

Mobiles and Pens of Hospital Staff, Patients and Visitors Found to Carry MRSA

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ABSTRACT

Introduction: Life threatening infections like sepsis, osteomyelitis and endocarditis have been reported due to Methicillin resistant *Staphylococcus aureus* (MRSA) which is a major nosocomial pathogen worldwide. Asymptomatic colonized patients, healthcare workers and visitors are the major sources of super bug. These carriers can transmit this organism to other patients and inanimate objects mainly by contaminated hands and posed a serious therapeutic challenge. Extensive use of mobiles and pens by health care workers, patients and visitors in hospitals, OPD, IPD, wards, ICU and OT have also been reported to carry high risk of transfer of MRSA and other pathogens.

Aim: The present study was conducted to assess the prevalence of carriage of MRSA by hospital staff, patients and visitors on their mobiles and pens and to recommend the preventive measures in a tertiary care hospital in South Delhi.

Materials and Methods: A total of 100 swabs (60 swabs from the mobiles and 40 swabs from pens) were collected from four groups of people attending hospital :- Nurses and technicians; Sweeper and attendants; Visitors; and Patients. All these

samples swabs were cultured and identified by biochemical tests and strains identified as *Staphylococcus aureus* were then subjected to oxacillin (6 µg) and cefoxitin (30 µg) disc diffusion test to test methicillin resistance as per CLSI guidelines.

Results: In this study contamination rate of 54% was observed. 13 swabs (6 mobiles and 7 pens) were identified to carry MRSA among 100 swabs of health care workers. The prevalence of MSSA (Methicillin sensitive *Staphylococcus aureus*), and other bacteria (coagulase negative *staphylococcus*, *diphtheroids*, gram positive bacilli, gram negative bacilli) were 18% and 23% respectively.

Conclusion: This study has demonstrated that potentially dangerous bacteria can be carried around hospitals on mobiles and pens by hospital staff, visitors and patients. Isolation of MRSA from HCWs mobiles and pens is cause of concern, and indicates a threat of spread of infection. Measures to control nosocomial infections by decontamination of inanimate objects and decolonization of carriers, laboratory based surveillance, use of barrier precaution, hand washing and hand sepsis should be used in hospitals for each and every hospital staff and patient regularly.

Keywords: HAI (hospital acquired infections), Methicillin, Nosocomial

INTRODUCTION

Hospital acquired infection (HAI) due to multidrug resistant bacteria like MRSA are a growing problem in many health care institutes.

Hands, instruments, mobile phones, pens, swipe cards, dresses, etc may serve as the vectors for the nosocomial transmission of microorganisms [1, 2].

Mobile phones have become an important accessory of human life and used for communication in hospital by patients, visitors and health care staff.

Mobiles, keyboards and pens, usually found in hospitals, have been documented as health risk in studies which reported the count of multi-drug resistant organisms on patients and their visitors mobiles and devices many times more as compared to healthcare providers devices. It is documented

that constant handling and generation of heat by mobiles creates a prime area for growth of commensals usually found on skin [3].

Methicillin resistant *Staphylococcus aureus* (MRSA), first detected in Britain in 1961, remain endemic in late 1960s in hospitals and rapidly spread to communities in 1990s and prevalent worldwide now [1-5]. It is resistant to beta lactams but methicillin resistance is due to the presence of *mecA* gene, which encodes for Penicillin binding protein PBP-2a having low affinity for beta lactams [6].

Infected and colonised patient, asymptomatic carrier in hospital staff and visitors are the main reservoir of MRSA and mainly the infection is transmitted by hospital staff from one patient to other by the inanimate objects like mobiles and pens if they are being used while attending patients [2]. Methicillin

resistance does not affect virulence but these strains are difficult to eradicate as they are multidrug resistant leaving glycopeptides as drug of choice which increase the cost, and hospital stay of the patient [7, 8].

This study was undertaken to evaluate the role of mobile phones and pens in the transmission of nosocomial infection. Early detection of MRSA and cleaning of mobiles and pens by 70% isopropyl alcohol, regular surveillance, formulation of effective antibiotic policy and simple prevention measures will help in curtailing hospital infection rate.

MATERIALS AND METHOD

It is a hospital based study approved by ethical committee, carried out at Microbiology Department of Hamdard Institute of Medical Sciences and Research, Delhi, from February 2014 to October 2014. A total of 100 swabs were collected from 60 mobiles and 40 pens of hospital staff, patients and visitors who used to come in lab for some reasons and from the wards of all specialities. We include patients with more than three days stay in hospital. Only those who were not willing to participate were excluded. A random sampling method was used for sample collection. All of them were informed about the study and verbal consent was taken. Sterile cotton swabs soaked in sterile normal saline rubbed by rolling technique on three surfaces of the device. Streaking of the swab was done on 5% sheep blood agar, MacConkey agar (Hi Media, New Delhi). Plates were incubated at 37°C (aerobic) overnight. Confirmation of strains was done on the basis of Gram stain, colony morphology, catalase, tube coagulase and mannitol fermentation test [9]. *Staphylococcus aureus* strains were then tested for methicillin resistance using oxacillin (6 µg) and cefoxitin (30 µg) on Mueller Hinton agar as per CLSI guidelines [10]. Data was collected by direct observation of the zone size as per CLSI guidelines [10].

RESULTS

A total of 100 swabs, sixty swabs from the mobiles and forty swabs from the pens were collected. Out of these 100 swabs, 50 were collected from hospital staff, 25 from visitors, and 25 from patients. Polymicrobial growth was observed in some plates. [Table/Fig-1] shows the isolation rate of MRSA and MSSA strains from different groups.

Out of 60 mobile swabs 6 (10 %) showed growth of MRSA, 11 (18.33%) showed MSSA and 13 (21.7%) other bacteria [Table/Fig-2] where as swabs from pen culture isolated 7(17.5%) MRSA, 7 (17.5%) MSSA, and 10(25%) showed other bacteria as Coagulase negative *staphylococcus* bacilli (CoNS), gram

Interpretive Criteria (in mm) for Cefoxitin Disk Diffusion Test			
	Susceptible	Intermediate	Resistant
<i>S. aureus</i>	≥ 22 mm	N/A	≤ 21 mm

* Oxacillin disk diffusion testing is not reliable for detecting oxacillin/methicillin resistance. Cefoxitin should be used as a surrogate for disk diffusion testing

Sample collected from	Total swabs collected	MRSA	MSSA
Nurses and lab technicians	25	1(4%)	3 (12%)
Patients	25	5(20%)	5 (20%)
Visitors	25	2(8%)	3 (12%)
Sweepers and attendants	25	5(20%)	7(28%)
Total	100	13(13%)	18(18%)

[Table/Fig-1]: Comparison of isolation rate of MRSA and MSSA strains from different groups

Sample collected from	Total swabs collected	Total culture positive	MRSA	MSSA	Others
Nurses and lab technicians	15	4 (26.6 %)	0	2 (13.3 %)	2 (13.3%)
Patients	15	9 (60%)	2 (6.6%)	3 (20%)	4 (26.6%)
Visitors	15	6 (40%)	1 (6.6%)	2 (13.3%)	3 (20%)
Sweepers and attendants	15	11 (73.3%)	3 (20%)	4 (26.6%)	4 (26.6%)
Total	60	30 (50%)	6 (10%)	11 (18.33%)	13 (21.7%)

[Table/Fig-2]: Distribution of MRSA and MSSA strains among mobile samples

Sample collected from	Total swabs collected	Total culture positive	MRSA	MSSA	Others
Nurses and lab technicians	10	4 (40%)	1 (10%)	1 (10%)	2 (20%)
Patients	10	7 (70%)	3 (30%)	2 (20%)	2 (20%)
Visitors	10	5 (50%)	1 (10%)	1 (10%)	3 (30%)
Sweepers and attendants	10	8 (80%)	2 (20%)	3 (30%)	3 (30%)
Total	40	24 (60%)	7 (17.5%)	7 (17.5%)	10 (25%)

[Table/Fig-3]: Distribution of MRSA and MSSA strains among pen samples

negative and gram positive bacilli [Table/Fig-3]. No growth could be isolated from rest of the samples. Interpretation of results were done as per CLSI guidelines [10].

DISCUSSION

The hospital environment plays an important role in transmission of microorganisms. Microorganisms can be transferred from

person to person or from inanimate objects to hand and vice versa. Mobile phones and pens are extensively used by the hospital staffs, patients and visitors within the hospital and if proper infection control practices are not followed these devices can act as source of infection [11,12]. We conducted this study to raise awareness among the staff and hospital attendees regarding spread of infection by improper handling of devices and dirty hands and to provide guidelines to help them in containing such a resistant bug.

In this study, 50% of mobiles and 60% of pens were found to be contaminated with microorganism which is slightly lower than contamination reported by studies in India i.e 72% and 95% [13,14]. Studies from abroad has documented 45% - 94.5% contamination rate [15-17].

In this study, most common isolated organism isolated was *Staphylococcus* spp. (31%) and other organisms isolated were Coagulase negative *staphylococcus* (gram negative bacilli and gram positive bacilli (Exact percentage not given as some plates show polymicrobial growth). In other studies *Staphylococcus* spp, *E.coli*, *Klebsiella* spp, *Pseudomonas* spp, *Acinetobacter* spp has also been reported and these can also cause nosocomial infection [18-21].

The prevalence rate of MRSA was found to be 13% in this study which is in accordance with other studies [Table/Fig-4]. The MRSA isolation rates from mobile in Indian studies were 83% to 2.7% [17, 22-24].

MRSA, like all *S.aureus* survives on skin, dust and on environmental surfaces. In healthy individuals these can be colonised asymptotically. Therefore the most common

sources of transmission to patients and hospital environment are hospital staff as well as visitors and patients with MRSA infection or who carry the infection asymptotically [18-20]. Most common location of colonisation in patients is nose followed by rectum, throat, perianal area and inguinal area. There have been studies about the nasal carriage, hand carriage, uniforms and swipe cards carriage of MRSA among the hospital staff [Table/Fig-4] [25-28]. Till now hands are considered to be the main mode of transmission to inanimate objects like apron, swipe cards, mobiles, key boards etc have also been studied to carry MRSA.

MRSA is problematic for patients in hospital with invasive devices or surgical wounds and lowered immunity having higher risk of contracting infection as compared to general public. Among patients being treated in hospital and/or having weakened immune system, HA-MRSA occurs most commonly and found to cause life threatening infections, such as blood stream infections, surgical site infections or pneumonia [26].

These organisms are difficult to treat with antibiotics used routinely as these are resistant to the methicillin and related B-lactams along with several classes of antibiotics. Vancomycin which is given for MRSA treatment needs to be given parenterally and can be toxic.

In this study maximum number of MRSA strains were isolated from sweepers and attendants followed by patients, visitors and nurses. This shows direct correlation between awareness and cleanliness. Nurses and technicians are more aware of disinfection and personal protection so must be using right handwashes and sanitizers and might not be touching or keeping their mobiles and pens at infectious surfaces so isolation rate reported is (32%) as compared to sweepers and attendants (76%). This reflects the need of regular trainings of hospital staff specially the sweepers who usually avoid or being neglected at time of trainings. Special ward wise training should be provided to patients also and charts and posters should be placed for infection control awareness wherever possible.

Some studies have documented higher prevalence in staff from clinical wards than elsewhere and transmission to their households has also been documented. Transmission of this bug between patient and employees is directly correlated with frequency and time spent with MRSA - positive patients and infection control measures being taken in hospital set up [27]. Similarly in this study, visitors have shown isolation rate (44%), which is lesser than patients (64%), staying for only little time in hospital as compared to patient. It is very difficult to eradicate MRSA as it is once introduced in hospitals [29-31].

For screening of carriers several methods have been recommended by CLSI which can be used for detection of MRSA. Though we have used oxacillin and cefoxitin disc diffusion method and fortunately found same results with both methods but in other studies oxacillin and latex agglutination

Studies	Source	Year and place	% age of MRSA
Evillard M et al., [2]	Nasal swabs of staff and patients	2004	6.2%
Angadi et al.,[12]	Mobile phones	2014	53.3%
Datta et al., [13]	Mobile phones	2009	18%
Srikanth et al.,[14]	mobile phones	2009	2%
Bhat et al.,[22]	Mobile phones	2011	40%
Jayalakshmi et al., [23]	Mobile phones	2008	2.7%
Tambekar et al., [24]	Mobile phones	2009	83%
Tsering DC et al., [25]	Nasal swabs of HCW	2011	20.9%
Medicalnews today.com [26]	Hospital staff swabs from swipe cards and uniforms.	2011	5.9%
Askarian M, et al.,[27]	Nasal swab of HCW	2009	5.3%
Goyal R, et al., [28]	Swabs from hands and nose.	2002	6.6%

[Table/Fig-4]: Comparison of isolation rates of MRSA from different sources in other studies

test have been used are found inferior in sensitivity and specificity than cefoxitin [32-34].

A device is under research based on rapid whole genome sequencing that can identify the source of hospital infection and help staff to stop them spreading [35].

Bacterial colonisation on the mobile phones can be reduced by proper training of staff about hand washing, use of alcohol disinfectant wipes, use of alcohol-chlorhexidine wipes, and by imposing restrictions on the use of mobile phones in high-risk areas. Many studies have reported ethyl or isopropyl alcohols as effective, disinfectant [23, 36, 37]. These precautions may also be adopted for phones of patients, their companions and visitors. Ultraviolet irradiation by ultrasonic cleaner might be used as a disinfectant, and silicone cell phone covers that are easier to clean might offer some protection. HYGreen is a system which monitors HCWs hand hygiene by detecting fumes of sanitizer or soap formed while usage from the hands [38]. Decolonisation regimens should be strictly followed for patients and healthcare workers if found positive. Avoidance and completion of antibiotic treatment protocols will enhance the margin of safety.

CONCLUSION

Mobiles and pen can act as fomites for transmission of nosocomial infection. But further molecular based studies should be carried out to check the genetic relatedness between the strains isolated from mobiles and pens and the carrier strains which can confirm the role in spread of hospital infection. We don't have these facilities in department and also not economical otherwise strain relatedness of MRSA among different people will be epidemiologically more informative.

As patients, visitors and sweepers are found to carry more MRSA than nursing and technical staff so every person should be given separate training about the universal precautions and guidelines for infection control. These people should be supplied with proper hand sanitizers in ample amount. Also screening should be done frequently and all those things should be included which are commonly shared and appropriate decontamination measures must be taken immediately.

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