

Mobile Phones Risk Cross-Infection in Clinics: A Clinical Study

Dhriti Seth¹ and Dr Achint Garg²

¹Class-12 IBDP Heritage Xperiential Learning School

²(M.Sc; F.D.S.R.C.S)

E-mail: ¹dhritiint169@ggn.hxls.org, ²achintgarg@yahoo.com

Abstract—A total of 84 dentists were invited to participate in a Knowledge, Attitude and Perspective questionnaire regarding mobile phone hygiene practices. All the participants who reported cleaning their phone less than once per week (40) were invited to participate in second part of the study. These 36 participants (4 dropouts) along with 17 (1 dropout out of 18) dental assistants and 1 control (sterile cotton applicator tip) were sampled onto sheep blood agar plates and CFU values were calculated (CFU-Pre). Then these mobile phones were cleaned with 70% isopropyl alcohol and allowed to dry. Again samples were taken and streaked onto sheep blood agar plates and CFU values were calculated (CFU-Post). Then after a period of 1 week again the mobile phones were sampled and streaked onto a sheep blood agar and CFU values were calculated (CFU-One Week Post). Our study reports that basic mobile phone hygiene practices amongst dentists are considerably poor and require training and education for adopting better practices. The CFU-Pre and CFU-Post values of buttoned mobile phones was significantly greater than those of touch screen mobile phones (0.008 and 0.000). CFU-Pre values were significantly higher in large sized mobile phones (p value – 0.000) compared to medium or small sized phones. CFU-Pre values were significantly greater in the Technicians (p value – 0.042) than the dentists. Our study that buttoned phones harbor greater bacterial load and that 70% isopropyl alcohol cannot efficiently clean buttoned mobile phones yet touch screen phones can be.

INTRODUCTION

Mobile phones have become an indispensable gadget that is used and carried by everyone. The doctors, dental practitioners and dental assistants are seen carrying their phones in the operatory and use it frequently to show X-ray images, lab reports, internet references and sometimes to answer calls. They may use it before or after washing hands and sometimes even without removing the gloves. This indiscriminate use of mobile phones can be significant cause of cross-infections. Such devices may carry harmful bacteria and virus and contribute to the spread of infections to unsuspecting individuals. Therefore, the implications of seemingly harmless use of device in a dental operatory can be far reaching. Therefore, a strict protocol of sterilization and hygiene in a dental practise should not be limited to sterilization of instruments and materials but also take into consideration the risk of spread of infections through the use of such devices in the operatory.

BACKGROUND

Any item contaminated by a patient's saliva or blood is a potential source of cross contamination and transmission of disease. Although currently undocumented because of lack of standardization and general protocols in dental practices as well as a lack of long term follow up of patients, cross-infection in a dental setting would prove to be a major overall health risk issue in the future, especially so in developing countries¹. A recent study showed that the areas around nose and inner corner of eyes are significantly at higher risk of contamination after basic dental procedures with aerosols.²

To comprehensively apply the infection control protocol, items of personal use like mobile phones, pens, eye wear, key chains etc. need to be included within the list of items to be cleaned at least, if not disinfected. Presently there are no guidelines concerning mobile phone hygiene practices for a dental setting. Awareness and the necessary precautions play a pivotal role in preventing the occurrence of cross-contamination. It is the responsibility of the entire dental team to work in unison to prevent the menace of cross-contamination and spread of infection.³

Keeping this view in mind and following the work of a study in Manipal Dental College⁴ this study was carried out on mobile phones of dentists to assess the amount of bacterial load a mobile phone carried before and after cleaning the device with 70% isopropyl alcohol and then after a period of 1 week to assess its efficacy. It will be prudent to assume that if such habits are inculcated amongst the students in a dental school such that it becomes a part of the behavior and professional discipline, the burden of this problem can be significantly reduced.

METHOD

A total of 84 direct dental care providers were approached to participate in the questionnaire part of the study after signing the informed consent. The participants who reported to having cleaned their phones less than once a week were invited to participate in the second part of the study. At this stage 18 dentalassistants would also be invited to participate in the

study. One control (unused sterile cotton applicator tip) will also be sampled in the same batch of the sheep blood agar plate. A total of 53 mobile phone samples were collected in the following manner:

All the surfaces of the mobile phones were sampled by a trained microbiology technician with sterile cotton swabs and streaked on sheep blood agar for assessment of bacterial load in Colony Forming Units and incubated at 37 C for twenty-four hours. All mobile phones were sampled by wearing a fresh pair of gloves for preventing chances of cross infections. All the surfaces of the mobile phones were then cleaned and disinfected with 70% isopropyl alcohol with fresh sterile cotton swabs to prevent any chances of cross infection. The mobile phones were then allowed to dry and another sterile cotton swab sample was taken and streaked onto another sheep blood agar in the same manner. The participants were advised to use their phones in the same manner as they used to and another sample was taken and streaked onto sheep blood agar after a period of 1 week.

Colony forming units were measurement was performed manually using a pen and a click-counter method. Instead of taking a log of the values, direct measurements and statistical test were applied on the values.

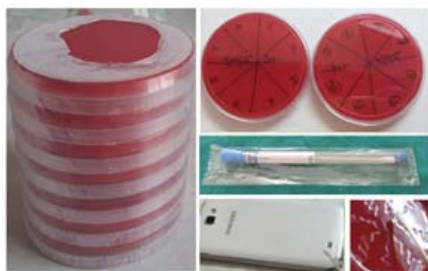


Figure 1: Sterile cotton tip applicators, sheep blood agar plates and streaking procedure.

Data from returned questionnaires were analyzed with Statistical Package for Social Sciences software version 20.0. Because some parts of the data were found to be not normally distributed using the Shapiro-Wilk test and Kolmogorov-smirnov test, non-parametric tests – Mann-Whitney and Kruskal-Wallis tests were applied and a *p* value lesser than 0.05 was considered statistically significant.

RESULTS

The results of our KAP questionnaire (Knowledge, Attitude and Perception) signify the lack of awareness regarding basic mobile phone hygiene practices. 12% (10) respondents reported using their phones less than 10 times a day, whereas the rest reported using their mobile phones more than 10 times in a day. 31% (26) respondents reported using their mobile phones while treating patients. 14 % (12) respondents reported using their mobile phones while wearing gloves. 76% (64) of the respondents reported using their mobile phones for all the

mentioned uses i.e. answering or making calls, checking time, text messaging and internet usage.

48% (40) of the respondents reported that they cleaned their mobile phones less than once per week. 65% (55) of the respondents reported using normal cloths or paper (*without alcohol*) for cleaning their mobile phones while only 12% (10) respondents reported using *alcohol* for cleaning their mobile phones. 82% (69) respondents reported that they did not wash their hand before or after using their mobile phones. 61% (51) respondents reported that that they were unaware about basic mobile phone hygiene protocols and procedures.

Based on this data all the 40 participants who reported that they cleaned their mobile phones less than once in a week were asked to participate in the second part of the study after signing the informed consent. of 36 dentists and 17 dental assistants agreed to participate

The male female ratio was 2.11 (36 Males: 17 Females). 47 mobile phones (88.7%) were touchscreen and 6 phones (11.3%) were buttoned. Out of the total sample 36 phones were of doctors (67.9%) and 17 were of technicians (32.1%). 11 phones (20.8%) were large (5 inches and above), 28 phones were medium in size (52.8%) and the remainder 14 mobile phones were small in size.

There was no growth produced by the control streaks which implies that all growths obtained are purely from the mobile phones only. The sterile cotton applicator tips are in fact sterile.

There was no statistical difference between the CFU-Pre, CFU-Post and CFU-One week post values of male and female mobile phones (*p* values - 0.340, 0.843 and 0.826 respectively).

BUTTONED AND TOUCHSCREEN MOBILE PHONES (FIGURE 2):

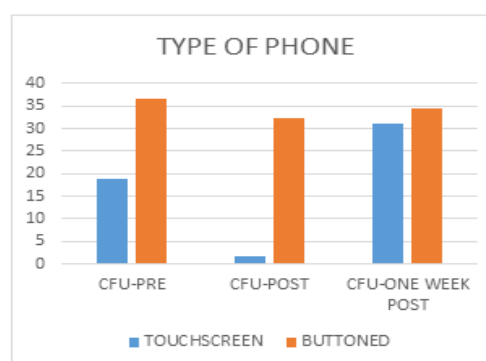


Figure 2: CFU values according to the Type of Phone

The CFU-Pre and CFU-Post values of buttoned mobile phones were significantly greater than those of touchscreen mobile phones (0.008 and 0.000) but there was no statistical difference in the CFU-One week post values of touchscreen

and buttoned mobile phones. This result implies that buttoned mobile phones not only harbor greater amount of bacterial growth, but also are more difficult to disinfect even with a potent disinfectant like 70% isopropyl alcohol.

LARGE, MEDIUM AND SMALL SIZED MOBILE PHONES (FIGURE 3):

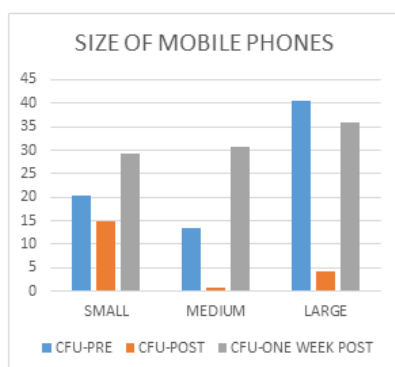


Figure 3: CFU Values according to the Size of phones

CFU-Pre values were significantly higher in large sized mobile phones (p value – 0.000) whereas CFU-Post values were significantly higher in small sized mobile phones (p value – 0.000) and there was no statistical difference in the CFU-One Week Post values of large, medium or small sized phones (p value – 0.356). The significantly higher difference in CFU-Post values in small sized mobile phones should be interpreted with caution as this data has been confounded by the fact that majority of buttoned phones were small in size (which independently has been shown to be difficult to disinfect thoroughly). The fact that CFU-Pre values are higher in large sized mobile phones implies that their greater surface area provides greater area for harboring microorganisms but is of very little practical significance because they can be cleaned as effectively as any other size of mobile phone.

MOBILE PHONES OF DOCTORS AND DENTAL ASSISTANTS OR TECHNICIANS (FIGURE 4):

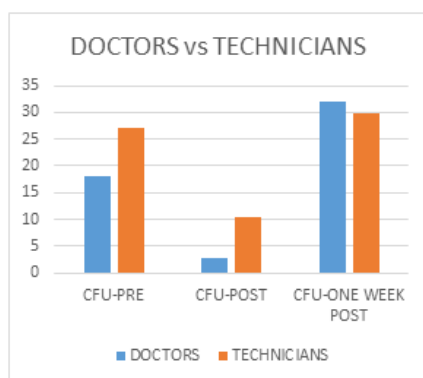


Figure 4: CFU Values of Doctors and Technicians (Dental Assistants)

When the groups of Technicians and Doctors was compared the only the CFU-Pre values were significantly greater in the Technicians (p value – 0.042) whereas there was no significant difference in the CFU-Post and CFU-One Week Post values (p value – 0.224 and 0.486 respectively). This data implies that there is more growth on mobile phones of technicians.

DISCUSSION

The lack of stringent infection control in dental practise settings has a great potential risk in the spread of infectious diseases like Herpes simplex, Hepatitis B, AIDS⁵. The infection control in dental practises are especially overlooked in developing countries. Though strict sterilization protocol for instruments and materials of direct use is easier to be implemented, the hygiene and sterilization of items of personal use like mobile phones, pens, stationary etc can pose a risk in transfer of infectious microorganism from one patient to another and also from patient to doctor⁶. Therefore dental practitioners should be mindful of including such items of personal use in the purview of comprehensive infection control in their practises.

This study also establishes that that smooth surface like touch screen phones are less susceptible to gather microorganism and easier to disinfect.

The data also establishes that there is no significant difference in the microorganism colonies on the phones of dental assistants and dentists involved directly in the patient care.

Though most of the data shows that growth obtained on these instruments is mostly environmental in origin but it is a significant finding and clearly emphasises that intra operative use of such devices has potential risk of impregnating pathogenic micro-organism in the patients mouth during non-invasive dental procedures and in the blood stream in invasive procedures.

No amount of research or potent disinfectant can ever replace training in basic standardized protocols to maintain the operative field contamination free.⁷

Infection control needs to be inculcated as a habit than a procedure. Establishing such habits in the early phases of dental school can achieve greater and far reaching results and reduce the possibilities of cross-contamination in a dental setting.

REFERENCES

- [1] Checchi, L., Montebugnoli, L. and Samaritani, S., Contamination of the turbine air chamber: a risk of cross infection. *Journal of Clinical Periodontology*, 1998;25: 607–611.
- [2] Nejatidanesh F et al; Risk of Contamination of Different Areas of Dentist's Face During Dental Practices; Nejatidanesh F et al., *Int J Prev Med*. 2013; 4(5): 611–615.
- [3] Sagar J et al. Cross-contamination in dentistry: A comprehensive overview, 2013, Volume:4, Issue Number: 1, 51-58

-
- [4] Singh S, Acharya S, Bhat M et al. Mobile phone hygiene: potential risks posed by use in the clinics of an Indian dental school. *Journal of dental education*. 2010 Oct 1;74(10):1153-8.
 - [5] Eggimann P, Pittet D. Infection control in the ICU. *Chest Journal*. 2001 Dec 1;120(6):2059-93.
 - [6] Khanghahi BM, Jamali Z, Azar FP, Behzad MN, Azami-Aghdash S. Knowledge, attitude, practice, and status of infection control among Iranian dentists and dental students: a systematic review. *Journal of dental research, dental clinics, dental prospects*. 2013 Apr 1;7(2):55.
 - [7] Microbial contamination of “in use” bar soap in dentalclinics; Hegde PP, Andrade AT, Bhat K; *Ind J Dent Res* 17(2): 70-73, 2006
 - [8] Singh BP, Khan SA, Agrawal N, Siddharth R, Kumar L. Current biomedical waste management practices and cross-infection control procedures of dentists in India. *International dental journal*. 2012 Jun 1;62(3):111-6.