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Original Research Article

The role of hand hygiene and mobile phones in transmitting hospital acquired infection

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Abstract

Background: Nosocomial infection or Hospital acquired infection [HAI] is an infection which is not present or incubated at the time of admission in the health care settings. It adds significant rate of morbidity & mortality in health care centres. Health care workers hold an important role in the transmission of HAI. Hands and mobile phones may be a frequent cause of transmission for nosocomial infection in a hospital.

Aim: To access the spread of HAI following practice of hand hygiene and usage of mobile phones by health care worker in a tertiary care hospital.

Materials and Methods: 280 samples were collected from 140 health care workers, 2 samples each i.e. one from the hand and other from the mobile phone through sterile cotton swabs, which were inoculated in Nutrient, Mac Conkey and Blood agar. Identification and speciation were done through biochemical tests. Antibiotic sensitivity testing was done using Kirby Bauer disc diffusion method.

Result: Among 280 samples, 220 showed positive bacterial growth, in which the pathogenic organisms accounted to 75. *Escherichia coli* were highest [28.0%] among the isolates, whereas *Enterococcus* was the lowest [6.6%]. Among the isolates 3 were found to be MRSA and 8 ESBL.

Keywords: Nosocomial infection, Hospital acquired infection, healthcare workers, MRSA, ESBL

1. Introduction

Approximately 25% of patients in developing countries are found to acquire infection which is not present or incubating at the time of admission in the health care settings such infection are termed as Hospital Acquired Infection [HAI] or Nosocomial infection [1]. It adds significant rate of morbidity & mortality in health care centres.

Health care workers hold an important role in the transmission of HAI. In health care setting, main route of transmission of microorganisms that cause infection is with contact route. Hospital personnel may be the major contributing factor for transmission of disease but whereas, inanimate objects like stethoscopes, pens, mobiles harvest large source of pathogenic organism which becomes etiological agents of HAI. [2][3]

Mobile phones being an independent accessory are frequently used by health care worker at the hospitals. These mobile phones may act as major carrier for transmission of pathogen, mobile phones in hospital halls, laboratories, intensive care units and operating rooms. During every phone call the mobile phone come into close contact with strongly contaminated human body areas with hands to hands, and hands to other areas like mouth, nose and ears [5]. As mobile phones act as perfect habitat for microbes to breed, especially in high temperature and humid conditions, it serves as a major reservoir of pathogenic microbes. Thus, in this study we access the spread of HAI following practice of hand hygiene and usage of mobile phones by health care worker in a tertiary care hospital. [6]

2. Materials and Methods

In the current study, swab samples were taken from 140 healthcare personnel. Two samples were collected from each subject as one from mobiles and other from hands, constituting to a total of 280 swab samples. The samples were collected from different departments such as orthopaedics, general medicine, paediatrics, ENT, ophthalmology, general surgery and other departments in a tertiary care hospital in the period from February 2015 to March 2015. The samples collected from the healthcare workers were categorized into: Group A - Doctors; Group B - Nurses [male & female]; Group C - Technicians; Group D - Dept. attendants. The concept of the study was explained prior to all subjects and their consent was sought.

2.1 Sample collection and bacteriological analysis

The samples were collected aseptically using sterile cotton swabs, moistened with sterile physiological saline. The swab samples were collected by rotating over three sites where hands mostly come into contact with the phone [both sides and keys of mobile phones]. The swab samples were also collected from subject's palmar and dorsal surface of hands including all the fingers and tip of nails, finger-rings [if worn by the participants] of both hands.

Samples collected thus were transported to the laboratory in nutrient broth. Further, for culturing they were inoculated on Nutrient agar, Blood agar and MacConkey's agar. The culture plates were then incubated at 37°C for 24 hours. All plates were examined for visible growth. Based on colonial morphology, Gram stain and different biochemical reactions, isolates were allocated to appropriate genera.

2.2 Antibiotic sensitivity test

Sensitivity of isolates to antibiotics was determined on Muller-Hinton agar by the Kirby-diffusion method as per CLSI guidelines. All *Staphylococcus aureus* isolates were tested for methicillin resistance and all Gram-negative bacilli were tested for being extended spectrum β lactamase producers [ESBL].

2.3 Cefoxitin disc diffusion test:

A 0.5 McFarland standard suspension of the isolate was made and lawn culture done on MHA plate, cefoxitin disc [30 μ g] were put and plates were incubated at 35°C for 18 hr. and zone of inhibition were measured. An inhibition zone diameter of ≤ 19 mm was reported as oxacillin resistant and ≥ 20 mm was considered as oxacillin sensitive.

2.4 Phenotypic Confirmatory Test for ESBL:

A 0.5 McFarland standard suspension of the isolate was made and lawn culture done on MHA

plate, Ceftazidime disc [30 μ g] and cefotaxime disc [30 μ g] in combination with the discs of Ceftazidime/Clavulanic acid [30/10 μ g] and Cefotaxime/Clavulanic acid [30/10 μ g] were put and plates were incubated at 35°C for 18 hr. and zone of inhibition were measured. An increase in inhibition zone diameter by ≤ 5 mm around the disc with Clavulanic acid over the disc with cephalosporins alone was confirmed as ESBL producers.

3. Results

Out of 140 swab samples taken from healthcare personnel [Two samples were collected from each subject as one from mobiles and other from hands, constituting to a total of 280 swab samples], bacterial growth was positive in 220 samples [78.57%], however 60 [21.42%] did not show any growth of microorganisms.

Out of 140 swab samples collected from hands, 121 were positive for bacterial growth. Whereas, from the corresponding mobile samples [140], 99 were positive. The pathogenic microorganism isolated from the total samples [280] was 75 and the non-pathogenic microorganisms were 145.

The pathogenic microorganisms grown were *Staphylococcus aureus*, *Enterococcus*, *Escherichia coli*, *Klebsiella* spp., *Citrobacter* spp. and *Pseudomonas* spp. The organisms such as *Bacillus* spp., and Coagulase negative *Staphylococcus aureus* were considered to be non-pathogenic due to their presence as normal flora.

Out of 11 *Staphylococcus aureus* grown, 3 [27.7%] were found to be Methicillin Resistant *Staphylococcus aureus* [MRSA] and from the 59 of total Gram negative species grown, 8 [13.55%] extended spectrum β lactamase producers [ESBL] resulted. The ESBL isolated were, 5 [23.80%] of *Escherichia coli* from the total of 21 and 3 [15.78%] of *Klebsiella* spp., from the total of 19.

Table 1: Shows data of bacterial contamination of hands and mobile phones in all the four groups.

Groups [n=35]	Bacterial contamination	
	Hand [%]	Mobile [%]
Group A	33 [94.2]	17 [48.5]
Group B	31 [88.5]	27 [77.1]
Group C	26 [74.2]	29 [82.8]
Group D	31 [88.5]	26 [74.2]

Out of all the study groups, group A showed highest bacterial contamination of hands [94.2%] and Group C showed the highest bacterial growth in mobile phones [82.8%].

Table 2: Shows the rate of occurrence of pathogenic and non-pathogenic organisms in the collected sample

Sample [n=140]	No. of Pathogens [%]	No. of Non pathogens [%]
Hands	43 [30.7]	78 [55.7]
Mobiles	32 [22.8]	67 [47.8]

Table 3: Shows distribution of various pathogenic organisms

Organisms[n=75]	Number	Percentage
<i>Staphylococcus aureus</i>	11	14.6
<i>Enterococcus spp.</i>	5	6.6
<i>Escherichia coli</i>	21	28
<i>Klebsiella spp.</i>	19	25.3
<i>Citrobacterspp.</i>	12	16
<i>Pseudomonas spp.</i>	7	9.3

4. Discussion

Among 140 samples collected each from hands and mobile phones, 121 were positive for the growth of micro-organism, where the numbers of pathogens were 43. Among the samples collected from mobiles, 99 were positive for growth, the number of pathogens being 32. The growth of organism in the samples collected from hands was found to be higher among doctors [94.2%], this might be attributed as the samples were collected mostly among outpatient department during the working hours. Among the samples collected from mobiles, the highest number of growth was seen among lab-technicians, the reason being frequent use of mobile phones in between sample processing. 78.57% of the total samples collected showed growth of microorganism which was lower than the study conducted by Fathma *et al*[7]. A significant lower rate of growth [62.0%] was seen in study conducted by Kabir *et al*[8].

The number of pathogens isolated from the samples were 75 [26.7%], the rest being commensals. Among the pathogens, *Escherichia coli* was the common isolate among the organisms, whereas *Enterococcus spp.*, was the least common. Overall 3[27.7%] MRSA and 8 [13.55%] ESBL were isolated from the positive findings. The percentage of MRSA was much lower the study conducted by Trivedi *et al*[10][50%] but is close enough to the study conducted by Nirupama *et al*[36%][12]. The study was conducted by the infection control committee to create awareness among the health care workers in the institute in regards to proper practice of hand hygiene.

5. Conclusion

Proper cleanliness of hands and limiting use of mobile phones in working areas may limit the spread of pathogens significantly which are the frequent cause of nosocomial infection. Health care workers should adhere to the protocol of hand washing. There is a need for the infection control committee to give proper training to the health care workers in regular intervals, either through workshops or seminars.

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Conflict of Interest: Conflict of interest declared none.

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