Original article

Prevalence and antimicrobial pattern of microbes isolated from mobile phones of University Volunteers at Swami Ramanand Teerth Marathwada University, Nanded, India

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A R T I C L E	I N F O

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A B S T R A C T

The present investigation aimed to examine prevalence of bacterial pathogens on cell phone surfaces and their antibiotic susceptibility test among students, teachers and non teaching staff of Swami Ramanand Teerth Marathwada University, Nanded. The pathogens were isolated by taking mobile swabs on selective media and were characterized by morphological and biochemical tests. Similarly, the antibiotic sensitivity of isolates was determined by disk diffusion method. Total 100 mobile cell phones were screened for pathogenic bacteria from university volunteers, including students (60), teaching staff (20) and non-teaching staff (20). Out of 100 cell phones screened, 98 (98%) were contaminated with bacteria. Overall, amongst them, Fifty (50%) cell phones were found to harbour Staphylococcus aureus followed by Escherichia coli on 26 (26%) cell phones, 16 (16%) Pseudomonas aeruginosa and Salmonella typhi 6 (6%). Antibiotic susceptibility tests of these isolates indicate that S. aureus and P. aeruginosa were resistant to most of the antibiotics used in present investigation, whereas E. coli and S. typhi were resistant to doxycycline hydrochloride, vancomycin and azithromycin. Such pathogens could serve as a source of cross transmission. Therefore, knowledge regarding safe handling of mobile devices is recommended to limit the risk of cross-contamination.

Introduction

The global system for mobile telecommunication was established in 1982 in Europe with a view to provide and improve communication networks [1]. Nowadays, mobile phones became one of the most requisite accessories of professional and social life. Although they are usually stored in bags or pockets, mobile phones are handled frequently and held to the face [2]. Thus, mobile phones provide a breeding place for transmission of bacterial infections and hospital-associated infections [3-6].

India has 1 billion mobile phone users and these accounts for 97% of all the telecommunication users [7]. Because of the advancement of technology, it is possible to use such devices for better communication. This increased use of mobile phones may be a cause to rise in nosocomial infections [8]. In many countries, mobile phones outnumber landline telephones. In the world, Asia has the fastest growth rate of cell phone subscribers at present. Computer technology in research laboratories has become an essential part of all aspects of modern laboratories [9]. Mobile phones in the University campus may be used for various purposes such as data sharing, idea sharing amongst the scientific community, social networking and playing games etc.

Due to the benefits of cell phones, their hazard to human health is often ignored. The constant handling of mobile phones and other electronic gadgets by different users exposes to an array of microorganisms and thus makes a good carrier for microbes [10]. This is especially so with the skin due to the moisture and optimum temperature of human body, especially our palms. Along with these factors, heat generated by mobile phones contributes to harbouring bacteria and their transmission on the devices at an alarming rate [11].

Antimicrobial resistance is an important issue associated with nosocomial infections and most nosocomial infections are often caused by antibiotic resistant organisms [12]. Many reports suggested that there is an increase in morbidity and mortality associated with infections due to the increased antibiotic resistance [12-16] and also contribute substantially to rising costs of care resulting from prolonged hospital stays and the need for more expensive drugs and increased health care costs [15-16]. Therefore, our study aimed at investigating the prevalence and antibiotic susceptibility profiling of pathogenic bacteria on the mobile phones of students, teaching and non-teaching staff in S.R.T.M.University, Nanded, India.

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MATERIALS AND METHODS

Sample collection

The study was conducted at School of Life Sciences, Swami Ramanand Teerth University, Nanded, Maharashtra, India, from July 2015 to May 2016. Total 100 mobile phones were sampled from students (60), teaching staff (20) and non-teaching staff (20) of School of Life Science. Sampling was done by moistening a sterile cotton swab with saline water (0.85%) and rotating onto the overall surface area of mobile phone by holding the phone between two fingers. Then the samples were kept in sterile vials.

Isolation and identification of organisms

Collected samples were immediately transported to the laboratory where they were inoculated on solid media such as MacConkey agar, Mannitol salt agar and Cetrimide agar plates and were incubated at 37°C for 24-48 h. After incubation, plates were observed for the growth and the identification was performed by morphological and biochemical tests (catalase, oxidase, indole, MR-VP, citrate, urease, TSI and motility).

Antibiotic susceptibility tests of isolates

Sensitivity of isolates to antibiotics was determined on Mueller-Hinton agar by the disk diffusion method [17] and recommendations of Clinical and Laboratory Standard Institute [18]. The antibiotics used in this study included ciprofloxacin (5mcg), ofloxacin (5mcg), doxycycline hydrochloride (30mcg), vancomycin (30mcg), azithromycin (15mcg), gatifloxacin (5mcg), sparfloxacin (5mcg) and aztreonam (30mcg) of Hi-Media Laboratories, Bombay, India. The strains were characterised as susceptible or resistant, based on the diameter of the inhibition zones around the disk.

RESULTS AND DISCUSSION

In this study 100 cell phone samples were collected from University volunteers, including Students, Teaching Staff and Non-teaching staff of School of Life Sciences, S.R.T.M.University Nanded. It is observed that ninety-eight (98%) out of 100 cell phones were found to be contaminated with bacteria. Among the students category, contamination with S. aureus was found to be higher (50%) followed by E.coli (15%), P. aeruginosa (15%) and S. typhi (10%). The cell phones from teaching staff were contaminated with S. aureus (50%) and E.coli (50%) only whereas P. aeruginosa and S. typhi were not detected. However, the percentage contamination by these isolates was highest. The cell phones from non-teaching staff were contaminated with three pathogens including S. aureus (50%), E.coli (35%) and P. aeruginosa (35%). However, S. typhi was not detected. Overall, among 100 samples, 50 samples (50%) were found to be contaminated with S. aureus followed by E. coli 26 (26%), P. aeruginosa 16 (16%) and S. typhi 6 (6.0%). S. typhi was found only in the student samples, whereas it was not detected in teaching and non-teaching staff samples (Fig. 1). This represents a high percentage of contamination with this pathogenic organism among students.

Total 56 bacterial pathogens were isolated from University volunteers in this study (Fig. 2). The rate of contamination was found to be with S. aureus 21 (37.5%), E. coli 19 (33.93%), P. aeruginosa 13 (23.21%) and S. typhi 03 (5.36%). Among them, student category showed highest pathogen (29) followed by non-teaching staff (14) and teaching staff (13). Sharing of phones amongst friends, which is a common practice might also be a reason for the high contamination rate observed among students.

Tagoe et al., (2011) [19], reported that the mobile phones of students from Cape Coast University Ghana showed high level of contamination with Pseudomonas sp. and least contamination with Salmonella sp. Ibrahim et al. (2014) [20], in his study reported the mobile phones with Staphylococcus sp., Pseudomonas sp. and E.coli. Highest percentage of S. aureus in all the volunteers may be because cell phones are kept warm in pockets, handbags and briefcases that provide optimum temperature for the growth of this bacterium and it is abundant in human body especially as a normal flora of the skin as reported by Karabay et al. (2007) [21].

Results of antibiotic resistance of bacterial isolates are listed in Table 1. S. aureus was resistant to ciprofloxacin (9.52%), doxycycline hydrochloride (9.52%), vancomycin (14.29%), azithromycin (19.05%), gatifloxacin (4.76%), sparfloxacin (4.76%) and aztreonam (14.29%). Moreover, none of the isolates showed resistance to ofloxacin. The level of resistance to vancomycin is higher than those reported by Kabir and Akhter (2014) [22]. Isolation of vancomycin-resistant S. aureus from the mobile phones was also reported by Shobha et al. (2012) [23]. Vancomycin is preferred antibiotic for the treatment of S. aureus infections.

E.coli was found to be resistant to doxycycline hydrochloride (15.79%), vancomycin (15.79%) and azithromycin (10.53%). Ciprofloxacin, ofloxacin, gatifloxacin, sparfloxacin and aztreonam were found most effective against E.coli. In our study, none of the isolates were found to be resistant to ciprofloxacin. This result is in agreement with Gashe et al. (2014) [24]. P. aeruginosa was resistant to doxycycline hydrochloride (7.69%), vancomycin (15.38%), azithromycin (7.69%), gatifloxacin (7.69%), sparfloxacin (15.38%) and aztreonam (15.38%). Ciprofloxacin and ofloxacin were found to be most effective against P. aeruginosa. Kumar and Aswathy found ciprofloxacin sensitive Pseudomonas from mobiles of college students [25]. S. typhi were resistant to doxycycline hydrochloride (33.33%), vancomycin (33.33%) and azithromycin (33.33%) while susceptible to other antibiotics.

In the present study, S. aureus, E. coli, P. aeruginosa and S. typhi were found to be resistant to most of the antibiotics under study. The infection with such drug resistant pathogens should be seriously considered and frequent monitoring of mobile phone associated pathogens becomes necessary. Bacterial pathogens are colonized on human host and inanimate objects, but most people do not realize that microbes are found on many common
CONCLUSION:

There were no previous reports on a comparative study of mobile phone in students, teaching and non-teaching staff in India. All the pathogenic organisms found in the present study were detected in students category compared to teaching and non-teaching category; it may be due to frequent use of mobile phones. Most of the pathogens were found to be antibiotic resistant and hence, can act as transmission vehicles for pathogenic organisms. Therefore, we recommend increasing awareness of hand hygiene and frequent decontamination of mobile devices to reduce the risk of cross-contamination by these devices in the University premises. Additionally, more studies are required to assess the efficacy of the above strategies in decreasing bacterial contamination and limiting infection transmission caused by the use of cell phones.

DISCLOSURE OF INTEREST: The authors declare that they have no competing interest.

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TABLES: Table 1: Antibiotic resistance of bacterial isolates from mobile phones of university volunteers

<table>
<thead>
<tr>
<th>Name of antibiotic</th>
<th>S. aureus(21)*</th>
<th>E.coli (19)*</th>
<th>P. aeruginosa (13)*</th>
<th>S. typhi (03)*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ciprofloxacin</td>
<td>9.52</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>Oxoflaxin</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>Doxycycline</td>
<td>9.52</td>
<td>15.79</td>
<td>07.69</td>
<td>33.33</td>
</tr>
<tr>
<td>Hydrochloride</td>
<td>14.29</td>
<td>15.79</td>
<td>15.38</td>
<td>33.33</td>
</tr>
<tr>
<td>Vancomycin</td>
<td>19.65</td>
<td>16.53</td>
<td>07.69</td>
<td>33.33</td>
</tr>
<tr>
<td>Azithromycin</td>
<td>04.79</td>
<td>0.00</td>
<td>07.69</td>
<td>33.33</td>
</tr>
<tr>
<td>Gatifloxacin</td>
<td>04.76</td>
<td>0.00</td>
<td>07.69</td>
<td>0.00</td>
</tr>
<tr>
<td>Sparfloxacin</td>
<td>04.76</td>
<td>0.00</td>
<td>15.38</td>
<td>33.33</td>
</tr>
<tr>
<td>Aztecanom</td>
<td>14.29</td>
<td>0.00</td>
<td>15.38</td>
<td>33.33</td>
</tr>
</tbody>
</table>

*Total number of bacterial isolates in parenthesis.

FIGURES:

Fig. 1: Percentage of bacterial isolates from mobile phones of volunteers

Fig. 2: Number of bacterial isolates from mobile phones of volunteers

REFERENCES


7. Telecom Regulatory Authority of India (TRAI). The Indian Telecom Services Performance Indicators 2016, New Delhi, India.


