



Evaluation of Microbial Contamination of Mobile Phone among Dentists in College of Dentistry in Baghdad University

Batool H. Al-Ghurabi^{1*}, Nidhal H. Ghaib², Ahmed A Abbas³, Batol K. Al-Musawi⁴,
Nada S. Hassain⁵ and Zainab H. Al-Ghurabi⁶

¹ Department of Basic Science, College of Dentistry, University of Baghdad, Iraq

² Department of Orthodontics, College of Dentistry, University of Baghdad, Iraq

³ Department of Microbiology, Medical College, Al-Nahrain University, Iraq

⁴ Ministry of Health, Iraq

⁵ Ministry of Health, Teaching Laboratory, Iraq

⁶ Department of Oral Diagnosis (Radiology), College of Dentistry, University of Baghdad, Iraq

*Corresponding e-mail: batoolamms@yahoo.com

ABSTRACT

Background: Mobiles have become one of the most indispensable accessories of profession and social life. The mobiles make life easier, but they pose a number of new hazards also. **Objectives:** The principle aim of this study was to evaluate the microbial contamination of mobile phones belonging to dentists in College of Dentistry in Baghdad University. **Materials and Methods:** 35 dentists (20 female and 15 male) were enrolled in this study. Sampling was taken from each participant's mobile by using moist sterile swab impregnated by normal saline for microbial analyses. **Results:** The findings of this study revealed that the growth of microorganisms has found in all samples taken from the mobile phones of dentists. The most common microorganisms detected were *Staphylococcus epidermidis*, *Micrococcus spp.*, *Candida albicans* and *Aspergillus niger*. On the other hand, there was no significant difference ($P > 0.05$) in the microorganisms isolated and their percentage frequency of occurrence between mobile phones for male and female. **Conclusions:** The current results indicated that mobile phones can serve as a vector for cross-transmission of community-acquired pathogenic organisms for human.

Keywords: Mobile phones, Microbial contamination, Dental office

INTRODUCTION

Mobile phones also known as cell phones, cellular phones or a hand phones are electronic devices used for personal telecommunications over a cellular network of specialized base stations known as cell sites and receive telephone calls over a radio link whilst moving around a wide geographic area [1]. Health care workers as they make the health care delivery system more efficient by increasing speed of communication. Dental professions no exception to cell phone uses. Dental professionals are exposed to many microorganisms present in blood and saliva. Their cellular phones are seldom cleaned and often touched during or after the examination of patients without hand washing [2,3].

Infection issue and controlling it is one of the basic challenges of dentistry profession, it is important risk factor for both the patient and dentist [4]. However, there are different pattern for microorganism transmission in the dentistry domain; through direct contact from one person to another or indirect ways, through contaminated equipment and devices and environmental surfaces that are not sterilized and disinfected regularly [5]. In general researches have shown that the dentistry care team is exposed to high risk of suffering infections such as *Mycobacterium tuberculosis*, hepatitis B and hepatitis C, *Staphylococci*, *Streptococci*, and Human Immunodeficiency Virus [6]. As a result, the principle ways of preventing infection transmission in dentistry field is accurate training and promoting dentists' awareness about the scientific methods of sterilization and disinfection of the equipment and devices of workplace [7]. People rarely disinfect mobile phones and they are cumbersome to clean. So, these devices have the potential for contamination

with various bacterial agents [8]. Many researchers have studied cell phone contamination among healthcare workers and in the community. However, no work has been reported in our country on bacterial contamination on cell phones used by dentists. Therefore, this study was carried out to evaluate the microbial contamination of mobile phones belonging to dentists in College of Dentistry in Baghdad University.

MATERIALS AND METHODS

The study included 35 mobile phones belonging to dentists (20 females and 15 males) work in College of Dentistry, Baghdad University. The mobile phone was first held with the aid of sterile gloves. The new mobiles were excluded from research. Each participant's mobile phone was swabbed aseptically by rotating damp cotton swabs with sterile demineralised water over three sites over all exposed outer surfaces of the mobile phones. The samples were transported immediately to the microbiological laboratory for culture and identification of microorganism. Swabs were streaked onto blood agar, McConkey agar and Sabouraud dextrose agar, after that the plates incubated at 37°C for 48 hrs. Isolated microorganisms were identified using gram stain, morphology, catalase, and coagulase reaction.

Statistical analysis was performed using SPSS (version 19). Intergroup comparisons were made using paired t-test, chi square test and descriptive statistics.

RESULTS

Fifty-three participants were recruited of which 57% females and 43% males, with mean age 47 ± 2.6 years (Table 1).

Table 1 Distribution of study subjects by age

Gender	N (%)
Female	20 (57%)
Male	15 (43%)
Total	35

Table 2 Frequency of bacteria isolated from personal mobile phones

Microorganisms	Mobile phone N (40)	Percentage (%)
<i>Staphylococcus epidermidis</i>	18	51%
<i>Micrococcus</i> spp.	7	20%
<i>Candida albicans</i>	20	57%
<i>Aspergillus niger</i>	3	8%

The microorganisms were found on all mobile phones samples, the rate of mobile phone contamination was 35/35 (100%). the microorganisms isolated, and their percentage frequency of occurrence was *Staphylococcus epidermidis* 18/35 (51%), *Micrococcus* spp. 7/35 (20%) *Candida albicans* 20/35 (57%) and *Aspergillus niger* 3/35 (8%) (Table 2). No significant differences ($P > 0.05$) were found in type of microbial contamination of mobile phones based on gender (Table 3).

Table 3 Frequency of bacteria isolated from personal mobile phones according to gender

Microorganisms	Female N (20)	Male N (15)	Chi-square p-value
<i>Staphylococcus epidermidis</i>	9 (45%)	9 (60%)	P>0.05
<i>Micrococcus</i> spp.	3 (15%)	4 (26%)	
<i>Candida albicans</i>	9 (45%)	12 (80%)	
<i>Aspergillus niger</i>	2 (10%)	1 (6%)	

RESULTS AND DISCUSSION

The mobile phone use is highly prevalent among medical staff playing a significant role in life and contributes positively to their ability to communicate concerning hospital affairs. However; this referred only to technical aspects and gives no consideration of their possible role in transmission of infections. Preventing cross infection in dentistry is a basic issue in dentistry profession, because the dentistry environment is an environment in which the transmission of infectious diseases occurs easily [9].

The results of the current study showed that the contamination ratio of the mobile phones of dentists in college of dentistry was 100 percent, and no significant differences ($P>0.05$) were found in type of microbial contamination of mobile phones based on gender. This finding is consistent with other Iranian study reported by Mohammad, et al. [10] who showed that the growth of bacteria has existed in all samples taken from the mobile phones of dentists and also normal citizens. In other word, the ratio of bacterial contamination of the mobile phones of dentists and normal citizens participating in his study was 100 percent. Similarly, Ilusanya, et al. also mention that the rate of bacterial contamination of food vendors' mobile phones was 100% [11]. Conversely, Bhoonderowa and colleagues evaluated the importance of mobile phones in transmitting contamination to the community in the sample of volunteer people, they showed that from total 192 investigated cases, there is a bacterial growth of 176 cases or 91.7%, that from this ratio 82.4 percent had mild growth, 13.1 percent had medium growth, and 4.5 percent had high growth [12]. Furthermore, in the study conducted by Singh, et al., microbial growth was observed in 98% of samples taken from mobile phones of academic members and students of dentistry, this microbial growth was different from 95.65 percent in academic members' mobile phones to 100 percent of students' mobile phones, but this difference was not statistically significant [13]. The high prevalence of bacterial agents isolated from mobile phones was attributed to the poor hygienic and sanitary practices. However, the discrepancies showed among different studies might be due to the influence of sampling method, sample size and different laboratory processes.

In accordance with our result, previous studies reported that there was no significant relationship between the contamination ratio with gender [14,15]. The reason may be equal duration of usage of cellular phones by both the genders.

CONCLUSION

The research findings indicate that *Candida albicans*, *Staphylococcus epidermidis*, *Micrococcus* spp. and *Aspergillus niger* are the main microbial isolates frequently associated with mobile phones. This result is partly agreed with results of other studies [14,16]. Barari Sawadkahi, et al., revealed that among the bacteria found on the samples' mobile phones *Staphylococcus epidermidis* with 13.1% had the second rank in respect of frequency after *Bacillus subtilis* [16]. Likewise, Bhoonderowa and colleagues found that the most common isolated bacteria were respectively coagulase-negative *Staphylococcus* with 69.3%, *Micrococcus* spp. with 51.8%, *Klebsiella* spp. with 1.5%, and *Pseudomonas aeruginosa* with 1% frequency [14]. On the other hand, Al-Abdalall made analysis of 202 cell phones and showed their high contamination with fungi from the genera: *Alternaria alternaria* (29%), *Aspergillus niger* (26.9%) and *Penicillium* spp. (10.47%) [17]. Similarly, the study done by Coutinho, et al. [18] indicated a high level of fungal contamination of mobiles, they isolated 34 species of microscopic fungi from public telephones in Brazil. In conclusion the current results indicated that mobile phones can serve as a vector for cross-transmission of community-acquired pathogenic organisms for human.

DECLARATIONS

Conflicts of interest

The authors and planners have disclosed no potential conflicts of interest, financial or otherwise.

REFERENCES

- [1] Rana, R., et al. "Cell phones-homes for microbes." *International Journal of Biological and Medical Research* Vol. 4, No. 3, 2013, pp. 3403-06.
- [2] Singh, Sweta, et al. "Mobile phone hygiene: potential risks posed by use in the clinics of an Indian dental school." *Journal of Dental Education* Vol. 74, No. 10, 2010, pp. 1153-58.
- [3] Usha, S., J. Jayalakshmi, and B. Appalaraju. "Cell phones as reservoir of nosocomial pathogens." *Abstract no: OA-10, IX-National Conference of Hospital Society of India, Chandigarh, India.* Vol. 16. 2007.
- [4] Kazi, Mohammad Mukhit, and Rajeev Saxena. "Infection control practices in dental settings-A review." *Journal of Dental and Allied Sciences* Vol. 1, No. 2, 2012, 67.
- [5] MacDonald, David S., and J. Douglas Waterfield. "Infection control in digital intraoral radiography: evaluation of microbiological contamination of photostimulable phosphor plates in barrier envelopes." *Journal (Canadian Dental Association)* Vol. 77, 2011, p. b93.

-
- [6] DTMH, OAM. "Infection control practices among dental professionals in Shiraz Dentistry School, Iran." *Archives of Iranian Medicine* Vol. 12, No. 1, 2009, pp. 48-51.
- [7] Eskandarloo A, Yousefi Mashouf R. Prevalence of bacterial contamination and principles of infection control in dental radiographic apparatus in Hamadan. *Journal of Hamadan University of Medical Sciences* Vol. 12, No. 4, 2005, pp. 59-55.
- [8] Elkholy, Mohamad T., and Ibrahim E. Ewees. "Mobile (cellular) phone contamination with nosocomial pathogens in Intensive care units." *Medical Journal of Cairo University* Vol. 78, No. 2, 2010, pp. 1-5.
- [9] Akinyemi, Kabir O., et al. "The potential role of mobile phones in the spread of bacterial infections." *The Journal of Infection in Developing Countries* Vol. 3, No. 08, 2009, pp. 628-32.
- [10] Shooriabi, Mohammad, et al. "Investigating the Ratio and Type of Bacterial Contamination of Dentists' Mobile Phones in Dentistry Unit of Sina Hospital in Ahvaz in 2014." *International Journal of Medical Research & Health Sciences* Vol. 5, No. 8, 2016, pp. 317-25.
- [11] Ilusanya, O.A.F., et al. "Personal hygiene and microbial contamination of mobile phones of food vendors in Ago-Iwoye town, Ogun State, Nigeria." *Pakistan Journal of Nutrition* Vol. 11, No. 3, 2012, pp. 276-78.
- [12] Alighardashi, M., et al. "The amount and type of microbial contamination on cell phones of medical staff in Shahid Beheshti Hospital, Hamadan, Iran." *Journal of Health System Research* Vol. 7, No. 6, 2011, pp. 1-9.
- [13] Singh, Sweta, et al. "Mobile phone hygiene: Potential risks posed by use in the clinics of an Indian dental school." *Journal of Dental Education* Vol. 74, No. 10, 2010, pp. 1153-58.
- [14] Bhoonderowa, A., S. Gookool, and S. D. Biranjia-Hurdoyal. "The importance of mobile phones in the possible transmission of bacterial infections in the community." *Journal of Community Health* Vol. 39, No. 5, 2014, pp. 965-67.
- [15] Barari, Sawadkoshi R., et al. "Comparison of the microbial colonization of mobile phone between health care personnel and non-care personnel of Babol University of medical science hospitals." 2014, pp. 67-71.
- [16] Kuria, J.K.N., et al. "Profile of bacteria and fungi on money coins." *East African Medical Journal* Vol. 86, No. 4, 2009, pp. 151-55.
- [17] Al-Abdalall, Amira HA. "Isolation and identification of microbes associated with mobile phones in Dammam in eastern Saudi Arabia." *Journal of Family and Community Medicine* Vol. 17, No. 1, 2010, pp. 11-14.
- [18] Coutinho, Flavia Paiva, Marilene da Silva Cavalcanti, and Francisco Cordeiro Neto. "Isolation of filamentous fungi from public telephones of the Metropolitan region of the city of Recife, PE, Brazil." *Brazilian Journal of Microbiology* Vol. 38, No. 2, 2007, pp. 324-29.