



## MOBILE PHONES USED BY THE HEALTH CARE PERSONNEL AS A POTENTIAL SOURCE OF INFECTIONS

### KEYWORDS

Mobile phones; Health care personnel.

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### ABSTRACT

**TOPIC:** Mobile phones used by the health care personnel as a potential source of infection. Use of mobile phones by health care personnel in a hospital setup has been implicated as reservoirs of known nosocomial microorganisms. Objectives were to isolate and identify the microorganisms present on mobile phones of participants and establish the relationship between isolates of hands and mobile phones. It was a case control study includes 60 participants. The samples were tested for the isolation and identification microorganisms by the routine bacteriological procedures. Results showed significant bacterial growth in mobile phones (96.7%) and hands (83.3%) of health care personnel. 36.3% of organism isolated from mobile phones was same with the organisms isolated from hands of their respective participants. Data analysis was done by Microsoft office excel 2007. This research concludes mobile phones may act as a potential source pathogenic microorganisms.

### INTRODUCTION:

The global system of mobile, telecommunication was established in 1982 in Europe. The first use of mobile phone in India was started in 1995, but now in India within the last 20 years we have more than 287 million mobile phone users which accounts for 85% of all the telecommunication users<sup>[1]</sup>. With the advancement of technology mobile phones have become one of the most indispensable accessories of professional and social life. They are increasingly becoming an important means of communication worldwide being easily accessible, economical and user friendly. They are widely used by the Health Care Personnel(HCP) and Non Healthcare Personnel(NHCP) equally in every location. With all the achievement and benefits of mobile phones, it is easy to overlook the health hazard it might pose to its many users and others<sup>[2]</sup>. The constant handling of mobile phones by users in hospitals (by HCP, patients, visitors etc.) makes it an open breeding place for transmission of microorganisms, as well as health care associated infection (HAIs). This is especially so with those associated with the skin due to the moisture and optimum temperature of human body especially our palm, external ear and face<sup>[3]</sup>.

These factors and the heat generated by mobile phones contribute to harbouring microbes on the device at alarming levels. When we consider a phone's daily contact with the hands the dire health risks of using germ infested mobile devices are obvious<sup>[4]</sup>.

Approximately 2-meter square of body surface area is constantly in contact with environment, microbes and become readily colonised by bacteria. Unlike our hands, which is easily disinfected using Alcohol Based Hand Rubs (ABHRs) that are made available readily across all hospitals and medical facilities; Are mobile phones cumbersome to clean? We even rarely make an effort to disinfect them. As a result, these devices have the potential for contamination with various bacterial agents<sup>[5]</sup>.

Doctors and other health care personnel working in a critical care unit, intensive care units (ICUs), isolation wards and operating units are highly exposed to deadly microorganisms. The mobile phones used by HCPs often become carriers and may serve as vehicle and spread microorganisms whenever they are taken along<sup>[6]</sup>. Colonised microorganisms on the devices of HCPs may be transmitted to the patients even if they do not have direct contact with mobile phones<sup>[7]</sup>. These organisms if pathogenic can be detrimental to health of the patients, especially those in Critical Care Units, (CCUs) and if the organism transferred happen to be drug resistant, the situation become even more grave as it become difficult to treat because of limited drug option available<sup>[8]</sup>. Majority of HAIs inadvertently

transmitted through hands of HCP, the environment being the source of nosocomial agent occasionally<sup>[9]</sup>.

### AIMS AND OBJECTIVES:

- Isolation and identification of microorganisms present on mobile phones of health care personnel.
- To establish the relationship of microbial flora between mobile phones and hands of health care personnel.

### MATERIALS AND METHODS:

**Cases:** After the Institutional Ethics Committee (IEC) approval this case control study was carried out with written informed consent including 60 participants (30 HCPs and 30 control group of patients admitted in the ward or visited to OPD and their attendants) randomly selected from the Department of Medicine(10), Surgery(10), ENT(10), Orthopaedics(10), Dermatology(5), Pulmonary medicine (5), Obstetrics & Gynaecology(5) and Intensive Care Unit (5) of Jorhat Medical College, Jorhat, Assam

**Time of study:** During the months of June and July, 2015.

A questionnaire which contained data regarding usage of phones was also filled during sample collection.

**Sample collection and analysis:** The samples were collected aseptically using sterile cotton swabs, after moistening with sterile peptone water. From each participant 2 numbers of samples were collected (one from mobile phone and one from dominant hand). The mobile phone swab samples were collected by rotating one sterile swab sticks over both the surfaces of mobile phones simultaneously after moistening. The hand swab samples were collected from participants' palmer surface of hand (either right or left based on whether the participant is right handed or left handed) including all the fingers and nails and ring(if worn on the selected hand) after moistening the swab.

The collected samples were immediately transported to the microbiology laboratory. Swabs were cultured on Blood agar and MacConkey's agar and then incubated aerobically at 37 degrees Celsius for 24 hours.

Identification of the bacterial pathogens were made by Gram's stain, motility test, coagulase test and other routine biochemical reactions. Statistical analysis: Data were entered and analysed in Microsoft Excel, Chi-square test was done. P values less than 0.05 were considered statistically significant.

**RESULTS AND OBSERVATIONS:****Table 1:** Frequency of bacterial contamination of mobile phones and hands in both health care personnel (HCP) and control group.

Groups	Mobile phones		Hands		P value
	Contamination	Sterile	Contamination	Sterile	
HCP(n=30)	29(96.7%)	1(3.33%)	25(83.3%)	5(15.7%)	0.0001
Control(n=30)	26(86.7%)	4(13.3%)	25(83.3%)	5(15.7%)	0.0001

A total number of 30 mobile swabs of HCP were tested. Out of which 29 (96.7%) showed significant bacterial growth. Similarly, 30 mobile swabs of control group were also tested and 26 (86.7%) showed significant bacterial growth.

30 number of hand swabs of each HCP and control group were tested. Out of which 25 (83.3%) showed bacterial contamination in each group.

The contamination rate of both mobile and hands in the study group as well as in the control group was statistically significant. P value was 0.0001.

**Table 2:** Frequency of bacterial contamination of mobile phones and hands in different groups of H.C.P.

Groups	Mobile phones (%)	Hands (%)
Doctors (n=9)	8 (88.9%)	8 (88.9%)
Nurses (n=12)	12 (100%)	8 (88.9%)
Medical student (n=7)	6 (85.7%)	7 (100%)
Ward boy (n=3)	3 (100%)	3 (100%)

Maximum contamination of mobile phones was found in both Nurses (100%), Ward boys (100%) followed by Doctor (88.9%) and Medical student (85.7%).

Hands were contaminated maximum in Medical students (100%), Ward boys (100%) followed by Doctors (88.9%) and Nurses (66.7%).

**Table 3:** Bacteriological profile of mobile phones and hands of HCP

Bacteria	Mobile phones (n=29)	Hands (n=25)
Staphylococcus aureus	3 (10.3%)	10 (40%)
CoNS	5 (17.2%)	2 (8%)
Enterococcus	3 (10.3%)	4 (16%)
Micrococcus	5 (17.2%)	2 (8%)
Bacillus subtilis	4 (13.8%)	2 (8%)
Shigella dysenteriae	1 (3.4%)	1 (4%)
Proteus spp.	1 (3.4%)	1 (4%)
Escherichia coli	2 (6.9%)	0 (0%)
Klebsiella pneumoniae	3 (10.3%)	2 (8%)
Pseudomonas spp.	2 (6.9%)	1 (4%)

The most isolated bacteria from mobile phones of HCP were Coagulase Negative Staphylococcus (CoNS) (17.2%), Micrococcus (17.2%) followed by Bacillus Subtilis (13.8%), Staphylococcus aureus(10.3%), Enterococcus(10.3%), and Klebsiella pneumoniae (10.3%), Escherichia coli(6.9%), Pseudomonas spp. (6.9%), Shigella dysenteriae(3.4%) and Proteus spp.(3.4%).

On the other hand, the most isolated bacteria from hands of HCP was Staphylococcus aureus (40%) followed by Enterococcus (16%), Coagulase Negative Staphylococcus(8%), Micrococcus(8%), Bacillus Subtilis(8%), Klebsiella pneumoniae (8%),Shigella dysenteriae(4%), Proteus spp.(4%) and Pseudomonas spp.(4%).

**DISCUSSION:**

Hands, instruments, mobile phones or other inanimate hospital objects used by HCPs may serve as a vehicle for the nosocomial transmission of microorganisms [10,11]. Unlike fixed phones, mobile phones are often used in these areas close to the patients and these

patients are more vulnerable to hospital acquired infections [12,13].

The present study showed significant bacterial growth from the mobile phones (96.7%) and from the hands (83.3%) of HCPs. A similar result was also reported by Rawia Ibrahim Bade et. al. [14] who observed 93.7% mobile phones of HCP were contaminated. Lower rate of contamination was found by Kokate et. al [6] and Mark et.al. [15] Where both of them were reported 60% contamination rates of mobile phones.

We have also found 86.7% mobile and 83.3% hands of control group were contaminated with various pathogenic bacteria. So, it is a serious threat to the community.

In our study it was observed that the contamination rate of mobile phone in different groups of HCP is between 85.7% to 100%. Wiener-Well et.al. [16] also reported high incidence of contamination of mobile phones of doctors, nurses and medical students. 100% contamination rates of both the mobile phones and hands were found in ward boy. A similar finding was observed by Tambe and Pai [17]. This may be due to poor hygienic and sanitary practices due to lack of knowledge.

Our study observed monomicrobial growth in all the positive culture (100%). This finding contradicted with Tagoe et.al. [3], where all the positive culture (100%) were polymicrobial. On the other hand, Ulger et.al. [18] reported monomicrobial growth only in 49% culture positive samples. In the current study maximum number of microorganisms isolated from mobile phones were Coagulase Negative Staphylococcus (CoNS) (17.27%) and Micrococcus (17.27%), followed by Bacillus subtilis (13.8%), Staphylococcus aureus(10.3%), Enterococcus (10.3%), Klebsiella pneumonia (10.3%), Escherichia coli(6.9%), Pseudomonas spp (6.9%), Shigella dysenteriae(3.4%) and Proteus spp (3.4%). CoNS was also reported as a predominant organism by BHoondewa et.al. [19] and Kokate et.al. [6]. This organism is non-pathogenic ordinarily but when the host defences are breached, it may cause infections like stitch abscess and growth on implanted foreign bodies, such as artificial heart valves, shunts etc. This leads to bacteraemia. The predominant organism isolated from hand swab was Staphylococcus aureus (40%). It was also the second predominant organism isolated from mobile phones (10.3%). This is due to their capability to resist dryness and can survive and multiply in warm environment [20].

The 36.3% of organisms isolated from mobile phones were same with the organism isolated from hands of respective participants. They showed same biochemical profiles. It was almost a similar finding reported by Meadow et.al. [21]. where they found 35.8% organisms from hands are same as that of the organisms from mobile phones of the same participants. It suggests that hands are potential source of nosocomial infections via the mobile phones or on the other hand mobile phones can also act as a vehicle of transmission.

**CONCLUSION:**

From the present study it has been observed that, mobile phones have become one of the reservoirs for nosocomial agents in hospital setup. Therefore, proper and adequate sanitary measures must be monitored to prevent spread of infectious agents between health care personnel and patients. There is also need to restrict the use of mobile phones in high risk areas such as Intensive care units (ICU), burn unit, operation theatre etc. In future mobile phones could be produced by using protective materials against bacterial contamination.

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