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RESEARCH ARTICLE

BACTERIAL CONTAMINATION OF HEALTHCARE WORKERS' MOBILE PHONES IN A TERTIARY CARE CENTER IN SAUDI ARABIA

Fares Almeshal¹, Feras Asiri¹, Anas Alyamani¹, Mohammed Altuwaijri¹, Sameera Aljehani^{1,2,4}, Abdulhai Almuhana² and Adel Alothman^{1,3,4}.

1. College of Medicine, KSAU-HS, Riyadh
2. Department of microbiology, KAMC-Riyadh
3. Division of infectious diseases, KAMC-Riyadh
4. King Abdullah International Research Center," KAIMRC" Riyadh

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Abstract

Background: Mobile phones provide health care workers' (HCWs) with fast communication and quick access to medical information. Their frequent use in the hospital environment may pose a risk of spreading nosocomial infections. In this study, we aimed to determine the bacterial contamination of HCWs' mobile phones.

Materials/Methods: Samples were collected from mobiles of HCWs' at King Abdulaziz Medical City, Riyadh. A swab taken from the mobile phone and a questionnaire was answered by each subject. The swabs were sent to the lab for culture, carrying a serial number to indicate the questionnaire.

Results: Of the 400 mobile phone samples, 171 (43%) showed bacterial growth. Different variables were examined. The number of male HCWs sampled was 167, 90 of them (54%) showed positive growth, while only 81 (35%) of the 233 samples taken from female participants showed positive growth (p-value= <0.005). In addition, samples taken from phones that are frequently cleaned (226 samples) showed 10% less growth than mobile phones that are not frequently cleaned (p-value= 0.049). The most commonly isolated organism was Coagulase negative Staphylococci, which were isolated from 121 (30%) phones of the mobile phones sampled.

Discussion: More than one third of the HCWs' mobile phones were contaminated with bacteria. Our results showed that the degree of bacterial contamination in KAMC-Riyadh is less than studies done in other countries. The most common isolated organism in many of the reviewed studies was methicillin sensitive S.aureus, while in our study it was coagulase negative Staphylococci.

Conclusion: More than one third of the HCWs mobile phones were contaminated by bacteria. The results support the claim that HCWs' mobile phones may serve as vectors for transmission of nosocomial infections, and that cleaning mobile phones may reduce this risk.

Introduction:-

Mobile phones provide healthcare workers (HCWs) with faster communication and quick access to information, hence, they are usually kept near-at-hand.⁷ Some hospitals are even using mobile phones instead of pagers.^{9, 10} There are currently no guidelines on mobile phone cleaning and handling in the medical field. Whenever HCWs use their mobile phones, they may transmit organisms from their hands to their mobile phones. As a result, HCWs' mobile phones serve as reservoirs for these microorganisms that could be easily transmitted back to the HCWs' hands. In this way, mobile phones may facilitate the transmission of nosocomial infections.

Many studies have supported this claim: a study done in Turkey has shown that 94% of HCWs' mobile phones and hands in operating rooms and intensive care units demonstrated evidence of bacterial contamination with different types of bacterial organisms. 31.3% of the mobile phones sampled were contaminated with gram negative strains.¹¹ Another study done in India has shown that as much as 98.5% of HCWs' mobile phones were contaminated by bacteria.¹² Furthermore, a study that sampled 90 HCWs' mobile phones revealed that 70 (89.7%) mobile phones were contaminated by bacteria, 10 of them (11.5%) were contaminated with bacteria known to cause nosocomial infections.¹⁵

Our study was conducted in King Abdulaziz Medical City (KAMC)-Riyadh. KAMC-Riyadh is a 962 bed tertiary care center located in Riyadh City, Saudi Arabia, which is affiliated with King Saud Bin Abdul-Aziz University for Health Sciences.¹⁶ In this study, we aimed to determine the degree of bacterial contamination of HCWs' mobile phones in KAMC-Riyadh and to identify the microorganisms colonizing these mobile phones. Also, we wanted to estimate the effect of various factors (e.g. gender, position, department of the owner and age of the mobile phone) on bacterial contamination of the mobile phones.

Methods:-

A total of 400 samples were collected from HCWs. Non-probability convenience sampling was used. Each morning the principal investigator would assign the data collectors to a different location inside the hospital. Ten samples were collected per day. Before taking samples, written consent was taken from each participant. After that, the participant's mobile phone was sampled using a sterile wet swab. All 400 swab-samples were collected by a single data collector to ensure consistency of the swabbing technique. The back and sides of the mobile phone were swabbed using a sterile wet swab. Simultaneously, the participant was asked to fill a questionnaire. The questionnaire was prepared based on literature review. The questionnaire assessed the following factors: position, department, gender, years of owning the mobile phone, frequency and method of cleaning the phone, frequency of usage of the mobile phone, use of headphones, and use of the phone while dealing with patients. Then, the swabs were taken to the lab conservatively, and assigned lab technicians cultured the samples on blood agar media for 48 hours. Positive cultures were further analyzed using Gram stain, Coagulase, and Catalase reactions.^{11,12,14,15}

After obtaining culture results, data from the lab and questionnaire were entered into Microsoft Excel. After data entry was done, data was exported to SPSS version 21 for analysis. Variables were analyzed by Chi square test. P values < 0.05 were considered significant.

Results:-

The rate of bacterial contamination of HCWs' mobile phones was 43% (171 phones). Coagulase negative Staphylococci were isolated from 123 (30%) mobile phones, followed by Corynebacterium species, which was isolated from 53 (13%) mobile phones. Details of the number and type of bacteria obtained from mobile phones are depicted in Figure I.

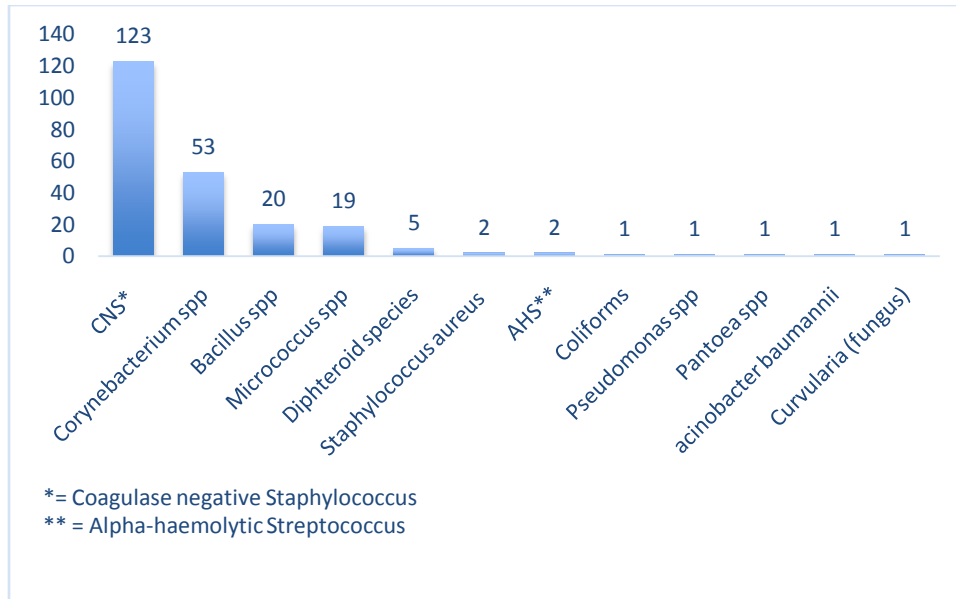


Figure 1-Frequency of isolated organisms from mobile phones

Demographic variables and their effect on phone contamination were obtained from HCWs and are summarized in Table 1. Phone related factors and whether or not they affected the rate of contamination are shown in Table 2. Of the aforementioned variables, only two showed significant difference, which were gender of the owner and cleaning the mobile phone. The number of samples taken from male participants was 167, of which 90 samples(54%) showed positive growth. On the other hand, 81(35%) of the 233 samples taken from female participants showed positive growth (p-value= <0.005). In addition, samples taken from phones that are cleaned daily (226 samples) showed 10% less growth than mobile phones that are not cleaned daily (p-value= 0.049). In addition to isolating various bacteria, one mobile phone of a female nurse isolated a fungus “Curvularia species.”

Table 1:- Participant demographics.

		Positive		Negative		P-value
		N	%	N	%	
Position	Consultant	33	47%	37	53%	0.571
	Resident	44	47%	50	53%	
	Nurse	82	40%	124	60%	
	Other	12	40%	18	60%	
Department	Medicine	60	45%	72	55%	0.239
	Surgery	29	41%	42	59%	
	Pediatrics	21	60%	14	40%	
	ER	7	44%	9	56%	
	ICU	24	38%	40	62%	
	Other	30	37%	52	63%	
Gender	Male	90	54%	77	46%	<0.005
	Female	81	35%	152	65%	

Table 2:- Phone related factors.

		Positive		Negative		P-value
		N	%	N	%	
Age of your cell phone	<6months	59	67%	29	33%	0.190
	6-12 months	53	57%	40	43%	
	13-24 months	54	53%	47	47%	
	>24 months	63	53%	55	47%	
How many times do you clean your cell phone per day?	0	90	52%	84	48%	0.396
	1	92	61%	59	39%	
	2	26	62%	16	38%	
	3	12	67%	6	33%	
	4 or more	9	60%	6	40%	
Do you clean your mobile phone?	Yes	139	62%	87	38%	0.04998
	No	90	52%	84	48%	
How many times do you use your cellphone during working hours?	>15	76	60%	50	40%	0.384
	10-15	44	59%	31	41%	
	5-9	52	60%	34	40%	
	<5	57	50%	56	50%	
Do you use headphones?	Yes	85	59%	58	41%	0.509
	No	144	56%	113	44%	
Do you use your cellphone while dealing with the patient?	Yes	62	52%	58	48%	0.139
	No	167	60%	113	40%	

Discussion:-

Of the phones sampled in this current study, 43% showed positive bacterial growth which is comparable to a study conducted in the eastern province of Saudi Arabia by Sadat-Ali et al.¹⁷ Most studies show higher contamination rate than our study. Another study done by Ulger et al. reported that 94.5% of 200 health care workers' mobile phones were contaminated with various microorganisms, including nosocomial pathogens.¹¹ Another study done in India has shown that as much as 98.5% of HCWs' mobile phones were bacterially contaminated.¹² However, a study done in Queen Elizabeth hospital in Barbados, West Indies, had results similar to ours with 45% of mobile phones of 266 medical staff and students were culture positive.¹⁴

In our study, the most frequently isolated organism was coagulase negative Staphylococcus which was isolated from 30% (121 phones) of the samples. The most common organisms found by Sadat-Ali et al. were Staphylococcus aureus (33%), followed by Staphylococcus epidermidis (22.9%) and Escherichia coli (12.8%).¹⁷ Whereas, a study done in Egypt by Badr et al. had similar results to our study with coagulase negative Staphylococcus being the most common isolated organism (33.3%).¹⁸ Also, 90.5% of the phones sampled by Ulger et al. showed positive growth of coagulase negative Staphylococcus.¹¹

The fact that we were able to isolate a fungus "Curvalaria species" indicates another area of thinking about the chance that mobile phones can transmit fungal infections to certain patients.

A limitation to our study is the lack of antibiotic sensitivity testing, which prevented us from accurately comparing our results to other studies. Also, we were not able to assess the risk of some of the isolated bacteria.

Even though the use of cellphones may facilitate patient care, it may pose a risk to patients in the form of transmitting nosocomial infections. Cleaning mobile phones reduces the bacterial contamination of mobile phones which may decrease this risk. We recommend that mobile phone cleaning guidelines are put forth and implemented. Furthermore, the use of mobile phones should be restricted in high-risk situations.

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