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Original Research Article

SURVEILLANCE OF HEALTH-CARE WORKERS OBJECTS TO DETECT CARRIAGE OF MULTIDRUG-RESISTANT STAPHYLOCOCCUS SPP. IN A TERTIARY CARE CENTER: AN OBSERVATIONAL STUDY

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ABSTRACT

Background: Nosocomial infections significantly contribute to morbidity and mortality in hospital settings specially by drug resistant bugs. The Methicillin-resistant Staphylococcus Aureus (MRSA) appears to be one of those notorious bacteria. MRSA spreads through contact between healthcare workers (HCWs) and patients. Essential accessories such as stethoscopes, mobile phones, wristwatches, spectacles, and pens are frequently used by HCWs. This study aims to monitor these items for the detection of multidrug-resistant species specially MRSA in a tertiary care center.

Materials and Methods: This study was conducted in healthcare workers of 5 different ICUs and 5 Wards in a tertiary care centre north India. A total of 60 healthcare workers participated in the study, with 168 objects including stethoscopes, mobiles, wristwatches, Spectacles, Pen and Vanity Bag being examined.

Results: This study found that MRSA and Methicillin-resistant coagulase negative Staphylococcus (MR-CONS) were present in 24.30% of and17.10% of ICU doctor objects respectively and 19.20% and 26.90% in ward doctor objects respectively. For nurse's objects, 11.70% of MRSA was found in ICUs and 11.10% in wards. No MR-CONS was found in ICU nurse objects, but 22.20% was found in ward nurse objects. This study also found 8.57% of MRSA was present in ICU worker objects and 10% in ward worker's objects.28.5% MR-CONS was found in ICU worker's objects, but 20% was found in ward worker's objects.

Conclusion: This study concludes that the significant bacterial contamination present on inanimate objects used by healthcare workers. Implementing stringent hygiene practices of frequently used devices can help reduce the risk of infection transmission within healthcare environments.

Keywords: Nosocomial infections, Health-care workers, multidrug resistance, Staphylococcus spp.

INTRODUCTION

Healthcare-associated Infections (HCAI) or nosocomial infections significantly contribute to morbidity and mortality of patients in hospital settings.[1] With theemergence of multidrug-resistant (MDR) bacteria in increasing count, HCAIs are now very hard to treat. The methicillin-resistant Staphylococcus aureus (MRSA) appears to be one of the drug resistant bugs. through contact between healthcare workers (HCWs) and patients.[2] MRSA can cause a wide range of infections,[3] and HCWs are believed to be more likely to be colonized due to their increased exposure compared to the general population.[4] This increases the risk of spreading

MRSA and other multidrug resistant organisms through direct or indirect contact.

Mobile phones, pens, wrist watches, stethoscope have become one of the most indispensable accessories in both professional and social life.[5,6] HAIs pose a significant threat to patient safety worldwide, especially in low- and middle-income countries, as they lead to substantial morbidity, mortality, and increased healthcare costs.[6,7] Therefore, this study aims to surveil healthcare workers' objects to detect the carriage of multi-drug-resistant Staphylococcus spp. in a tertiary care center.

MATERIAL AND METHODS

Study Area: This study was conducted in healthcare workers of 5 different ICUs and 5 Wards in a tertiary care centre north India.

Study Population: A total of 60 healthcare workers participated in the study, with 168 objects including stethoscopes, mobiles, wristwatches, Spectacles, Pen and Vanity Bag being examined. Written and informed consent was obtained from each participant. Staff who were not actively working in the ICU, operating theater, or postoperative wards, were excluded from the study

Study Duration: The duration of study was over a period of six months.

Data Collection: A sterile cotton swab, removed from a screw-capped polypropylene tube (Hi Media Laboratories, Mumbai, India) using gloved hands, was premoistened with non-bacteriostatic normal saline and rubbed over the surface of various objects. The tube was labeled with appropriate information. The swabs were immediately inoculated onto blood agar and MacConkey agar plates, which were then incubated aerobically at 37°C for 48 hours. After incubation, plates with no growth were considered sterile. Colony characteristics and Gram staining were used for bacterial identification. Gram staining confirmed the morphology and ruled out other contaminants. Gram-positive, cocci-shaped bacteria arranged in clusters were identified as Staphylococcus spp. Further identification involved catalase, dimethyl sulfoxide oxidase, DNAse, and coagulase tests. Staphylococcus aureus was noted by its typical golden-yellow colonies on blood agar. Growth of Gram-negative bacteria was also recorded. To test for methicillin resistance, cefoxitin discs were placed on Mueller-Hinton Agar following CLSI guidelines; resistance indicated MRSA and susceptibility indicated MSSA.

Data Analysis: Data were analysed by using Microsoft Excel.

RESULTS

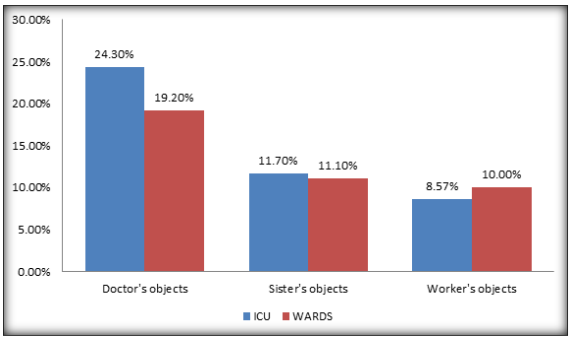

Figure 1: Percentage of MRSA from Healthcare workers

Figure 2: Percentage of MR-CONS from Healthcare workers

This study included a total of 5 ICUs and 5 wards. In the ICUs and wards, there were 14 doctors and 18 nurses and 28 workerswere chosen randomly. We collected samples from 41 objects, 17 objects and 35 from objects doctor, nurse and workers in the ICUs respectively, and from 26 doctor objects, 9 nurse objects and 10 from worker's objects in the wards.

The objects included 17 stethoscopes, 20 mobiles, 10 wristwatches, 10 Spectacles, 10 Pen from doctors. From nurses, we collected samples from 20 mobiles, 11 wristwatches,10 Pen and 15 Vanity Bag. From worker's, we collected samples from 22 mobiles, 10 wristwatches,2 Spectacles, 4 Pen and 7 Vanity Bag.

In the ICU, we found the following isolates from doctor objects: 10 MRSA, 4 MSSA, 7 MR-CONS, 6 MS-CONS, and 14 with no growth. In the ward doctors, the isolates from different objects were: 5 MRSA, 2 MSSA, 7 MR-CONS, 8 MS-CONS, and 8 with no growth.

In ICU nurses, the isolates were: 2 MRSA, 1 MSSA, 0 MR-CONS, 2 MS-CONS, and 12 with no growth. In ward nurses, the isolates were: 1 MRSA, 1 MSSA, 2 MR-CONS, 1 MS-CONS, and 4 with no growth.

In ICU workers, the isolates were: 3 MRSA, 1 MSSA, 10 MR-CONS, 3 MS-CONS, and 18 with no growth. In ward workers, the isolates were: 1 MRSA, 1 MSSA, 2 MR-CONS, 1 MS-CONS, and 5 with no growth.

This study found that 24.30% of MRSA was present in ICU doctor objects and 19.20% in ward doctor

objects. For nurse's objects, 11.70% of MRSA was found in ICUs and 11.10% in wards. The study also found that 17.10% of MR-CONS was present in ICU doctor objects and 26.90% in ward doctor objects. No MR-CONS was found in ICU nurse objects, but 22.20% was found in ward nurse objects. This study also found 8.57% of MRSA was present in ICU doctor objects and 10% in ward worker's objects.28.5% MR-CONS was found in ICU worker's objects, but 20% was found in ward worker's objects.

Table 1: Number of distribution according to total Objects

	No.	Doctors Object	Sisters Object	Workers Object
ICU	4	41	37	35
WARD	5	26	19	10
Total	9	67	56	45

Table 2: Number of distribution according to different Objects of Doctors, Sisters and workers

Objects	Doctors	Sisters	Workers
Stethoscope	17	0	0
Mobile	20	20	22
Wrist Watch	10	11	10
Spectacles	10	0	2
Pen	10	10	4
Vanity Bag	0	15	7
Total	67	56	45

Table 3: Bacterial isolates from Doctor's object in ICU

Isolates	Numbers	Percentage
MRSA	10	24.3
MSSA	4	9.7
MR-CONS	7	17.1
MS-CONS	6	14.6
No growth	14	34.1
Total	41	100

Table 4: Bacterial isolates from Doctor's object in Wards

Isolates	Numbers	Percentage
MRSA	5	19.2
MSSA	2	7.6
MR-CONS	7	26.9
MS-CONS	4	15.3
No growth	8	30.7
Total	26	100

Table 5: Bacterial isolates from Sister's object in ICU

Isolates	Numbers	Percentage
MRSA	2	5.4
MSSA	1	2.7
MR-CONS	5	13.5
MS-CONS	12	32.4
No growth	17	45.9
Total	37	100

Table 6: Bacterial isolates from Sister's object in wards

Isolates	Numbers	Percentage
MRSA	1	5.2
MSSA	2	10.5
MR-CONS	4	21.1
MS-CONS	2	10.5
No growth	10	52.6
Total	19	100

Table 7: Bacterial isolates from worker's object in ICU

Isolates	Numbers	Percentage
MRSA	3	10
MSSA	1	3.4
MR-CONS	10	33.4
MS-CONS	3	10
No growth	18	60
Total	35	100

Table 8: Bacterial isolates from worker's object in word

Isolates	Numbers	Percentage
MRSA	1	10
MSSA	1	10
MR-CONS	2	20
MS-CONS	1	10
No growth	5	50
Total	10	100

DISCUSSION

Studies on inanimate objects belonging to healthcare workers have highlighted the potential transmission of diseases via contaminated devices or other items that are not routinely cleaned. These objects can serve as reservoirs for microbes in healthcare environments.

The frequent use of mobile phones by HCWs, coupled with a lack of disinfection, makes them potential vectors for transmitting bacterial pathogens, including multi-drug-resistant organisms.[9,10] Mobile phones used by HCWs can serve as reservoirs for healthcare-associated pathogens, particularly bacteria associated with skin colonization, due to the moisture and ideal temperature of the human body, especially the palms.[11,12] Additionally, the heat generated by mobile phones contributes to the growth of bacteria on these devices. Bacterial organisms can survive on inanimate surfaces for weeks,[13,14] leading to microbial cross-contamination between HCWs and patients, and potentially causing healthcare-acquired infections (HAIs).[15,16]

Previous studies corroborate these findings. In 2009, Usha Arora et al. screened 160 cell phones from doctors and paramedical staff at a government medical college in North India, finding bacterial growth in 40.62% of phones, with Staphylococcal spp being the most common isolate.[17] Similarly, Ulger F et al. (2009) found a 94.5% contamination rate of healthcare workers' mobile phones in operating rooms and ICUs, with 52.0% of these being methicillin-resistant S. aureus (MRSA).[18]

In 2014, Misgana GM et al. conducted a study in Ethiopia, revealing that 71.2% of healthcare workers' mobile phones were contaminated, with a higher degree of contamination compared to non-healthcare workers' phones.[19] Uneke CJ et al. (2008) found that 79% of stethoscopes in a Nigerian hospital were contaminated with bacteria, with a significant reduction in contamination when stethoscopes were cleaned with alcohol and when healthcare workers practiced handwashing .[20]

Many studies have indicated that the hand carriage of potential pathogens, such as multidrug-resistant (MDR) Staphylococcus species, is very high among healthcare workers (HCWs). Additionally, the carriage of multidrug-resistant Staphylococcus species is notably prevalent among HCWs in our tertiary care center.[1,21] Our research found that MRSA and methicillin-resistant coagulase-negative staphylococci (MRCoNS) are very common in healthcare workers.

Therefore, These studies underscore the importance of including inanimate objects in routine cleaning protocols and maintaining stringent hygiene practices to mitigate the risk of infection transmission in healthcare settings.

CONCLUSION

This study highlights the significant bacterial contamination present on inanimate objects used by healthcare workers in ICUs and wards, emphasizing the potential for these objects to act as reservoirs for pathogens. With notable differences in contamination rates between doctors', nurses' and workers objects, the findings stress the critical need for regular cleaning and disinfection protocols. Implementing stringent hygiene practices of frequently used devices can help reduce the risk of infection transmission within healthcare environments.

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