consideration

The study was approved by Department of Microbiology-University of El Imam El Mahdi and Management of Kosti Teaching Hospital. Verbal consent was taken from each participant and all samples were collected after he/she accepted and knew that they are participating in clinical study.

### Data analysis

All data were analyzed by statistical package for social sciences (SPSS) software version 17 and presented in form of tables.

### Results

The frequency of positive culture among mobile phone, ear, and hand swabs were 95% (57/60), 100% (30/30) and 96.7% (29/30), respectively. The frequency of isolated bacteria was displayed in Tables 1 and 2. Based on susceptibility of *Staphylococcus aureus* isolates to Oxacillin 1 µg, the frequency of MRSA was 98.6% as seen in Table 3.

Isolates	Frequency			Total
	Mobile phones	Ear swabs	Hand swabs	
<i>Staphylococcus aureus</i>	32	16	22	70
Gram negative rod	14	9	2	25
<i>Bacillus spp</i> (Gram positive rod)	11	5	5	21
<b>Total</b>	<b>57</b>	<b>30</b>	<b>29</b>	<b>--</b>

**Table 1:** Distribution of isolates among samples.

Type	Frequency	Percentage
<i>Proteus vulgaris</i>	9	36%
<i>Proteus mirabilis</i>	4	16%
<i>Salmonella para A</i>	3	12%
<i>Citrobacter freundii</i>	2	8%
<i>Klebsiella pneumoniae</i>	1	4%
<i>Providencia spp</i>	1	4%
<i>Morgnella morgani</i>	1	4%
<i>Eschireichia coli</i>	1	4%
<i>Salmonella typhi</i>	1	4%
<i>Enterobacter spp</i>	1	4%
<i>Pseudomonas aeruginosa</i>	1	4%
<b>Total</b>	<b>25</b>	<b>100%</b>

**Table 2:** Frequency of Gram negative isolates.

Antibiotic	Frequency		
	Sensitive	Intermediate	Resistant
Oxacillin 1 µg	1.4% (1/70)	0% (0/70)	98.6% (69/70)

**Table 3:** Susceptibility of *Staphylococcus aureus* isolates to Oxacillin.

### Discussion

Mobile phone, hands and other parts of body can colonize with bacteria and serve as source of infections. As displayed in this study the frequency of positive culture among mobile phone, ear, and hand swabs were 95% (57/60), 100% (30/30), and 96.7% (29/30), respectively, these results revealed that mobile phone, ears and hands of health workers may associated with transmission of bacterial infection to others as also reported by many other studies, due to colonization with bacteria that constitute the normal flora of the skin. These results agree with Pal S et al. study that reported 100% contamination was found in mobile phones and hands of HCWs indicating mobile phones can be potential source of nosocomial pathogens [9]. Also agree with Monaha A study that reported 100% contamination was detected in mobile phone [13].

In this study the highest bacterial contaminate was *Staphylococcus aureus* (70), followed by Gram negative bacilli (25) and bacillus sp (21). The results which we have been got were an important and should be taken seriously as we reported the frequency of MRSA among *Staphylococcus aureus* isolates were 98.6%. These findings agree with Pathare et al. study which revealed that many resistant strains of different isolates were prevalent in the mobile phones that indicates a marked resistance to the most commonly used antibiotics as MRSA strains [14]. And disagree with Pal et al. study that reported the frequency of MRSA among hands and phones of health workers was 5.7% [9]. Also disagree with Monahan et al. study that reported the frequency of MRSA among health care workers was 10% [13]. The frequency of MRSA in Pal et al. and Monahan et al. study are lower

when compare with our study which may due to the difference in study area and the used methods.

## Conclusions

Mobile phone, ears and hands of Healthcare Workers were the source of nosocomial infections. Good basic hygiene measures are extremely important, not only for hospital staff but also for patients and visitors, and it has a positive impact in infection control.

## Conflicts of Interest Statement

All authors declare that they have no competing interests.

## Funding

This study has not been funded by any organization or institution. All authors funded and supported this work.

## Acknowledgment

First, our great thanks to participant patients. Also we would like to acknowledge staffs of Kosti Teaching Hospital and Department of Microbiology-University of El Imam El Mahdi.

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