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Nosocomial Hazards of Doctor's Mobile Phones in Hospitals

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A microbiological analysis of 75 doctor's mobile phones was carried out in Amravati city. A total of 90 bacterial pathogens were isolated, *Staphylococcus aureus* 18 (20%) was prominent followed by *Micrococcus luteus* 16 (18%), *Pseudomonas aeruginosa* 14 (15%), *Proteus mirabilis* 10 (11%), *Escherichia coli* 10 (11%), *Klebsiella pneumoniae* 9 (10%), *Enterobacter aerogenes* 8 (9%) and *Salmonella typhi* 5 (5%). The male doctor's mobile phones were more (69%) contaminated as compared to female doctor's phones (31%). The study demonstrates that mobile phone in a clinical setting become contaminated by contact with healthcare workers' hands (HCWs') and acts as potential source to spread infection is an important argument in any debate, in which the relaxation of restrictions on its use is being considered.

Key words: Doctor's mobile phone, bacterial pathogens, MRSA, nosocomial infections

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INTRODUCTION

Despite the advances in modern medicine, nosocomial infection still poses a risk of increased morbidity and mortality to patients and the hands of healthcare personnel may play an important role in the transmission of Hospital-Acquired Infections (HAIs) (Landman *et al*., 2002; De Gheldre *et al*., 2001). However, the etiological agent of HAI varies from hospital to hospital and in different geographical regions (Struelens *et al*., 2004). These days, mobile phones utilization has increased in healthcare system and its acceptance by healthcare personnel. Few studies have been reported from India (Khivsara *et al*., 2006; Tambekar and Dahikar, 2006), Israel and Spain (Meltzer, 2003), that mobile phone may also involved in the transmission of infections in the healthcare systems (Borer *et al*., 2005; Brady *et al*., 2006; Brandy, 2006; Dubik, 2006) and threatening infection due to potential pathogens could be acquired from doctor's mobile phones in hospitals, which cause great concern to everyone (Derbyshire and Burgess, 2006; Bhattacharya, 2005).

Moreover, the increased use of mobile phones is seen against a background rise in nosocomial infection rates. The sources of contamination of mobile phones include hands of healthcare personnel, inanimate objects (bed, instruments, furniture etc.) and pathogenic air flora of the hospitals (Rafferty and Pancoast, 1984). Hospital acquired or mobile phone transmitted infections are therefore a constant thereat to the lives of already seriously ill patients as well as healthy individuals visiting the hospital (Muhall, 1997; Myerson and Mitchell, 2003). The present study was undertaken to investigate potential of doctor's mobile phone to carry bacteria known to cause nosocomial infection and to develop awareness in doctors, patients, visitors and other healthcare workers for proper handling of mobile phone. Due to relative lack of research into the doctor's mobile phone pathogen transmission tends to conduct role of doctor's mobile phones in infection transmission in hospital settings in Amravati city, India.

MATERIALS AND METHODS

Sample collection: A total of 75 mobile phone swab samples of different speciality doctors (surgeons and non-surgeons) were collected in Amravati city and analyzed for presence of bacterial pathogens on it (Table 1). The doctor's mobile phone swab samples were collected in sterile vials by using sterilized cotton bud dipped in saline water (0.85%). Before taking swab samples, both hands were thoroughly washed with soap and disinfected with alcohol. The sterilized cotton bud was rotated onto the overall surface area of the mobile phone by keeping the mobile phone in two fingers. The cotton bud swab after swabbing the mobile phone was again kept in the respective sterile vials.

Table 1: Speciality wise doctor's mobile phone analyzed from Amravati city hospitals

	No. of mobile phone		
Speciality	Male	Female	Total
Orthopedic	5	0	5
General	10	2	12
Cardiologist	7	2	9
Skin specialist	5	1	6
Gynecologist	4	5	9
Psychiatrist	1	0	1
Physiotherapist	1	1	2
Eye specialist	1	1	2
Children specialist	5	2	7
Homoeopathic	5	6	11
Ayurvedic	2	5	7
Dentist	1	2	3
Radiologist	1	0	1
Total	48	27	75

Isolation and identification of pathogens: The study was carried out over a period of four months from July to October 2006, during which random sampling of mobile phones (n = 75) was done. These collected samples were immediately transported to the microbiology laboratory and inoculated onto MacConkey agar plates, Cetrimide Agar and Mannitol Salt agar plates (Hi-Media Laboratories, Mumbai). These plates were incubated at 37°C for 24-48 h. Plates were observed for growth and a Gram smear was performed from different types of colonies. Gram reaction, colony morphology, pigment formation, florescence, catalase, coagulase, urease and oxidase tests were performed and allocated to appropriate genera to the isolates. The cultural characteristics including lactose fermentation by enterobacteriaceae on MacConkey agar, pyocynin formation of *Pseudomonas* sp. on cetrimide agar and golden yellow colored colonies of *Staphylococcus aureus* on mannitol salt agar were noted. Further identification to species level was carried out on the basis of various specialized tests. Methicillin resistant *Staphylococcus aureus* (MRSA) isolates were confirmed on Columbia plus 2% NaCl agar (Hi-media) with a methicillin 5 mg disc (Hi-media).

RESULTS

A total of 75 doctor's mobile phone swab samples were analyzed for the presence of bacterial pathogens, (48 swabs from male and 27 from female doctors' mobile phone), 71 showed growth of 8 various genera

of 90 bacterial pathogens. The *Staphylococcus aureus* 18 (20%) was the dominant pathogen followed by *Micrococcus luteus* 16 (18%), *Pseudomonas aeruginosa* 14 (15%), *Proteus mirabilis* 10 (11%), *Escherichia coli* 10 (11%), *Klebsiella pneumoniae* 9 (10%), *Enterobacter aerogenes* 8 (9%) and *Salmonella typhi* 5 (5%) Among the *Staphylococcus aureus*, 15 (83%) were MRSA (Table 2).

In total, 95% of mobile phones demonstrated evidence of bacterial contamination, 4 (5%) (3 belongs to non-surgeon's, 1 ayurvedic and 2 homoeopathic doctor, 1 belongs to cardiac surgeon) did not show any growth whereas 52 (70%) showed growth of single bacterial pathogen, of which 40 belongs to non-surgeon's while 12 surgeons and 19 (25%) showed 2 pathogens each belongs to 12 non-surgeon and 5 surgeon (Table 3).

Among different disciplines (pathy's) doctor's mobile phones, 98% allopathic, 86% ayurvedic, 82% homeopathic and 100% dentist's phone were contaminated. Out of 90 bacterial pathogens isolated, 69 (76%) were found on allopathic doctor's mobile. On comparison, 46 (96%) swabs from male and 25 (93%) from female doctor's mobile phones were found contaminated with pathogens. Out of 90, 62 (72%) pathogens were found on male doctor's phone while 25 (28%) on female doctors' mobile phone (Table 4).

Table 2: Bacterial pathogens from doctors' mobile phone

Pathogens	Male	Female	Total
Staphylococcus aureus	11 (61%)	7 (39%)	18 (20%)
Micrococcus luteus	13 (81%)	3 (19%)	16 (18%)
Pseudomonas aeruginosa	9 (81%)	5 (19%)	14 (15%)
Escherichia coli	6 (60%)	4 (40%)	10 (11%)
Proteus mirabilis	7 (70%)	3 (30%)	10 (11%)
Klebsiella pneumoniae	8 (89%)	1 (11%)	9 (10%)
Enterobacter aerogenes	5 (63%)	3 (37%)	8 (9%)
Salmonella typhi	3 (60%)	2 (40%)	5 (5%)
Total	62 (69%)	28(31%)	90 (100%)
MRSA	10 (66%)	5 (34%)	15 (83%)

Table 3: Analysis of doctor's mobile phone swab for presence of bacterial pathogens

Mobile phones analyzed	No. of pathogen isolated	No. of mobile phones contaminated	No. of pathogens isolated
75	0	4 (5%)	0
	1	52 (69%)	52
	2	19 (25%)	38

DISCUSSION

The microbial contamination observed in doctors mobile phones were similar with the reports of Brady *et al.* (2006), who reported high rate of mobile phone contamination by pathogens known to cause nosocomial infection (Table 2). A similar study at Soroka hospital in Israel found that 12% of mobile phones belonging to doctors and nurses carried drug-resistant bacteria that can be lethal to critically ill patients. Hence, the use of mobile phones in patient-care areas has been banned in that hospital (Meltzer, 2003).

The non-surgeons mobile phone were comparatively more contaminated with bacterial pathogens, it may be due to not following the preventive measures (like hand washing practices) strictly as that of the surgeon. The potential of mobile phones of healthcare workers to serve as a reservoir of bacteria known to cause nosocomial infection was reported by Khivsara *et al.* (2006). They reported high levels (40%) of contamination in these phones by *Staphylococcus aureus* and its MRSA at a hospital in Mangalore.

All types of isolated pathogens were found on allopathic doctor's mobile phone, it might be due to environments, except those maintained under sterile conditions, harbors microorganisms that may be pathogenic (Rhame, 1998). In ayurvedic doctor's, the female's mobile phone were 100% contaminated by pathogens while that of male 50%. The dentist's (Male/ Female) mobile phones were 100% contaminated, homeopathic male doctors mobile phones were 100% and females phones were 66% contaminated by pathogens (Table 4). The different methods of handling and treatment of patients by various pathy's doctors, the bioburden of pathogens varies along with different

Table 4: Comparison of pathogens obtained on male and female doctors' mobile phones of different discipline

Types of pathy	Sex	No. of mobile phones analysed	No. of mobile phones contaminated	Methicillin sensitive *Staphylococcus aureus*	Methicillin resistant *Staphylococcus aureus*	*Micrococcus luteus*	*Pseudomonas aeruginosa*	*Enterobacter aerogenes*	*Escherichia coli*	*Proteus mirabilis*	*Klebsiella pneumoniae*	*Salmonella typhi*	Total
Allopathic	Male	40	39 (97%)	0	10(11%)	12 (13%)	8 (9%)	4(4%)	7 (8%)	4 (4%)	8 (9%)	3 (3%)	56 (62%)
	Female	14	14 (100%)	0	4 (4%)	2 (2%)	2 (2%)	1 (1%)	1(1%)	1 (1%)	0	2 (2%)	13 (14%)
	Total	54	53 (98%)	0	14 (15%)	14 (15%)	10 (11%)	5 (5%)	8 (9%)	5 (5%)	8 (9%)	5 (5%)	69 (76%)
Ayurvedic	Male	2	1 (50%)	0	0	0	0	0	0	1 (1%)	0	0	1 (1%)
	Female	5	5 (100%)	2 (2%)	0	0	0	1 (1%)	0	2 (2%)	0	0	5 (5%)
	Total	7	6 (86%)	2 (2%)	0	0	0	1 (1%)		3 (3%)	0	0	6 (6%)
Dentist	Male	1	1 (100%)	0	0	1 (1%)	0	0	1 (1%)	0	0	0	2 (2%)
	Female	2	2 (100%)	0	0	1 (1%)	1 (1%)	0	0	0	1 (1%)	0	3 (3%)
	Total	3	3 (100%)	0	0	2 (2%)	1 (1%)	0	1 (1%)	0	1 (1%)	0	5 (5%)
Homeo-pathic	Male	5	5 (100%)	0	1 (1%)	0	1 (1%)	1 (1%)	1 (1%)	2 (2%)	0	0	6 (6%)
	Female	6	4 (66%)	1 (1%)	0	0	2 (2%)	1 (1%)	0	0	0	0	4 (4%)
	Total	11	9 (82%)	1 (1%)	1 (1%)	0	3 (3%)	2 (2%)	1 (1%)	2 (2%)	0	0	10 (11%)
	Grand Total	75	71 (94%)	3 (3%)	15 (16%)	16 (17%)	14 (15%)	8 (9%)	10 (11%)	10 (10%)	9 (10%)	5 (5%)	90 (100%)

activities of patients like coughing, sneezing, loud talking etc. expel the pathogens in the environment, which might get adhered onto the doctors' mobile phone.

The male doctors' mobile phone were comparatively more contaminated than female doctor's phone with bacterial pathogens, it might be due to the reason that female doctors often keep their phones in purses and use less frequently during their duties. On the other hand, male doctor keeps their mobile phones in their pockets and used frequently anywhere, any time whenever it is needed and thus contaminated and played an important role in transmission of pathogens.

Present results indicate that mobile phones may get contaminated through the hands. Hence, these mobile phones when used carelessly in the ICU or surgical wards may act as a source of infections to patients. Moreover, these contaminated mobile phones and the hands of the healthcare professionals may also pose a danger in the spread of infection to the community. These findings clearly explain that, growth of organisms from mobile phone samples of healthcare professionals (71 out of 75) could be due to relaxed hand washing practice after patient examination. Surely, the best measure for avoidance of HAI is effective training and implementation of strict hand-hygiene measures, thus avoiding mobile phone contamination in the first place.

CONCLUSION AND RECOMMENDATIONS

This study demonstrates that mobile phone in a clinical setting become contaminated by contact with healthcare workers' hands (HCWs'). The potential of mobile phones to spread infection is an important argument in any debate, in which the relaxation of restrictions on use is being considered. However, development of effective preventive strategies such as regular decontamination of mobile phones with alcohol disinfectant wipes to reduce the bioburden combined with emphasis on hand hygiene are necessary to prevent cross infection in healthcare system. Nevertheless, further studies involving more number of samples are needed to substantiate the role of mobile phones in the transmission of infection to critically ill patients in the hospitals

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