MOBILE PHONES—DO WE NEED DECONTAMINATION?
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ABSTRACT

BACKGROUND
Mobile phones have become a necessity in the present scenario. They are extensively used for communication, internet, images, education, you tube, banking, for sharing reports, X-rays in healthcare settings. On the other hand they are reported to be contaminated by micro-organisms and may act as source of infection. In our study we analysed the mobile phones of healthcare workers (HCW) and college students for microbial contamination and also efficacy of sanitizers, wet wipes for decontamination.

MATERIALS AND METHODS
A total of 220 swabs were collected from 110 mobile phones of HCWs and 110 students. Swabs were cultured on 5% sheep blood agar; MacConkey agar and isolates were identified by standard protocol.

RESULTS
91.8% of students and 89.1% of HCWs mobiles were contaminated. Organisms like Staphylococcus aureus, CONS, E. coli, Klebsiella aerogenes were isolated. HCWs mobiles showed higher number of potential pathogens.

Decontamination by absolute alcohol, alcohol-based hand sanitizers decontaminated 96% of the mobile phones. Non-alcohol-based hand sanitizers and wet wipes were able to decontaminate 88% and 96% of the mobiles respectively.

CONCLUSION
Mobile phones of healthcare workers and also students were contaminated. Absolute alcohol could clean 96% mobiles of HCWs and 92% of students. Alcohol based hand sanitizers eliminated the organisms (96%) as against non-alcohol-based sanitizers. (88%). It was also observed that wet wipes were effective in students’ groups. (96%).

KEYWORDS
Mobile Phones, Contamination, Decontamination.

carbapenem-resistant Acinetobacter baumanii.5 Nigeria study showed that 62% of total 400 mobiles studied were contaminated. Ulger, et al. from USA has reported much higher 94.5% of mobile phones to be contaminated with various microorganisms.6 In India Trivedi HR et al has shown that 52% of HCW’s dominant hand and 40% of their mobile phone had bacterial contaminations.7 These organisms may act as potential health hazard to self and family members. Warm environment surrounding the mobile phones along with constant handling creates favourable conditions for growth of micro-organisms, hence they are called as “technological Petri – dish for thousands of worms”.

Every mobile manufacturer gives Dos and Don’ts instructions to users about the mobile use. But no manufacturer gives any instruction about the surface disinfection of the mobile without any damage to the mobile.

As we cannot clean mobile phones with water, isopropyl alcohol has been used with 98% efficacy, but it is not easily available for public and is highly inflammable, so we decided to evaluate commercially easily available skin sanitizers, alcohol based, non-alcohol based and wet wipes for easy mobile disinfection and compared with absolute alcohol. Since mobile phones of health care workers are known have contamination rate, another group we chose was students as they are constantly using mobile phones.

MATERIALS AND METHODS

Study was prospective anonymous unlinked surveillance. Study was planned by enrolling the 110 HCWs of Private Nursing home, (Resident doctors -18, Nursing staff - 62, Laboratory technicians– 11, Operation theatre (OT) assistants – 19). 110 Students attending Arts Graduation College with no connection to hospitals as Non- HCWS. First the plan of study was explained, and consent was taken from each participant. Only android touch screen mobiles were included. Each day we collected samples from 10 mobile phones. We collected the data that none of them were cleaning phones with disinfectants. We gave identification number to each phone and whole data was analysed on that number.

The mobile phones of each HCW was asked to place on the table at the end of their shift duty. Sterile swabs moistened with sterile saline were used to rub the surface of the mobile and immediately inserted into sterile test tube.

From student’s mobile phones also, we collected the swab at the end of the college in the same manner. The swabs were immediately inoculated on 5% sheep blood agar, MacConkey agar and incubated overnight at 37°C. Next day the organisms were identified by colony morphology, Gram stain, biochemical tests. We noted different types of growth from each mobile. Then the isolates identified as Staphylococcus aureus were subjected to cefoxitin disc diffusion test to detect MRSA.

We then selected randomly 100 mobile from HCWs and students, their Identification number recorded and divided into four groups, with 25 in each group. Mobile phones of first group were cleaned with sterile cotton dipped in Absolute alcohol. Second group of mobile phones were cleaned with alcohol-based hand sanitizer (3M Hand rub). Third group was cleaned with non-alcohol-based sanitizer (Godrej Protekt, hand sanitizer), last group was cleaned with wet wipes (Kara hand sanitizing wet wipes). After 10 minutes, we again rubbed the surface of mobile phone with sterile cotton swab for culture and processed as above.

RESULTS

<table>
<thead>
<tr>
<th>Health Care Workers. (110)</th>
<th>Students. (110)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Contamination rate</td>
<td></td>
</tr>
<tr>
<td></td>
<td>98 (89.1%)</td>
</tr>
<tr>
<td></td>
<td>101 (91.8%)</td>
</tr>
</tbody>
</table>

Table 1. Showing Contamination Rate of Mobile Phones in Both Groups

<table>
<thead>
<tr>
<th>Name of the Organism</th>
<th>HCW</th>
<th>Students</th>
</tr>
</thead>
<tbody>
<tr>
<td>MSSA</td>
<td>38</td>
<td>39</td>
</tr>
<tr>
<td>MRSA</td>
<td>18</td>
<td>07</td>
</tr>
<tr>
<td>CONS</td>
<td>51</td>
<td>59</td>
</tr>
<tr>
<td>E.coli</td>
<td>51</td>
<td>52</td>
</tr>
<tr>
<td>Klebsiella aerogenes</td>
<td>37</td>
<td>34</td>
</tr>
<tr>
<td>Pseudomonas aeruginosa</td>
<td>17</td>
<td>17</td>
</tr>
<tr>
<td>Acinetobacter baumanii</td>
<td>03</td>
<td>00</td>
</tr>
<tr>
<td>Enterococci</td>
<td>08</td>
<td>01</td>
</tr>
<tr>
<td>Total</td>
<td>223</td>
<td>209</td>
</tr>
</tbody>
</table>

Table 2. Showing the Pattern of Organisms in Contaminated Mobile Phones

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
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<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>HCW (100)</td>
<td>24 (96%)</td>
<td>24 (96%)</td>
<td>22 (88%)</td>
<td>22 (88%)</td>
</tr>
<tr>
<td>Students</td>
<td>23 (92%)</td>
<td>24 (96%)</td>
<td>23 (88%)</td>
<td>24 (96%)</td>
</tr>
</tbody>
</table>

Table 4. Effects of Disinfection

This study showed that mobile phones of students were more contaminated (91.8%) than the Health care workers (89.1%). This difference was not statistically significant. Only one type of organism (monobacterial) isolation was more from mobile phones of students (33.7%) than that of HCWs, who showed predominantly three or more type of micro-organisms (46.9%).

Microbial profile in the study showed predominantly Coagulase negative staphylococci and E. coli (22.9%) each from mobiles of healthcare workers, where as it was Coagulase negative staphylococci (28.2%) followed by E. coli (24.9%) from student’s mobiles. Pathogens like MRSA were more prevalent on mobile phones of HCWs (8.1%) as
against only 3.3% from student groups. Potential pathogens like Acinetobacter baumannii, Enterococci were also more prevalent on HCW’s mobiles.

With Absolute alcohol as disinfectant, 96% of mobiles of HCWs and 92% of student’s mobiles showed absence of growth. Alcohol based hand sanitizers eliminated the organisms from 96% as against non-alcohol-based sanitizers. (88%). It was also observed that wet wipes were effective in students’ groups. (96%).

DISCUSSION

Due to increase in functions of mobile phones at affordable prices, they are have become universally accepted accessories. It can be found in dining area, kitchen, restaurant, gym, even bathrooms. The heat generated by cell phones contribute to harbouring bacteria on the device to multiply at alarming levels. We bring the cell phones daily in contact with face, mouth, ears, and hands. We use cell phones during travelling, so may bring back unusual organisms from that place. Younger generation students seem to use it more, even while eating, walking, on bed. If they have micro-organisms on their surface, they may act as source of infection to users.

Observations in this study showing contamination of mobile phones among HCW (89.1%) is consistent with Sterling I et al (96.2%),9 Usha S et al (91.6%),10 Badr RJ et al (93.7%),11 Jeske HC et al (90%),12 Brady RR et al13 has also reported similar contamination rate of 96.2%. We did not come across any study with students’ mobile phones. Srikanth P et al14 has studied mobile phones of corporate personnel, which were also contaminated.

It is proposed that organisms on mobile phones come from the hands. In our study two or more type of organisms were isolated from both groups. Similar observations were made among HCWs by Kaur S et al, and Elkholy et al.15,16 But Badr RJ et al has observed more monobacterial contamination (93.3%).11

Micro-organisms on mobile phones were similar in both groups, but potential pathogens like MRSA, Klebsiella aerogenes, Acinetobacter baumannii are more prevalent in HCWs, as these organisms are associated with hospitals. Tankhiwale N et al17 has also reported CONS, Staphylococcus aureus, E. coli, Klebsiella and pseudomonas from Health care workers. Similar observations were made by Kokate SB et al. Badr RI also reported consistent findings.18,11 Tambe MN observed fungi also along with bacteria.4 In this study we observed that all disinfectants we used reduce the contamination rate. Absolute alcohol and alcohol-based disinfectants are efficient in reducing 96% of contamination. Usha S et al has reported that isopropl alcohol showed 98% efficacy in decontaminating the mobile phones.10 Similar observations were made by Tankhiwale N et al.17 Singh A et al observed 87% reduction in bacterial contamination with 70% alcohol.19 But we did not come across any study, which reported efficacy of hand sanitizers, moist wipes for effective decontamination of mobile phones.

As now it is observed that mobile phones of Health care workers and students are highly contaminated with microorganisms, some potential pathogens. These mobile phones are constantly in touch with our body. small children also use these mobile phones. Cleaning with easily available alcohol based, non-alcohol bases hand sanitizers or wet wipes can easily reduce the bacterial contamination. So if mobile manufacturers study these facts in detail and recommend to the customers it will be beneficial to the mobile users and make mobile use safe.

Limitations of our Study

We have not studied the effects of disinfectants on mobiles. Manufacturers of various disinfectants claim the activity for 2-8 hours. But we have not studied the duration of decontamination activity of sanitizers or wet wipes so cannot recommend how frequently decontamination must be done.

CONCLUSION

Mobile phones of HCWs and students were contaminated. Two or more organisms were observed along with potential pathogens like MRSA, Enterococci, Acinetobacter baumannii, which may act as source of infection to patients in health care setup or family members. These mobile phones can be cleaned using alcohol based or non-alcohol-based sanitizers or wet wipes.

Acknowledgement

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[10] Usha S, Jayalakshmi J, Appalaraju B. Cell phones are reservoir of nosocomial pathogens. Abstract no: OA-


